

REPUBLIC OF MAURITIUS  
**DEPARTMENT OF CIVIL AVIATION**

Sir Seewoosagur Ramgoolam International Airport, Plaine Magnien

# **MAURITIUS CIVIL AVIATION REQUIREMENTS**

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## **MCAR PART - FCL**

### **Flight Crew Licensing**

**ISSUE 5 | REV 0**

**10 June 2025**

## **Foreword**

The Director of Civil Aviation (hereinafter referred to as the 'Authority') is the competent Authority responsible for the regulation of Civil Aviation in the Republic of Mauritius.

This MCAR-Part-FCL is issued by the Authority pursuant to the provisions of Regulation 135 of the Civil Aviation Regulations and establishes the requirements for the grant, validation, revalidation and renewal of flight crew licences in the Republic of Mauritius.

This MCAR-Part-FCL also lays down detailed requirements for the Approval of Training Organisations (ATO) to establish acceptable standards.

This MCAR-Part-FCL is fully compliant with the standard of ICAO Annex 1.

Also, complementary to this MCAR are the following Authority's documents:

- Instructions and Procedures to Examiners: Licence Skill Tests and Licence Proficiency Checks for Multi-Pilot Aeroplanes-For Examiners
- Procedures and Guidance for Type Rating Instructor (Aeroplanes), Synthetic Flight Instructor (Aeroplanes) and Course Providers for TRI (A), SFI (A)

All concerned stakeholders are required to strictly adhere to the provision of this MCAR-Part -FCL which replaces the issue 04 dated October 2021.

Any comments or views on this MCAR should be sent to the Director of Civil Aviation via email on [civil-aviation@govmu.org](mailto:civil-aviation@govmu.org) for consideration and amendment if required.

This MCAR Part FCL issue 05 will be effective as from 10 June 2025 and concerned stakeholders will have to demonstrate full compliance by 31 October 2025.



**I POKHUN**

**Director of Civil Aviation**

**Record of Revisions**

<b>Revision Number.</b>	<b>Date of issue</b>	<b>Entered by</b>
Issue 3 Rev 0	04 March 2015	DCA
Issue 4 Rev 0	26 October 2021	DCA
Issue 5 Rev 0	10 June 2025	DCA

**NOTE**

The content of this document is arranged as follows: the cover regulation (recitals and articles) with the implementing requirement (IR) or delegated act (DA) points, as regulation, appears first, followed by the related acceptable means of compliance (AMC) and guidance material (GM) paragraph(s).

All elements (i.e. cover regulation, regulation, AMC, and GM) are colour-coded and can be identified according to the illustration below.

**Regulation**

**Acceptable means of compliance**

**Guidance material**



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## **SUBPART A – GENERAL REQUIREMENTS**

### **FCL.001 Competent authority**

For the purpose of this MCAR, the competent authority shall be the Director of Civil Aviation, to whom a person applies for the issue of pilot licences or associated ratings or certificates.

### **FCL.005 Scope**

This MCAR establishes the requirements for the issue of pilot licences and associated ratings and certificates and the conditions of their validity and use.

### **GM1 FCL.005 Scope**

#### **INTERPRETATIVE MATERIAL**

- (a) Whenever licences, ratings, approvals or certificates are mentioned in MCAR-Part-FCL, these are meant to be valid licences, ratings, approvals or certificates issued in accordance with MCAR-Part-FCL. In all other cases, these documents are specified.
- (b) Whenever a reference is made to a Contracting States to mutual recognition of licences, ratings, approvals or certificates, this means a Contracting State party to the Convention and applying requirements equivalent to the MCAR-Part-FCL..
- (c) Whenever an inclusive or exclusive 'or' is used, it should be understood within the context of the whole meaning of the requirement in which it is used.

### **FCL.010 Definitions**

For the purposes of this MCAR-Part-FCL, the following definitions shall apply:

- "Accessible" means that a device can be used by:
  - the approved training organisation (ATO) under whose approval a training course for a class or type rating is being conducted; or
  - the examiner conducting the assessment of competence, skill test or proficiency check for the purpose of assessing, testing or checking.



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- "Aerobatic flight" means an intentional manoeuvre involving an abrupt change in an aircraft's attitude, an abnormal attitude, or abnormal acceleration, not necessary for normal flight or for instruction for licences, certificates, or ratings other than the aerobatic rating.
- "Aeroplane" means an engine-driven fixed-wing aircraft heavier than air which is supported in flight by the dynamic reaction of the air against its wings.
- "Aeroplane" required to be operated with a co-pilot" means a type of aeroplane which is required to be operated with a co-pilot as specified in the flight manual or by the air operator certificate.
- "Aeroplane upset prevention and recovery training" (UPRT) means training consisting of:
  - aeroplane upset prevention training: a combination of theoretical knowledge and flying training with the aim of providing flight crew with the required competencies to prevent aeroplane upsets; and
  - aeroplane upset recovery training: a combination of theoretical knowledge and flying training with the aim of providing flight crew with the required competencies to recover from aeroplane upsets.
- "Aircraft" means any machine which can derive support in the atmosphere from the reactions of the air other than the reactions of the air against the earth's surface.
- "Airmanship" means the consistent use of good judgement and well-developed knowledge, skills and attitudes to accomplish flight objectives.
- "Airship" means a power-driven lighter-than-air aircraft, with the exception of hot-air airships, which are considered to be balloons in accordance with the Civil Aviation Regulations.
- "Available FSTD" means any flight simulation training device (FSTD) that is vacant for use of the FSTD operator or of the customer irrespective of any time considerations.
- "Angular operation" means an instrument approach operation in which the maximum tolerable error/deviation from the planned track is expressed in terms of deflection of the needles on the Course Deviation Indicator (CDI) or equivalent display in the cockpit.

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- "Assessment of competence" means the demonstration of skills, knowledge and attitude for the initial issue, revalidation or renewal of an instructor or examiner certificate.
- "Balloon" means a lighter-than-air aircraft which is not engine-driven and sustains flight through the use of either gas or an airborne heater. For the purposes of this MCAR, a hot-air airship, although engine-driven, is also considered a balloon.
- "Category of aircraft" means a categorisation of aircraft according to specified basic characteristics, for example aeroplane, powered-lift, helicopter, airship, sailplane, free balloon.
- "Class of aeroplane" means a categorisation of single-pilot aeroplanes not requiring a type rating.
- "Commercial air transport" means the transport of passengers, cargo or mail for remuneration or hire.
- "Competency" means a combination of skills, knowledge and attitude required to perform a task to the prescribed standard.
- "Competency element" means an action which constitutes a task that has a triggering event and a terminating event that clearly defines its limits, and an observable outcome.
- "Competency unit" means a discrete function consisting of a number of competency elements.
- "Co-pilot" means a pilot operating other than as pilot-in-command, on an aircraft for which more than one pilot is required, but excluding a pilot who is on board the aircraft for the sole purpose of receiving flight instruction for a licence or rating.
- "Cross-country" means a flight between a point of departure and a point of arrival following a pre-planned route, using standard navigation procedures.
- "Cruise relief co-pilot" means a pilot who relieves the co-pilot of his/her duties at the controls during the cruise phase of a flight in multi-pilot operations above FL 200.
- "Dual instruction time" means flight time or instrument ground time during which a person is receiving flight instruction from a properly authorised instructor.
- "En route IFR flight" means the phase of an IFR flight that commences after the completion of an IFR departure procedure and finishes when commencing an IFR approach procedure.

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- "Error" means an action or inaction taken by the flight crew which leads to deviations from organisational or flight intentions or expectations.
- "Error management" means the process of detecting and responding to errors with countermeasures which reduce or eliminate the consequences of errors, and mitigate the probability of errors or undesired aircraft states.
- "Evidence based training (EBT) operator" means an organisation that is holding an air operator certificate (AOC) in accordance with MCAR-Part-ORO and that has implemented an EBT programme approved by the Authority, in accordance with the provisions of that MCAR.
- "EBT practical assessment" means a method for assessing performance that serves to verify the integrated performance of competencies. It takes place in either a simulated or an operational environment.
- "EBT programme" means a pilot assessment and training programme in accordance with point ORO.FC.231 of MCAR-Part-ORO.
- "Mixed EBT programme" means an operator's recurrent training and checking programme provided for in point ORO.FC.230 of MCAR-Part-ORO, a portion of which is dedicated to the application of EBT but which does not replace proficiency checks provided for in Appendix 9 to this MCAR.
- "Full Flight Simulator" (FFS) means a full size replica of a specific type or make, model and series aircraft flight deck, including the assemblage of all equipment and computer programmes necessary to represent the aircraft in ground and flight operations, a visual system providing an out-of-the-flight deck view, and a force cueing motion system.
- "Flight time":
  - for aeroplanes, touring motor gliders and powered-lift aircraft, it means the total time from the moment an aircraft first moves for the purpose of taking off until the moment it finally comes to rest at the end of the flight;
  - for helicopters, it means the total time from the moment a helicopter's rotor blades start turning until the moment the helicopter finally comes to rest at the end of the flight, and the rotor blades are stopped;
  - for airships, it means the total time from the moment an airship is released from the mast for the purpose of taking off until the moment the airship finally comes to rest at the end of the flight, and is secured on the mast.

[applicable until 30 April 2025]

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- for airships, it means the total time from the moment an airship is released from the mast for the purpose of taking off until the moment the airship finally comes to rest at the end of the flight, and is secured on the mast;

[applicable from 1 May 2025]

- for VTOL-capable aircraft (VCA), it means the total time between the moment the lift and thrust units are powered on for the purpose of taking off until the moment the aircraft finally comes to rest at the end of the flight and the lift and thrust units are powered off.

[applicable from 1 May 2025]

- "Flight time under Instrument Flight Rules" (IFR) means all flight time during which the aircraft is being operated under the Instrument Flight Rules.
- "Flight Training Device" (FTD) means a full size replica of a specific aircraft type's instruments, equipment, panels and controls in an open flight deck area or an enclosed aircraft flight deck, including the assemblage of equipment and computer software programmes necessary to represent the aircraft in ground and flight conditions to the extent of the systems installed in the device. It does not require a force cueing motion or visual system, except in the case of helicopter FTD levels 2 and 3, where visual systems are required.
- "Flight and Navigation Procedures Trainer" (FNPT) means a training device which represents the flight deck or cockpit environment, including the assemblage of equipment and computer programmes necessary to represent an aircraft type or class in flight operations to the extent that the systems appear to function as in an aircraft.
- "Flown solely by reference to instruments" means that the pilots fly the aircraft without any external visual references, in simulated or actual instrument meteorological conditions (IMC).
- "Helicopter" means a heavier-than-air aircraft supported in flight chiefly by the reactions of the air on one or more power-driven rotors on substantially vertical axes.

[applicable until 30 April 2025]

- "Helicopter" means a type of rotorcraft supported in flight chiefly by the reactions of the air on up to two power-driven rotors on substantially vertical axes.

[applicable from 1 May 2025]

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- "Instrument flight time" means the time during which a pilot is controlling an aircraft in flight solely by reference to instruments.
- "Instrument ground time" means the time during which a pilot is receiving instruction in simulated instrument flight, in flight simulation training devices (FSTD).
- "Instrument time" means instrument flight time or instrument ground time.
- "Limited panel instrument flight" means attitude interpretation by reference to standby instruments interpretation after the loss of main attitude and heading reference system.
- "Linear operation" means an instrument approach operation in which the maximum tolerable error/deviation from the planned track is expressed in units of length, for instance nautical miles, for cross-track lateral deviation.
- "Line flying under supervision" (LIFUS) means line flying after an approved zero flight time type rating training course or the line flying required by an operational suitability data (OSD) report.
- "LNAV" means Lateral Navigation.
- "LPV" means Localiser Performance with Vertical Guidance.
- "Multi-pilot operation" means an operation requiring at least two pilots using multi-crew cooperation in either a multi-pilot or a single-pilot aircraft.
- "Multi-crew cooperation" (MCC) means the functioning of the flight crew as a team of cooperating members led by the pilot-in-command.
- "Multi-pilot aircraft":
  - for aeroplanes, it means aeroplanes certificated for operation with a minimum crew of at least two pilots,
  - or helicopters, airships and powered-lift aircraft, it means an aircraft which is certificated for operation with a minimum crew of at least two pilots or which is required to be operated with at least two pilots in accordance with the Civil Aviation Regulations.
- "Night" means the period between the end of evening civil twilight and the beginning of morning civil twilight or such other period between sunset and sunrise as may be prescribed by the appropriate authority.

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- "OSD" means the operational suitability data established in accordance with MCAR-Part-21.
- "Other training devices" (OTD) means training aids other than FSTDs which provide means for training where a complete flight deck environment is not necessary.
- "Performance-Based Navigation (PBN)" means area navigation based on performance requirements for aircraft operating along an ATS route, on an instrument approach procedure or in a designated airspace.
- "Performance criteria" means a simple, evaluative statement on the required outcome of the competency element and a description of the criteria used to judge if the required level of performance has been achieved.
- "Pilot-in-command" (PIC) means the pilot designated as being in command and charged with the safe conduct of the flight.
- "Pilot-in-command under supervision" (PICUS) means a co-pilot performing, under the supervision of the pilot-in-command, the duties and functions of a pilot-in-command.
- "Powered-lift aircraft" means any aircraft deriving vertical lift and in flight propulsion/lift from variable geometry rotors or engines/propulsive devices attached to or contained within the fuselage or wings.
- "Powered sailplane" means a sailplane equipped with one or more engines that has, with engines inoperative, the characteristics of a sailplane.
- "Private pilot" means a pilot who holds a licence which prohibits the piloting of aircraft in operations for which remuneration is given, with the exclusion of instruction or examination activities, as established in this MCAR.
- "Proficiency check" means the demonstration of skill to revalidate or renew ratings or privileges, and including such oral examination as may be required.
- "Renewal" (of, e.g. a rating or certificate) means the administrative action taken after a rating or certificate has lapsed for the purpose of renewing the privileges of the rating or certificate for a further specified period consequent upon the fulfilment of specified requirements.
- "Revalidation" (of, e.g. a rating or certificate) means the administrative action taken within the period of validity of a rating or certificate which allows the holder to continue to exercise the privileges of a rating or certificate for a further specified period consequent upon the fulfilment of specified requirements.

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- "RNP APCH" means a PBN specification used for instrument approach operations.
- "RNP APCH operation down to LNAV minima" means a 2D instrument approach operation for which the lateral guidance is based on GNSS positioning.
- "RNP APCH operation down to LNAV/VNAV minima" means a 3D instrument approach operation for which the lateral guidance is based on GNSS positioning and the vertical guidance is provided either by the Baro VNAV function or by the GNSS positioning including SBAS.
- "RNP APCH operation down to LPV minima" means a 3D instrument approach operation for which both lateral and vertical guidance are based on GNSS positioning including SBAS.
- "RNP AR APCH" means a navigation specification used for instrument approach operations requiring a specific approval.
- "Route sector" means a flight comprising take-off, departure, cruise of not less than 15 minutes, arrival, approach and landing phases.
- "Sailplane" means a heavier-than-air aircraft which is supported in flight by the dynamic reaction of the air against its fixed lifting surfaces, the free flight of which does not depend on an engine.
- "Single-pilot aircraft":
  - for aeroplanes, it means an aircraft certificated for operation by one pilot,
  - for helicopters, airships and powered lift aircraft, it means an aircraft which is certificated for operation by one pilot and which is not required to be operated with at least two pilots by the Civil Aviation Regulations.
- "Skill test" means the demonstration of skill for a licence or rating issue, including such oral examination as may be required.
- "Solo flight time" means flight time during which a student pilot is the sole occupant of an aircraft.
- "Student pilot-in-command" (SPIC) means a student pilot acting as pilot-in-command on a flight with an instructor where the latter will only observe the student pilot and shall not influence or control the flight of the aircraft.
- "Threat" means events or errors which occur beyond the influence of the flight crew, increase operational complexity and which must be managed to maintain the margin of safety.

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- "Threat management" means the process of detecting and responding to the threats with countermeasures which reduce or eliminate the consequences of threats, and mitigate the probability of errors or undesired aircraft states.
- "Three-dimensional (3D) instrument approach operation" means an instrument approach operation using both lateral and vertical navigation guidance.
- "Touring motor glider (TMG)" means, unless otherwise specified following the certification process in accordance with MCAR-Part-21, a specific class of powered sailplanes that has an integrally mounted, non-retractable engine and a non retractable propeller. It shall be capable of taking off and climbing under its engine power according to its flight manual.
- "Two-dimensional (2D) instrument approach operation" means an instrument approach operation using lateral navigation guidance only.
- "Type of aircraft" means a categorisation of aircraft requiring a type rating as determined in the operational suitability data established in accordance with MCAR-Part-21, and which include all aircraft of the same basic design including all modifications thereto except those which result in a change in handling or flight characteristics.
- "Type rating and licence endorsement list" means a list published by the Authority based on the result of the OSD evaluation and containing classes of aeroplanes and types of aircraft for the purpose of flight crew licensing.
- "VNAV" means Vertical Navigation.

## **GM1 FCL.010 Definitions**

### **ABBREVIATIONS**

The following abbreviations apply to the Acceptable Means of Compliance and Guidance Material to MCAR-Part-FCL:

A	Aeroplane
AC	Alternating Current
ACAS	Airborne Collision Avoidance System
ADF	Automatic Direction Finding
ADS	Aeronautical Design Standard



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AFCS	Automatic Flight Control System
AFM	Aircraft Flight Manual
AGL	Above Ground Level
AIC	Aeronautical Information Circular
AIP	Aeronautical Information Publication
AIRAC	Aeronautical Information Regulation and Control
AIS	Aeronautical Information Services
AMC	Acceptable Means of Compliance
AeMC	Aero-medical Centre
AME	Aero-medical Examiner
AoA	Angle of Attack
AOH	Aircraft Operating Handbook
AOM	Aircraft Operating Manual
APU	Auxiliary Power Unit
As	Airship
ATC	Air Traffic Control
ATIS	Automatic Terminal Information Service
ATO	Approved Training Organisation
ATP	Airline Transport Pilot
ATPL	Airline Transport Pilot Licence
ATS	Air Traffic Service
AUM	All Up Mass
AUPRTA	Airplane Upset Prevention and Recovery Training Aid

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B	Balloon
BCAR	British Civil Airworthiness Requirement
BEM	Basic Empty Mass
BIR	Basic instrument rating
BITD	Basic Instrument Training Device
BPL	Balloon Pilot Licence
CAS	Calibrated Airspeed
CAT	Clear Air Turbulence
CB-IR	Competency-based training course for Instrument Rating
CDFA	Constant-Descent Final Approach
CDI	Course Deviation Indicator
CFI	Chief Flight Instructor
CG	Centre of Gravity
CP	Co-pilot
CPL	Commercial Pilot Licence
CRE	Class Rating Examiner
CRI	Class Rating Instructor
CRM	Crew Resource Management
CS	Certification Specification
CTKI	Chief Theoretical Knowledge Instructor
DC	Direct Current
DF	Direction Finding
DME	Distance Measuring Equipment

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DPATO	Defined Point After Take-Off
DPBL	Defined Point Before Landing
DR	Dead Reckoning navigation
DTO	Declared Training Organisation
DVE	Degraded Visual Environment
ECQB	European Central Question Bank
EFIS	Electronic Flight Instrument System
EIR	En route Instrument Rating
EOL	Engine Off Landings
ERPM	Engine Revolutions per Minute
ETA	Estimated Time of Arrival
ETOPS	Extended-range Twin-engine Operation Performance Standard
FAF	Final Approach Fix
FAR	Federal Aviation Regulations
FCL	Flight Crew Licensing
FE	Flight Examiner
F/E	Flight Engineer
FEM	Flight Examiner Manual
FFS	Full-Flight Simulator
FI	Flight Instructor
FIE	Flight Instructor Examiner
FIS	Flight Information Service
FMC	Flight Management Computer

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FMS	Flight Management System
FNPT	Flight and Navigation Procedures Trainer
FS	Flight Simulator
FSTD	Flight Simulation Training Device
ft	feet
FTD	Flight Training Device
G	Gravity forces
GLONASS	Global Orbiting Navigation Satellite System
GM	Guidance Material
GNSS	Global Navigation Satellite Systems
GPS	Global Positioning System
H	Helicopter
HF	High Frequency
HOFCS	High Order Flight Control System
HPA	High-Performance Aeroplane
hrs	Hours
HUMS	Health and Usage Monitoring System
HT	Head of Training
IAS	Indicated Airspeed
ICAO	International Civil Aviation Organization
IGE	In-Ground Effect
IFR	Instrument Flight Rules
ILS	Instrument Landing System

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IMC	Instrument Meteorological Conditions
IOS	Instructor Operating Station
IR	Instrument Rating
IRE	Instrument Rating Examiner
IRI	Instrument Rating Instructor
ISA	International Standard Atmosphere
JAR	Joint Aviation Requirements
kg	Kilogram
LAPL	Light Aircraft Pilot Licence
LDP	Landing Decision Point
LMT	Local Mean Time
LO	Learning Objectives
LOC-I	Loss of Control In-flight
LOFT	Line-Orientated Flight Training
m	Meter
MCC	Multi-Crew Cooperation
MCCI	Multi-Crew Cooperation Instructor
ME	Multi-Engine
MEL	Minimum Equipment List
MEP	Multi-Engine Piston
MET	Multi-Engine Turboprop
METAR	Meteorological Aerodrome Report
MI	Mountain Rating Instructor

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MP	Multi-Pilot
MPA	Multi-Pilot Aeroplane
MPL	Multi-crew Pilot Licence
MPH	Multi-Pilot Helicopter
MTOM	Maximum Take-Off Mass
NDB	Non-Directional Beacon
NM	Nautical Miles
NOTAM	Notice To Airmen
NOTAR	No Tail Rotor
OAT	Outside Air Temperature
OBS	Omni Bearing Selector
OEI	One Engine Inoperative
OEM	Original Equipment Manufacturer
OGE	Out of Ground Effect
OML	Operational Multi-pilot Limitation
OSL	Operational Safety Pilot Limitation
OTD	Other Training Devices
PAPI	Precision Approach Path Indicator
PBN	Performance-based Navigation
PF	Pilot Flying
PIC	Pilot-In-Command
PICUS	Pilot-In-Command Under Supervision
PL	Powered-lift

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PNF	Pilot Not Flying
POM	Pilot Operating Manual
PPL	Private Pilot Licence
QDM	Magnetic Heading (aircraft to station)
QDR	Magnetic Heading (station to aircraft)
QFE	Atmospheric pressure at aerodrome elevation
QNH	Altimeter sub-scale setting to obtain elevation when on the ground
RAIM	Receiver Autonomous Integrity Monitoring
RNAV	Radio Navigation
RPM	Revolutions per Minute
RRPM	Rotor Revolutions per Minute
R/T	Radio-telephony
S	Sailplane
SATCOM	Satellite Communication
SE	Single-Engine
SEP	Single-Engine Piston
SET	Single-Engine Turboprop
SFE	Synthetic Flight Examiner
SFI	Synthetic Flight Instructor
SID	Standard Instrument Departure
SIGMET	Significant Meteorological Weather
SLPC	Single Lever Power Control
SOP	Standard Operating Procedure

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SP	Single-Pilot
SPA	Single-Pilot Aeroplane
SPH	Single-Pilot Helicopter
SPIC	Student PIC
SPL	Sailplane Pilot Licence
SSR	Secondary Surveillance Radar
STI	Synthetic Training Instructor
TAF	(Terminal Area Forecasts) Aerodrome Forecast
TAS	True Airspeed
TAWS	Terrain Awareness Warning System
TCH	Type Certificate Holder
TDP	Take-off Decision Point
TEM	Threat and Error Management
TK	Theoretical Knowledge
TMG	Touring Motor Glider
TORA	Take-Off Run Available
TODA	Take-Off Distance Available
TR	Type Rating
TRE	Type Rating Examiner
TRI	Type Rating Instructor
UPRT	Upset Prevention and Recovery Training
UTC	Universal Time Coordinated
V	Velocity



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VASI	Visual Approach Slope Indicator
VFR	Visual Flight Rules
VHF	Very High Frequency
VMC	Visual Meteorological Conditions
VOLMET	Meteorological Information for Aircraft in-Flight
VOR	VHF Omni-directional Radio Range
ZFTT	Zero Flight Time Training
ZFM	Zero Fuel Mass

### **GM2 FCL.010 Definitions – lateral and vertical navigation**

Lateral and vertical navigation guidance refers to the guidance provided either by:

- (a) a ground-based radio navigation aid; or
- (b) computer-generated navigation data from ground-based, space-based, self-contained navigation aids or a combination of these.

### **GM3 FCL.010 Definitions**

#### **UPSET PREVENTION AND RECOVERY TRAINING (UPRT) DEFINITIONS**

In the context of UPRT, the following abbreviations apply to the Acceptable Means of Compliance and Guidance Material to MCAR-Part-FCL:

‘Advanced UPRT’ refers to the advanced UPRT course in accordance with point FCL.745.A.

‘Aeroplane upset’ refers to an undesired aircraft state characterised by unintentional divergences from parameters normally experienced during operations. An aeroplane upset may involve pitch and/or bank angle divergences as well as inappropriate airspeeds for the conditions.

‘Angle of Attack (AoA)’ refers to the angle between the oncoming air, or relative wind, and a defined reference line on the aeroplane or wing.

‘Approach-to-stall’ refers to flight conditions bordered by the stall warning and stall.

‘Basic UPRT’ refers to the UPRT elements and exercises integrated into training courses for the issue of a CPL, MPL or Phases 1 to 3 of the integrated ATP course.

‘Developed upset’ refers to a condition meeting the definition of an aeroplane upset.

‘Developing upset’ refers to any time the aeroplane begins to unintentionally diverge from the intended flight path or airspeed.

‘Energy state’ refers to how much of each kind of energy (kinetic, potential or chemical) the aeroplane has available at any given time.

‘First indication of a stall’ refers to the initial aural, tactile or visual sign of a stall event which can be either naturally or synthetically induced.

‘Flight crew resilience’ refers to the ability of a flight crew member to recognise, absorb and adapt to disruptions.

‘Fidelity level’ refers to the level of realism assigned to each of the defined FSTD features.

‘Flight path’ refers to the trajectory or path of the aeroplane travelling through the air over a given space of time.

‘Flight path management’ refers to active manipulation, using either the aeroplane’s automation or manual handling, to command the aeroplane’s flight controls in order to direct the aeroplane along a desired trajectory.

‘FSTD validation envelope’ refers to the envelope consisting of the following three subdivisions:

(a) Flight test validated region

This is the region of the flight envelope which has been validated with flight test data, typically by comparing the performance of the FSTD against the flight test data through tests incorporated in the qualification test guide (QTG) and other flight test data utilised to further extend the model beyond the minimum requirements. Within this region, there is high confidence that the simulator responds similarly to the aircraft. Note that this region is not strictly limited to what has been tested in the QTG; as long as the aerodynamics mathematical model has been conformed to the flight test results, that portion of the mathematical model can be considered to be within the flight test validated region.

(b) Wind tunnel and/or analytical region

This is the region of the flight envelope for which the FSTD has not been compared to flight test data, but for which there has been wind tunnel testing or the use of

other reliable predictive methods (typically by the aircraft manufacturer) to define the aerodynamic model. Any extensions to the aerodynamic model that have been evaluated in accordance with the definition of an exemplar stall model (as described in the stall manoeuvre evaluation section) must be clearly indicated. Within this region, there is moderate confidence that the simulator will respond similarly to the aircraft.

(c) Extrapolated region

This is the region extrapolated beyond the flight test validated and wind tunnel/analytical regions. The extrapolation may be a linear extrapolation, a holding of the last value before the extrapolation began, or some other set of values. Whether this extrapolated data is provided by the aircraft or simulator manufacturer, it is a 'best guess' only. Within this region, there is low confidence that the simulator will respond similarly to the aircraft. Brief excursions into this region may still retain a moderate confidence level in FSTD fidelity; however, the instructor should be aware that the FSTD's response may deviate from that of the actual aircraft.

'Load factor' refers to the ratio of a specified load to the weight of the aeroplane, the former being expressed in terms of aerodynamic forces, propulsive forces or ground reactions.

'Loss of Control In-flight (LOC-I)' refers to a categorisation of an accident or incident resulting from a deviation from the intended flight path.

'Manoeuvre-based training' refers to training that focuses on a single event or manoeuvre in isolation.

'Negative training' refers to training which unintentionally introduces incorrect information or invalid concepts, which could actually decrease rather than increase safety.

'Negative transfer of training' refers to the application (and 'transfer') of what was learned in a training environment (i.e. a classroom, an FSTD) to normal practice, i.e. it describes the degree to which what was learned in training is applied to actual, normal practices. In this context, negative transfer of training refers to the inappropriate generalisation of knowledge and skills to a situation or setting in normal practice that does not equal the training situation or setting.

'Original Equipment Manufacturer (OEM)' refers to the original equipment manufacturer of an aircraft or associated parts or equipment or of parts or equipment installed on the basis of a supplemental type certificate (STC).

'Post-stall regime' refers to flight conditions at an AoA greater than the critical AoA.

‘Scenario-based training’ refers to training that incorporates manoeuvres into real-world experiences to cultivate practical flying skills in an operational environment.

‘Stall’ refers to loss of lift caused by exceeding the aeroplane’s critical AoA.

Note: A stalled condition can exist at any attitude and airspeed, and may be recognised by continuous stall warning activation accompanied by at least one of the following:

- (a) buffeting, which could be heavy at times;
- (b) lack of pitch authority and/or roll control; and
- (c) inability to arrest the descent rate.

Note: It is possible that in certain conditions the stall warning may not be activated.

‘Stall event’ refers to an occurrence whereby the aeroplane experiences conditions associated with an approach-to-stall or a stall.

‘Stall (event) recovery procedure’ refers to the manufacturer-approved aeroplane-specific stall recovery procedures, such as those contained in the flight crew operations manual (FCOM). If an OEM-approved recovery procedure does not exist, the aeroplane-specific stall recovery procedure developed by the ATO, based on the stall recovery template, may be used.

‘Stall warning’ refers to a natural or synthetic indication provided when approaching a stall that may include one or more of the following indications:

- (a) aerodynamic buffeting (some aeroplanes will buffet more than others);
- (b) reduced roll stability and aileron effectiveness;
- (c) visual or aural cues and warnings;
- (d) reduced elevator (pitch) authority;
- (e) inability to maintain altitude or arrest rate of descent; and
- (f) stick shaker activation (if installed).

Note: A stall warning indicates an immediate need to reduce the AoA.

‘Startle’ refers to the initial, short-term, involuntary physiological and cognitive reactions to an unexpected event that commence the normal human stress response.

‘Stick pusher’ refers to any device that automatically applies a nose-down movement and pitch force to an aeroplane’s control columns to attempt to decrease the aeroplane’s AoA. Device activation may occur before or after aerodynamic stall, depending on the aeroplane type.

Note: A stick pusher is not installed on all aeroplane types.

‘Stick shaker’ refers to a device that automatically vibrates the control column to warn the pilot of an approaching stall.

Note: A stick shaker is not installed on all aeroplane types.

‘Stress (response)’ refers to the response to a threatening event that includes physiological, psychological and cognitive effects. These effects may range from positive to negative and can either enhance or decrease performance.

‘Surprise’ refers to the emotionally based recognition of a difference in what was expected and what is actual.

‘Train-to-proficiency’ refers to approved training designed to achieve end-state performance objectives, providing sufficient assurances that the trained individual is capable of consistently carrying out specific tasks safely and effectively.

Note: In the context of this definition, ‘train-to-proficiency’ can be replaced by ‘training-to-proficiency’.

‘Type-specific UPRT’ refers to UPRT elements and exercises integrated into training courses for the issue of a class or type rating pursuant to MCAR-Part-FCL or during recurrent or refresher training for a specific aeroplane class or type.

‘Undesired aircraft state’ refers to flight-crew-induced aircraft position or speed deviation, misapplication of controls, or incorrect systems configuration, associated with a reduction in margins of safety.

Note (1): Undesired states can be managed effectively, restoring margins of safety, or flight crew response(s) can induce an additional error, incident or accident.

Note (2): All countermeasures are necessary flight crew actions. However, some countermeasures to threats, errors and undesired aircraft states that flight crew employ are built upon ‘hard’/systemic-based resources provided by the aviation system.

‘Unsafe situation’ refers to a situation which has led to an unacceptable reduction in safety margin.

‘Unusual attitude’ refers to an aircraft in flight intentionally exceeding the parameters normally experienced in line operations or training, as applicable.

‘Incipient spin’ refers to a transient flight condition in the post-stall regime where an initial, uncommanded roll in excess of 45° has resulted from yaw asymmetry during a stall and which, if recovery action is not taken, will lead rapidly to a developing spin. Prompt recovery during this incipient spin stage will normally result in an overall heading change, from pre-stall conditions, of not more than 180°.

‘Developing spin’ refers to a flight condition in the post-stall regime where the aeroplane exhibits abnormal, but varying, rates of yaw and roll, together with changing pitch attitude, following an incipient spin but before the establishment of a developed spin. A developing spin follows an unrecovered incipient spin and will usually persist, in the absence of any recovery action, until a developed spin ensues.

‘Developed spin’ refers to a flight condition in the post-stall regime where the aeroplane has achieved approximately constant pitch attitude, yaw rate and roll rate on a descending flight path. In transition from a stall with significant, persistent yaw, with no recovery action, to attaining a developed spin, the aeroplane is likely to have rolled through at least 540°.

‘FSTD training envelope’ refers to the high and moderate confidence regions of the FSTD validation envelope.

## **GM4 FCL.010 Definitions**

### **DEFINITIONS IN GM3 FCL.010 RELATED TO THE POST-STALL REGIME**

The definitions for ‘incipient spin’, developing spin’ and ‘developed spin’ in GM3 FCL.010 relate to the post-stall regime in aeroplanes that might typically be used in the context of the advanced UPRT in accordance with point FCL.745.A. The definitions are not intended for application to commercial air transport operations.

## **GM5 FCL.010 Definitions**

### **AVAILABLE AND ACCESSIBLE FSTDs**

- (a) To determine the availability of an FSTD, the following additional criteria should be taken into account. The FSTD should be:
  - (1) certified by the Authority within the scope of the Civil Aviation Regulations and its associated MCAR’s;

- (2) approved by the Authority for use within the scope of the Civil Aviation Regulation;
  - (3) representative of the operator's or applicant's aircraft class or type, and serviceable; and
  - (4) representative of the configuration of the operator's or applicant's aircraft.
- (b) To determine the accessibility of an FSTD, the following additional criteria should be taken into account. The FSTD should be:
- (1) accessible to the instructor or examiner of the applicant;
  - (2) accessible for use within the scope of the candidate's/operator's training and checking activities; and
  - (3) accessible to allow normal programming and prevent excessive scheduling disruptions within the operator's crew roster patterns.
- (c) 'irrespective of any time considerations' means that the FSTD may be used at any time during day or night.
- (d) If an FSTD is not available or accessible, mitigating measures to ensure the required level of safety should be agreed with the Authority before testing or checking the applicant in an aircraft.

#### **GM6 FCL.010 Definitions**

- (a) For the purpose of crediting of a pilot's prior experience, 'multi-pilot operation' can be understood to include State aircraft operations (such as military or search & rescue) where two pilots are required by the applicable national regulations, the relevant operations manual or an equivalent document.
- (b) Operations under MCAR-Part-NCO are not under the 'multi-pilot operation' category, except for operations at an ATO for the purpose of providing training in multi-pilot operations, in accordance with the training manual of the ATO.

#### **FCL.015 Application and issue, revalidation and renewal of licences, ratings and certificates**

- (a) An application for the issue, revalidation or renewal of pilot licences and associated ratings and certificates as well as any amendment thereto shall be submitted to the Authority in a form and manner established by this Authority. The application shall be accompanied by evidence that applicants comply with the requirements

for the issue, revalidation or renewal of the licence or certificate as well as associated ratings or endorsements established in this MCAR and in MCAR-Part-MED.

- (b) Unless otherwise specified in this MCAR, any limitation or extension of the privileges granted by a licence, rating or certificate shall be endorsed in the licence or certificate by the Authority.
- (c) A person shall not hold at any time more than one licence per category of aircraft issued in accordance with this MCAR.
- (d) Reserved
- (e) Resereved
- (f) For the issue of a licence, rating or certificate the applicant shall apply not later than 6 months after having succeeded at the skill test or assessment of competence.
- (g) Training completed in aircraft or in FSTDs in accordance with MCAR-Part-ORO shall be taken into account for the experience and revalidation requirements established in this MCAR-Part-FCL.

### **AMC1 FCL.015 Application and issue of licences, ratings and certificates**

#### **APPLICATION AND REPORT FORMS**

Common application and report forms can be found:

- (a) For skill tests, proficiency checks for issue, revalidation or renewal of LAPL, BPL, SPL, PPL, CPL and IR in AMC1 to Appendix 7.
- (b) For training, skill tests or proficiency checks for ATPL, MPL and class and type ratings, in AMC1 to Appendix 9.
- (c) For assessments of competence for instructors, in AMC5 FCL.935.

### **GM1 FCL.015(a) Application and issue, revalidation and renewal of licences, ratings and certificates**

The application for the addition of the remark on the automatic validation of licences under licence item XIII can be submitted either when the pilot applies for the issue, revalidation or renewal of the licence, or independently at any other time.



### **FCL.020 Student pilot**

- (a) A student pilot shall not fly solo unless he or she meets the following conditions:
  - (1) is authorised to do so and supervised by a flight instructor;
  - (2) prior to receiving the authorisation specified in point (1), has acquired the competence to safely operate the relevant aircraft during the intended solo flight.
- (b) Before his or her first solo flight, a student pilot shall be at least 16 years of age.

### **FCL.025 Theoretical knowledge examinations for the issue of licences and ratings**

- (a) Responsibilities of the applicant
  - (1) Applicants shall take the entire set of theoretical knowledge examinations for a specific licence or rating under the responsibility of Authority
  - (2) Applicants shall only take the theoretical knowledge examination when recommended by the declared training organisation (DTO) or the approved training organisation (ATO) responsible for their training, once they have completed the appropriate elements of the training course of theoretical knowledge instruction to a satisfactory standard.
  - (3) The recommendation by a DTO or an ATO shall be valid for 12 months. If the applicant has failed to attempt at least one theoretical knowledge examination paper within this period of validity, the need for further training shall be determined by the DTO or the ATO, based on the needs of the applicant.
- (b) Pass standards
  - (1) A pass in a theoretical knowledge examination paper will be awarded to an applicant achieving at least 75 % of the marks allocated to that paper. No penalty marking shall be applied.
  - (2) Unless otherwise determined in this MCAR, an applicant has successfully completed the required theoretical knowledge examination for the

appropriate pilot licence or rating if he or she has passed all the required theoretical knowledge examination papers within a period of 18 months counted from the end of the calendar month when the applicant first attempted an examination.

- (3) If an applicant for the ATPL theoretical knowledge examination, or for the issue of a commercial pilot licence (CPL), or an instrument rating (IR) has failed to pass one of the theoretical knowledge examination papers within four attempts, or has failed to pass all papers within either six sittings or within the period mentioned in point (b)(2), he or she shall retake the complete set of theoretical knowledge examination papers.
  - (4) If applicants for the issue of a light aircraft pilot licence (LAPL), a private pilot licence (PPL), or a basic instrument rating (BIR) have failed to pass one of the theoretical knowledge examination papers within four attempts or have failed to pass all papers within the period mentioned in point (b)(2), they shall retake the complete set of theoretical knowledge examination papers.
  - (5) Before retaking the complete set of theoretical knowledge examination papers, applicants shall undertake further training at a DTO or an ATO. The extent and scope of the training needed shall be determined by the DTO or the ATO, based on the needs of the applicants.
- (c) Validity period
- (1) The successful completion of the theoretical knowledge examinations will be valid:
    - (i) for the issue of a light aircraft pilot licence or a private pilot licence, for a period of 24 months;
    - (ii) for the issue of a commercial pilot licence, a multi-crew pilot licence or an instrument rating (IR), for a period of 36 months;
    - (iii) for the issue of a basic instrument rating (BIR), for an unlimited duration.

The periods in paragraphs (i) and (ii) shall be counted from the day on which the pilots have successfully completed the theoretical knowledge examination, in accordance with paragraph (b)(2).
  - (2) The completion of the airline transport pilot licence (ATPL) theoretical knowledge examinations will remain valid for the issue of an ATPL for a period of 7 years from the last validity date of:

- (i) an IR entered in the licence; or
- (ii) in the case of helicopters, a helicopter's type rating entered in that licence.

## **GM1 FCL.025 Theoretical knowledge examinations for the issue of licences**

### **TERMINOLOGY**

The meaning of the following terms used in FCL.025 should be as follows:

- (a) 'Entire set of examinations': an examination in all subjects required by the licence level.
- (b) 'Examination': the demonstration of knowledge in one or more examination papers.
- (c) 'Examination paper': a set of questions, which covers one subject required by the licence level or rating, to be answered by a candidate for examination.
- (d) 'Attempt': a try to pass a specific paper.
- (e) 'Sitting': a period of time established by the Authority within which a candidate can take an examination. This period should not exceed 10 consecutive days. Only one attempt at each examination paper is allowed in one sitting.

## **AMC1 FCL.025(a)(2) Theoretical knowledge examinations for the issue of licences and ratings**

### **COMPLETION OF THE AREA 100 KSA ASSESSMENT BEFORE FINAL EXAMINATION**

Before being recommended by an ATO to sit the final examination paper at the first attempt, an applicant for a professional licence should have successfully completed the applicable Area 100 KSA summative assessments and mental maths test at the ATO.

## **FCL.030 Practical skill test**

- (a) Before a skill test for the issue of a licence, rating or certificate is taken, the applicant shall have passed the required theoretical knowledge examination, except in the case of applicants undergoing a course of integrated flying training.

In any case, the theoretical knowledge instruction shall always have been completed before the skill tests are taken.

- (b) Except for the issue of an airline transport pilot licence, the applicant for a skill test shall be recommended for the test by the organisation/person responsible for the training, once the training is completed. The training records shall be made available to the examiner.
- (c) For the issue of a BIR, the applicant for a skill test must first complete all training modules and be recommended for the skill test by an ATO. His or her training records shall be made available to the examiner, by the ATO.

### **FCL.035 Crediting of flight time and theoretical knowledge**

- (a) Crediting of flight time
  - (1) Unless otherwise specified in this MCAR, flight time to be credited for a licence, rating or certificate shall have been flown in the same category of aircraft for which the licence, rating or certificate is sought.
  - (2) PIC or under instruction.
    - (i) An applicant for a licence, rating or certificate shall be credited in full with all solo, dual instruction or PIC flight time towards the total flight time required for the licence, rating or certificate.
    - (ii) A graduate of an ATP integrated training course is entitled to be credited with up to 50 hours of student pilot-in-command instrument time towards the PIC time required for the issue of the airline transport pilot licence, commercial pilot licence and a multi-engine type or class rating.
    - (iii) A graduate of a CPL/IR integrated training course is entitled to be credited with up to 50 hours of the student pilot-in-command instrument time towards the PIC time required for the issue of the commercial pilot licence and a multi-engine type or class rating.
  - (3) Flight time as co-pilot or PICUS. Unless otherwise determined in this MCAR, the holder of a pilot licence, when acting as co-pilot or PICUS, is entitled to be credited with all of the co-pilot time towards the total flight time required for a higher grade of pilot licence.
  - (4) All hours flown in aeroplanes or TMGs that are subject to a decision of the State taken in accordance with the Civil Aviation Regulations and its

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associated MCAR's shall be credited in full towards fulfilling the flight time requirements of point FCL.140.A(a)(1) and point FCL.740.A(b)(1)(ii) of this MCAR, provided that the following conditions are met:

- (i) the aeroplane or TMG concerned is of the same category and class as the MCAR-Part-FCL aircraft in respect of which the hours flown are to be credited;
- (ii) in case of training flights with an instructor, the aeroplane or TMG used is subject to an authorisation specified in point ORA.ATO.135 of MCAR-Part-ORA or point DTO.GEN.240 of MCAR-Part-DTO.

(b) Crediting of theoretical knowledge

- (1) Applicants that have passed the theoretical knowledge examination for an airline transport pilot licence shall be credited towards the requirements for the theoretical knowledge for the light aircraft pilot licence, the private pilot licence, the commercial pilot licence and, except in the case of helicopters, the IR and the BIR in the same category of aircraft.
- (2) Applicants that have passed the theoretical knowledge examination for a commercial pilot licence shall be credited towards the requirements for the theoretical knowledge for:
  - (i) the light aircraft pilot licence in the same category of aircraft;
  - (ii) the private pilot licence in the same category of aircraft; and
  - (iii) the subject 'communications' for the BIR. This credit shall include the IFR part of the subject 'communications' only if that subject was completed in accordance with point FCL.310, as applicable as of 20 December 2019.
- (3) Holders of an IR or applicants that have passed the IR theoretical knowledge examination for a category of aircraft shall be credited towards the requirements for the theoretical knowledge instruction and examination for:
  - (i) the IR in another category of aircraft; and
  - (ii) the BIR.
- (4) Holders of a pilot licence shall be credited towards the requirements for theoretical knowledge instruction and examination for a licence in another category of aircraft in accordance with Appendix 1 to this MCAR. This credit

also applies to applicants for a pilot licence who have already successfully completed the theoretical knowledge examinations for the issue of that licence in another category of aircraft, as long as the theoretical knowledge examination is within the validity period specified in point FCL.025(c).

- (5) By way of derogation from paragraph (b)(3), holders of an IR(A) who have completed a competency-based modular IR(A) course shall be fully credited towards the requirements for theoretical knowledge instruction and examination for an IR in another category of aircraft only if they have also passed the theoretical knowledge instruction and examination for the IFR part of the course required in accordance with point FCL.720.A.(a)(2)(ii)(A).
- (6) When Appendix 1 includes a credit for the subject Communications, all of the following shall apply:
  - (i) such credit shall only be granted for training and examination for that subject if applicants, during previous theoretical knowledge examinations in accordance with point ARA.FCL.300 of MCAR-Part-ARA, have completed either the subject Communications or both subjects VFR communications and IFR communications;
  - (ii) applicants who have completed either only the subject VFR communications or only the subject IFR communications shall complete theoretical knowledge instruction in the subject Communications, the duration of which may be reduced based on an assessment of the applicants by the ATO. For applicants who have completed the subject VFR communications, aspects purely related to VFR communication may be reduced. For applicants who have completed the subject IFR communications, aspects purely related to IFR communication may be reduced. In any case, applicants shall complete the theoretical knowledge examination in the subject Communications. DxCrossRefBm894735444

## **FCL.040 Exercise of the privileges of licences**

The exercise of the privileges granted by a licence shall be dependent upon the validity of the ratings contained therein, if applicable, and of the medical certificate as appropriate to the privileges exercised.

### **FCL.045 Obligation to carry and present documents**

- (a) A valid licence and a valid medical certificate shall always be carried by the pilot when exercising the privileges of the licence.
- (b) The pilot shall also carry a personal identification document containing his/her photo.
- (c) A pilot or a student pilot shall without undue delay present his/her flight time record for inspection upon request by an authorised representative of the Authority.
- (d) A student pilot shall carry on all solo cross-country flights evidence of the authorisation required by point FCL.020(a)(1).
- (e) A pilot intending to fly outside Union territory on an aircraft registered in a State other than the one that issued the flight crew licence shall carry, in print or in electronic format, the latest issue of the ICAO attachment, which includes a reference to the ICAO registration number of the agreement that recognises the automatic validation of licences, as well as the list of States which are party to this agreement.

### **FCL.050 Recording of flight time**

The pilot shall keep a reliable record of the details of all flights flown in a form and manner established by the Authority.

### **AMC1 FCL.050 Recording of flight time**

#### **GENERAL**

- (a) The record of the flights flown should contain at least the following information:
  - (1) personal details: name(s) and address of the pilot;
  - (2) for each flight:
    - (i) name(s) of PIC;
    - (ii) date of flight;
    - (iii) place and time of departure and arrival;
    - (iv) type, including make, model and variant, and registration of the aircraft;

- (v) indication if the aircraft is SE or ME, if applicable;
    - (vi) total time of flight;
    - (vii) accumulated total time of flight.
  - (3) for each FSTD session, if applicable:
    - (i) type and qualification number of the training device;
    - (ii) FSTD instruction;
    - (iii) date;
    - (iv) total time of session;
    - (v) accumulated total time.
  - (4) details on pilot function, namely PIC, including solo, SPIC and PICUS time, co-pilot, dual, FI or FE;
  - (5) Operational conditions, namely if the operation takes place at night, or is conducted under instrument flight rules.
- (b) Logging of time:
- (1) PIC flight time:
    - (i) the holder of a licence may log as PIC time all of the flight time during which he or she is the PIC;
    - (ii) the applicant for, or holder of, a pilot licence may log as PIC time all solo flight time, flight time as SPIC and flight time under supervision provided that such SPIC time and flight time under supervision are countersigned by the instructor;
    - (iii) the holder of an instructor certificate may log as PIC all flight time during which he or she acts as an instructor in an aircraft;
    - (iv) the holder of an examiner's certificate may log as PIC all flight time during which he or she occupies a pilot's seat and acts as an examiner in an aircraft;
    - (v) a co-pilot acting as PICUS on an aircraft on which more than one pilot is required under the type certification of the aircraft or as



required by operational requirements provided that such PICUS time is countersigned by the PIC;

- (vi) if the holder of a pilot licence carries out a number of flights upon the same day returning on each occasion to the same place of departure and the interval between successive flights does not exceed 30 minutes, such series of flights may be recorded as a single entry;
  - (vii) where the Civil Aviation Regulations requires the pilot to act as PIC under the supervision of another pilot (supervisor), both the pilot and the supervisor may log the flight time as PIC.
- (2) co-pilot flight time: the holder of a pilot licence occupying a pilot seat as co-pilot may log all flight time as co-pilot flight time on an aircraft on which more than one pilot is required under the type certification of the aircraft, the regulations or the operations manual of the operator under which the flight is conducted;
  - (3) cruise relief co-pilot flight time: a cruise relief co-pilot may log all flight time as co-pilot when occupying a pilot's seat;
  - (4) instruction time: a summary of all time logged by an applicant for a licence or rating as flight instruction, instrument flight instruction, instrument ground time, etc., may be logged if certified by the appropriately rated or authorised instructor from whom it was received;
  - (5) PICUS flight time: provided that the method of supervision is acceptable to the Authority, a co-pilot may log as PIC flight time flown as PICUS when all the duties and functions of PIC on that flight were carried out in such a way that the intervention of the PIC in the interest of safety was not required.
- (c) Format of the record:
- (1) details of flights flown under commercial air transport may be recorded in an electronic format maintained by the operator.  
  
In this case an operator should make the records of all flights operated by the pilot, including differences and familiarisation training, available upon request to the flight crew member concerned;
  - (2) for other types of flights in aeroplanes, helicopters and powered-lift aircraft, the pilot should record the details of the flights flown in the following logbook format, which may be kept in electronic format. All data set out in (a) should be included.

- (3) For sailplanes, balloons and airships, a suitable format, which may be electric, should be used. That format should contain the relevant items mentioned in (a) and additional information specific to the type of operation.

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## PILOT LOGBOOK

*Holder's name(s)*

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*Holder's licence number*

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DEPARTMENT OF CIVIL AVIATION  
MCAR-PART-FCL

HOLDER'S ADDRESS:	
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1	2		3		4		5			6	7	8	
DATE (dd/mm/yy)	DEPARTURE		ARRIVAL		AIRCRAFT		SINGLE-PILOT TIME		MULTI-PILOT TIME	TOTAL TIME OF FLIGHT	NAME(S) PIC	LANDINGS	
	PLACE	TIME	PLACE	TIME	MAKE, MODEL, VARIANT	REGISTRATION	SE	ME				DAY	NIGHT
						TOTAL THIS PAGE							
						TOTAL FROM PREVIOUS PAGES							
						TOTAL TIME							



## **INSTRUCTIONS FOR USE**

- (d) FCL.050 requires holders of a pilot licence to record details of all flights flown. This logbook enables pilot licence holders to record flying experience in a manner which will facilitate this process while providing a permanent record of the licence holders flying. Pilots who fly regularly aeroplanes and helicopters or other aircraft categories are recommended to maintain separate logbooks for each aircraft category.
- (e) Flight crew logbook entries should be made as soon as practicable after any flight undertaken. All entries in the flight crew logbook should comply with the following:
  - (1) in case of paper records, they should be made in ink or indelible pencil; or
  - (2) in case of electronic records, they should be made and kept in a way to be readily available at the request of the Authority, and contain all relevant items that are mentioned in (a), certified by the pilot, and in a format acceptable by the Authority.
- (f) The particulars of every flight in the course of which the holder of a flight crew licence acts as a member of the operating crew of an aircraft are to be recorded in the appropriate columns using one line for each flight, provided that if an aircraft carries out a number of flights upon the same day returning on each occasion to the same place of departure and the interval between successive flights does not exceed 30 minutes, such series of flights may be recorded as a single entry.
- (g) Flight time is recorded:
  - (1) for aeroplanes, touring motor gliders and powered-lift aircraft, from the moment an aircraft first moves to taking off until the moment it finally comes to rest at the end of the flight;
  - (2) for helicopters, from the moment a helicopter's rotor blades start turning until the moment the helicopter finally comes to rest at the end of the flight, and the rotor blades are stopped;
  - (3) for airships, from the moment an airship is released from the mast to taking off until the moment the airship finally comes to rest at the end of the flight, and is secured on the mast;

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- (h) When an aircraft carries two or more pilots as members of the operating crew, one of them shall, before the flight commences, be designated by the operator as the aircraft PIC, according to operational requirements, who may delegate the conduct of the flight to another suitably qualified pilot. All flying carried out as PIC is entered in the logbook as 'PIC'. A pilot flying as 'PICUS' or 'SPIC' enters flying time as 'PIC' but all such entries are to be certified by the PIC or FI in the 'Remarks' column of the logbook.
- (i) Notes on recording of flight time:
- (1) column 1: enter the date (dd/mm/yy) on which the flight commences;
  - (2) column 2 or 3: enter the place of departure and destination either in full or the internationally recognised three or four letter designator. All times should be in UTC;
  - (3) column 5: indicate whether the operation was SP or MP, and for SP operation whether SE or ME;

Example:

1	2		3		4		5			6		7	8	
DATE (dd/mm/yy)	DEPARTURE		ARRIVAL		AIRCRAFT		SINGLE PILOT TIME		MULTI-PILOT TIME	TOTAL TIME OF FLIGHT		NAME(S) PIC	LANDINGS	
	PLACE	TIME	PLACE	TIME	MAKE, MODEL, VARIANT	REGISTRATION	SE	ME					DAY	NIGHT
08/04/12	LFAC	1025	EGBJ	1240	PA34-250	G-SENE		✓		2	15	SELF	1	
09/04/12	EGBJ	1810	EGBJ	1930	C152	G-NONE	✓			1	20	SELF		2
11/04/12	LGW	1645	LAX	0225	B747-400	G-ABCD			9	40	9	40	NAME(S) PIC	1



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- (4) column 6: total time of flight may be entered in hours and minutes or decimal notation as desired;
- (5) column 7: enter the name(s) of PIC or SELF as appropriate;
- (6) column 8: indicate the number of landings as pilot flying by day or night;
- (7) column 9: enter flight time undertaken at night or under instrument flight rules if applicable;
- (8) column 10: pilot function time:
  - (i) enter flight time as PIC, SPIC and PICUS as PIC;
  - (ii) all time recorded as SPIC or PICUS is countersigned by the aircraft PIC/Fl in the 'remarks' (column 12);
  - (iii) instructor time should be recorded as appropriate and also entered as PIC.
- (9) column 11: FSTD:
  - (i) for any FSTD enter the type of aircraft and qualification number of the device. For other flight training devices enter either FNPT I or FNPT II as appropriate;
  - (ii) total time of session includes all exercises carried out in the device, including pre- and after-flight checks;
  - (iii) enter the type of exercise performed in the 'remarks' (column 12), for example operator proficiency check, revalidation.
- (10) column 12: the 'remarks' column may be used to record details of the flight at the holder's discretion. The following entries, however, should always be made:
  - (i) instrument flight time undertaken as part of the training for a licence or rating;

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- (ii) details of all skill tests and proficiency checks;
  - (iii) name and signature of PIC if the pilot is recording flight time as SPIC or PICUS;
  - (iv) name and signature of instructor if flight is part of an SEP or TMG class rating revalidation;
  - (v) for multi-pilot operations in single-pilot helicopters, the form of operation, name and signature of the examiner conducting the skill test or proficiency check or operator proficiency check, and the name of the operator in the case of the operator proficiency check.
- (j) When each page is completed, accumulated flight time or hours should be entered in the appropriate columns and certified by the pilot in the 'remarks' column.

Example:

9				10								11				12	
OPERATIONAL CONDITION TIME				PILOT FUNCTION TIME								FSTD SESSION				REMARKS AND ENDORSEMENTS	
NIGHT		IFR		PIC		CO-PILOT		DUAL		INSTRUCTOR		DATE (dd/mm/ yy)	TYPE	TOTAL TIME OF SESSION			
		2	15	2	15												
1	20			1	20					1	20					Night rating training	
												10/04/1 2	B747-400 (Q1234)	4	10	Revalidation proficiency check	
8	10	9	40	9	40											PIC(US): signature of NAME(S) PIC	

## **GM1 FCL.050 Recording of flight time**

### **EXAMPLES FOR THE USE OF COLUMN 12 'REMARKS' OF THE PILOT LOGBOOK**

Pilots may use column 12 'remarks' of the pilot logbook (AMC1 FCL.050) to record the specific nature of a particular flight in the following cases, since a record of relevant experience might be useful with respect to operational requirements:

- (a) flight time as a pilot in a specialised operation, using the list provided in GM1 NCO.SPEC.100 and GM1 SPO.GEN.100 (see AMC1 ORO.FC.146(e);(f)&(g) of the AMC and GM to MCAR-Part ORO);
- (b) HEC 1 and 2 cycles, HESLO 1, 2, 3, and 4 cycles, and HHO hoisting cycles by day and night, as pilot flying (see AMC1 SPO.SPEC.HEC.100 and AMC1 SPO.SPEC.HESLO.100 of the AMC and GM to MCAR-Part-SPO, and point SPA.HHO.130 of MCAR-Part-SPA);
- (c) HHO hours (see point SPA.HHO.130 of MCAR-Part-SPA);
- (d) offshore landings by day / by night, as pilot flying (see point SPA.HOFO.170 of MCAR-Part-SPA);
- (e) NVIS flights or hours (see GM1 SPA.NVIS.130 of the AMC and GM to MCAR-Part-SPA);
- (f) IFR approaches in the single-pilot role (see point ORO.FC.202 of MCAR-Part-ORO);
- (g) any activity deemed necessary to be recorded for evidence purposes.

Pilots may also use column 12 'remarks' to record IFR approaches exercising PBN privileges and RNP APCH approaches in single-pilot operations (see Appendix 8 to MCAR-Part-FCL).

## **FCL.055 Language proficiency**

- (a) General. Aeroplane, helicopter, powered-lift and airship pilots required to use the radio telephone shall not exercise the privileges of their licences and ratings unless they have a language proficiency endorsement on their licence in either English or the language used for radio communications involved in the flight. The endorsement shall indicate the language, the proficiency level and the validity date, and it shall be obtained in accordance with a procedure established by the

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Authority. The minimum acceptable proficiency level is the operational level (Level 4) in accordance with Appendix 2 to this MCAR.

- (b) The applicant for a language proficiency endorsement shall demonstrate, in accordance with Appendix 2 to this MCAR, at least an operational level of language proficiency both in the use of phraseologies and plain language to an assessor certified by the Authority or a language-testing body approved by the Authority as applicable. To do so, the applicant shall demonstrate the ability to:
  - (1) communicate effectively in voice-only and in face-to-face situations;
  - (2) communicate on common and work-related topics with accuracy and clarity;
  - (3) use appropriate communicative strategies to exchange messages and to recognise and resolve misunderstandings in a general or work-related context;
  - (4) handle successfully the linguistic challenges presented by a complication or unexpected turn of events which occurs within the context of a routine work situation or communicative task with which they are otherwise familiar; and
  - (5) use a dialect or accent which is intelligible to the aeronautical community.
- (c) Except for pilots who have demonstrated language proficiency at an expert level (level 6) in accordance with Appendix 2 to this MCAR, the language proficiency endorsement shall be re-evaluated every:
  - (1) 4 years, if the level demonstrated is operational level (level 4); or
  - (2) 6 years, if the level demonstrated is extended level (level 5).
- (d) Specific requirements for holders of an instrument rating (IR). By way of derogation from the paragraphs above, holders of an IR shall have demonstrated the ability to use the English language at the appropriate proficiency level as defined in Appendix 2 to this MCAR.
- (e) The demonstration of language proficiency and the use of the English language for IR holders shall be done through a method of assessment established by the Authority.

## **AMC1 FCL.055 Language proficiency**

### **GENERAL**

- (a) The method of assessment of the language proficiency level (hereafter: assessment) should be designed to reflect a range of tasks undertaken by pilots but with specific focus on language rather than operational procedures.
- (b) The assessment should determine the applicant's ability to:
  - (1) communicate effectively using standard R/T phraseology;
  - (2) deliver and understand messages in plain language in both usual and unusual situations that necessitate departure from standard R/T phraseology.

Note: refer to the 'Manual on the Implementation of ICAO Language Proficiency Requirements' (ICAO Doc 9835), Appendix A Part III and Appendix B for further guidance.

### **ASSESSMENT**

- (c) The assessment may be subdivided into three elements, as follows:
  - (1) listening: assessment of comprehension;
  - (2) speaking: assessment of pronunciation, fluency, structure and vocabulary;
  - (3) interaction.
- (d) The three elements mentioned above may be combined and they can be covered by using a wide variety of means or technologies.
- (e) Where appropriate, some or all of these elements may be achieved through the use of the R/T testing arrangements.
- (f) When the elements of the testing are assessed separately, the final assessment should be consolidated in the language proficiency endorsement issued by the Authority.
- (g) The assessment may be conducted during one of the several existing checking or training activities, such as licence issue or rating issue and revalidation, line training, operator line checks or proficiency checks.

- (h) The Authority may use its own resources in developing or conducting the language proficiency assessment, or may delegate this task to language testing bodies.
- (i) The Authority should establish an appeal procedure for applicants.
- (j) The holder of a licence should receive a statement containing the level and validity of the language endorsements.
- (k) Where the assessment method for the English language established by the Authority is equivalent to that established for the assessment of use of the English language in accordance with AMC2 FCL.055, the same assessment may be used for both purposes.

### **BASIC ASSESSMENT REQUIREMENTS**

- (l) The aim of the assessment is to determine the ability of an applicant for a pilot licence or a licence holder to speak and understand the language used for R/T communications.
  - (1) The assessment should determine the ability of the applicant to use both:
    - (i) standard R/T phraseology;
    - (ii) plain language, in situations when standardised phraseology cannot serve an intended transmission.
  - (2) The assessment should include:
    - (i) voice-only and face-to-face situations;
    - (ii) common, concrete and work-related topics for pilots.
  - (3) The applicants should demonstrate their linguistic ability in dealing with an unexpected turn of events, and in solving apparent misunderstandings.
  - (4) The assessment should determine the applicant's speaking and listening abilities. Indirect assessments, of grammatical knowledge, reading and writing, are not appropriate.
  - (5) The assessment should determine the language skills of the applicant in the following areas:
    - (i) pronunciation:

- (A) the extent to which the pronunciation, stress, rhythm and intonation are influenced by the applicant's first language or national variations;
  - (B) how much they interfere with ease of understanding.
- (ii) structure:
  - (A) the ability of the applicant to use both basic and complex grammatical structures;
  - (B) the extent to which the applicant's errors interfere with the meaning.
- (iii) vocabulary:
  - (A) the range and accuracy of the vocabulary used;
  - (B) the ability of the applicant to paraphrase successfully when lacking vocabulary.
- (iv) fluency:
  - (A) tempo;
  - (B) hesitancy;
  - (C) rehearsed versus spontaneous speech;
  - (D) use of discourse markers and connectors.
- (v) comprehension:
  - (A) on common, concrete and work-related topics;
  - (B) when confronted with a linguistic or situational complication or an unexpected turn of events.

Note: the accent or variety of accents used in the test material should be sufficiently intelligible for an international community of users.
- (vi) interactions:
  - (A) quality of response (immediate, appropriate, and informative);
  - (B) the ability to initiate and maintain exchanges:

- (a) on common, concrete and work-related topics;
- (b) when dealing with an unexpected turn of events.
- (C) the ability to deal with apparent misunderstandings by checking, confirming or clarifying.

Note: the assessment of the language skills in the areas mentioned above is conducted using the rating scale in AMC2 FCL.055.

## **ASSESSORS**

- (m) It is essential that the persons responsible for language proficiency assessment ('assessors') are suitably trained and qualified. They should be either aviation specialists (for example current or former flight crew members or air traffic controllers), or language specialists with additional aviation related training. An alternative approach would be to form an assessment team consisting of an operational expert and a language expert.
  - (1) The assessors should be trained on the specific requirements of the assessment.
  - (2) The assessors should not test applicants to whom they have given language training.

## **CRITERIA FOR THE ACCEPTABILITY OF LANGUAGE-TESTING BODIES**

- (n) To ensure an impartial assessment process, the language assessment should be independent of the language training.
  - (1) To be accepted, the language-testing bodies should demonstrate:
    - (i) appropriate management and staffing;
    - (ii) quality system established and maintained to ensure compliance with, and adequacy of, assessment requirements, standards and procedures.
  - (2) The quality system established by a language-testing body should address the following:
    - (i) management;
    - (ii) policy and strategy;



- (iii) processes;
  - (iv) the relevant provisions of ICAO or MCAR-Part-FCL, standards and assessment procedures;
  - (v) organisational structure;
  - (vi) responsibility for the development, establishment and management of the quality system;
  - (vii) documentation;
  - (viii) quality assurance programme;
  - (ix) human resources and training (initial and recurrent);
  - (x) assessment requirements;
  - (xi) customer satisfaction.
- (3) The assessment documentation and records should be kept for a period of time determined by the Authority and made available to this Authority, on request.
- (4) The assessment documentation should include at least the following:
- (i) assessment objectives;
  - (ii) assessment layout, time scale, technologies used, assessment samples, voice samples;
  - (iii) assessment criteria and standards (at least for the levels 4, 5 and 6 of the rating scale mentioned in AMC2 FCL.055);
  - (iv) documentation demonstrating the assessment validity, relevance and reliability;
  - (v) assessment procedures and responsibilities:
    - (A) preparation of individual assessment;
    - (B) administration: location(s), identity check and invigilation, assessment discipline, confidentiality or security;
    - (C) reporting and documentation provided to the Authority or to the applicant, including sample certificate;

(D) retention of documents and records.

Note: refer to the 'Manual on the Implementation of ICAO Language Proficiency Requirements' (ICAO Doc 9835) for further guidance.

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**AMC2 FCL.055 Language proficiency**

**RATING SCALE**

The following table describes the different levels of language proficiency:

<b>LEVEL</b>	<b>PRONUNCIATION</b> Assumes a dialect or accent intelligible to the aeronautical community	<b>STRUCTURE</b> Relevant grammatical structures and sentence patterns are determined by language functions appropriate to the task	<b>VOCABULARY</b>	<b>FLUENCY</b>	<b>COMPREHENSION</b>	<b>INTERACTIONS</b>
Expert (Level 6)	Pronunciation, stress, rhythm, and intonation, though possibly influenced by the first language or regional variation, almost never interfere with ease of understanding.	Both basic and complex grammatical structures and sentence patterns are consistently well controlled.	Vocabulary range and accuracy are sufficient to communicate effectively on a wide variety of familiar and unfamiliar topics. Vocabulary is idiomatic, nuanced and sensitive to register.	Able to speak at length with a natural, effortless flow. Varies speech flow for stylistic effect, for example to emphasise a point. Uses appropriate discourse markers and connectors spontaneously.	Comprehension is consistently accurate in nearly all contexts and includes comprehension of linguistic and cultural subtleties.	Interacts with ease in nearly all situations. Is sensitive to verbal and non-verbal cues, and responds to them appropriately.
Extended (Level 5)	Pronunciation, stress, rhythm, and intonation, though influenced by the first language or regional variation,	Basic grammatical structures and sentence patterns are consistently well controlled. Complex	Vocabulary range and accuracy are sufficient to communicate effectively on common, concrete,	Able to speak at length with relative ease on familiar topics, but may not vary speech flow as a	Comprehension is accurate on common, concrete, and work-related topics and mostly accurate when the speaker is	Responses are immediate, appropriate, and informative.

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LEVEL	PRONUNCIATION Assumes a dialect or accent intelligible to the aeronautical community	STRUCTURE Relevant grammatical structures and sentence patterns are determined by language functions appropriate to the task	VOCABULARY	FLUENCY	COMPREHENSION	INTERACTIONS
	rarely interfere with ease of understanding.	structures are attempted but with errors which sometimes interfere with meaning.	and work-related topics. Paraphrases consistently and successfully. Vocabulary is sometimes idiomatic.	stylistic device. Can make use of appropriate discourse markers or connectors.	confronted with a linguistic or situational complication or an unexpected turn of events. Is able to comprehend a range of speech varieties (dialect or accent) or registers.	Manages the speaker or listener relationship effectively.
Operational (Level 4)	Pronunciation, stress, rhythm, and intonation are influenced by the first language or regional variation but only sometimes interfere with ease of understanding.	Basic grammatical structures and sentence patterns are used creatively and are usually well controlled. Errors may occur, particularly in unusual or unexpected circumstances, but rarely interfere with meaning.	Vocabulary range and accuracy are usually sufficient to communicate effectively on common, concrete, and work-related topics. Can often paraphrase successfully when lacking vocabulary particularly in unusual or unexpected circumstances.	Produces stretches of language at an appropriate tempo. There may be occasional loss of fluency on transition from rehearsed or formulaic speech to spontaneous interaction, but this does not prevent effective communication. Can make limited use of discourse markers	Comprehension is mostly accurate on common, concrete, and work-related topics when the accent or variety used is sufficiently intelligible for an international community of users. When the speaker is confronted with a linguistic or situational complication or an unexpected turn of events, comprehension may be slower or require clarification strategies.	Responses are usually immediate, appropriate, and informative. Initiates and maintains exchanges even when dealing with an unexpected turn of events. Deals adequately with apparent misunderstandings by checking, confirming, or clarifying.

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LEVEL	PRONUNCIATION Assumes a dialect or accent intelligible to the aeronautical community	STRUCTURE Relevant grammatical structures and sentence patterns are determined by language functions appropriate to the task	VOCABULARY	FLUENCY	COMPREHENSION	INTERACTIONS
				and connectors. Fillers are not distracting.		
Pre-Operational (Level 3)	Pronunciation, stress, rhythm, and intonation are influenced by the first language or regional variation and frequently interfere with ease of understanding.	Basic grammatical structures and sentence patterns associated with predictable situations are not always well controlled. Errors frequently interfere with meaning.	Vocabulary range and accuracy are often sufficient to communicate effectively on common, concrete, and work-related topics but range is limited and the word choice often inappropriate. Is often unable to paraphrase successfully when lacking vocabulary.	Produces stretches of language, but phrasing and pausing are often inappropriate. Hesitations or slowness in language processing may prevent effective communication. Fillers are sometimes distracting.	Comprehension is often accurate on common, concrete, and work-related topics when the accent or variety used is sufficiently intelligible for an international community of users. May fall to understand a linguistic or situational complication or an unexpected turn of events.	Responses are sometimes immediate, appropriate, and informative. Can initiate and maintain exchanges with reasonable ease on familiar topics and in predictable situations. Generally inadequate when dealing with an unexpected turn of events.

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<b>LEVEL</b>	<b>PRONUNCIATION</b> Assumes a dialect or accent intelligible to the aeronautical community	<b>STRUCTURE</b> Relevant grammatical structures and sentence patterns are determined by language functions appropriate to the task	<b>VOCABULARY</b>	<b>FLUENCY</b>	<b>COMPREHENSION</b>	<b>INTERACTIONS</b>
Elementary (Level 2)	Pronunciation, stress, rhythm, and intonation are heavily influenced by the first language or regional variation and usually interfere with ease of understanding.	Shows only limited control of few simple memorised grammatical structures and sentence patterns.	Limited vocabulary range consisting only of isolated words and memorised phrases.	Can produce very short, isolated, memorised utterances with frequent pausing and a distracting use of fillers to search for expressions and articulate less familiar words.	Comprehension is limited to isolated, memorised phrases when they are carefully and slowly articulated.	Response time is slow, and often inappropriate. Interaction is limited to simple routine exchanges.
Pre-Elementary (Level 1)	Performs at a level below the elementary level.	Performs at a level below the elementary level.	Performs at a level below the elementary level.	Performs at a level below the elementary level.	Performs at a level below the elementary level.	Performs at a level below the elementary level.

Note: operational Level (Level 4) is the minimum required proficiency level for R/T communication.

Levels 1 through 3 describe pre-elementary, elementary and pre-operational levels of language proficiency respectively, all of which describe a level below the language proficiency requirement.

Levels 5 and 6 describe extended and expert levels at levels of proficiency more advanced than the minimum required standard.

**AMC3 FCL.055 Language proficiency**

**SPECIFIC REQUIREMENTS FOR HOLDERS OF AN IR**

**USE OF ENGLISH LANGUAGE**

- (a) The requirement of FCL.055(d) includes the ability to use the English language for the following purposes:
  - (1) flight: R/T relevant to all phases of flight, including emergency situations.
  - (2) ground: all information relevant to the accomplishment of a flight:
    - (i) be able to read and demonstrate an understanding of technical manuals written in English, for example an operations manual, a helicopter flight manual, etc.;
    - (ii) pre-flight planning, weather information collection, NOTAMs, ATC flight plan, etc.;
    - (iii) use of all aeronautical en-route, departure and approach charts and associated documents written in English.
  - (3) communication: be able to communicate with other crew members in English during all phases of flight, including flight preparation.
- (b) Alternatively, the items in (a) above may be demonstrated:
  - (1) by having passed a specific examination given by the Authority after having undertaken a course of training enabling the applicant to meet all the objectives listed in (a) above; or
  - (2) the item in (a)(1) above is considered to be fulfilled, if the applicant has passed an IR, MPL or ATPL skill test and proficiency check during which the two-way R/T communication is performed in English;
  - (3) the item in (a)(2) above is considered to be fulfilled if the applicant has graduated from an IR, MPL or ATP course given in English or if he or she has passed the theoretical IR or ATPL examination in English;
  - (4) the item in (a)(3) above is considered to be fulfilled, if the applicant for or the holder of an IR has graduated from an MCC course given in English and is holding a certificate of satisfactory completion of that course or if the applicant has passed a MP skill test and proficiency check for the issue of

a class or type rating during which the two-way R/T communication and the communication with other crew members are performed in English.

- (c) Where the examination methods referred to above are equivalent to those established for the language proficiency requirements in accordance with AMC1 FCL.055, the examination may be used to issue a language proficiency endorsement.

### **FCL.060 Recent experience**

- (b) Aeroplanes, helicopters, powered-lift aircraft and airships. A pilot shall not operate an aircraft in commercial air transport or to carry passengers:

[applicable until 30 April 2025]

- (b) Aeroplanes, helicopters, powered-lift aircraft, airships and VTOL-capable aircraft (VCA). A pilot shall not operate an aircraft in commercial air transport or to carry passengers:

[applicable from 1 May 2025]

- (1) as PIC or co-pilot unless he or she has carried out, in the preceding 90 days, at least 3 take offs, approaches and landings as a pilot flying in an aircraft of the same type or class or an FFS representing that type or class. The 3 take-offs and landings shall be performed in either multi-pilot or single-pilot operations, depending on the privileges held by the pilot; and
- (2) as PIC at night unless he/she:
  - (i) has carried out in the preceding 90 days at least 1 take-off, approach and landing at night as a pilot flying in an aircraft of the same type or class or an FFS representing that type or class; or
  - (ii) holds an IR;
- (3) as cruise relief co-pilot unless he or she has completed, within the preceding 90 days, either of the following:
  - (i) at least three sectors as cruise relief co-pilot in the relevant type;
  - (ii) training the content of which is determined by the operator and that comprises at least three sectors as cruise relief co-pilot in an FSTD representing the relevant type;



- (iii) recurrent training in accordance with Subpart FC (ORO.FC) of MCAR-Part-ORO;
    - (iv) a proficiency check for cruise relief co-pilots in accordance with Appendix 9.
  - (4) When a pilot has the privilege to operate more than one type of aeroplane with similar handling and operation characteristics, the 3 take-offs, approaches and landings required in (1) may be performed as defined in the operational suitability data established in accordance with MCAR-Part-21.
  - (5) When a pilot has the privilege to operate more than one type of non-complex helicopter with similar handling and operation characteristics, as defined in the operational suitability data established in accordance with Part-21, the 3 take-offs, approaches and landings required in (1) may be performed in just one of the types, provided that the pilot has completed at least 2 hours of flight in each of the types of helicopter, during the preceding 6 months.
- (c) Specific requirements for commercial air transport:
- (1) In the case of commercial air transport, the 90-day period prescribed in subparagraphs (b)(1) and (2) above may be extended up to a maximum of 120 days, as long as the pilot undertakes line flying under the supervision of a type rating instructor or examiner.
  - (2) If the pilot does not comply with the requirement in point (1), he or she shall complete a training flight with an instructor qualified in accordance with Subpart J to instruct for that aircraft type. The training flight shall be performed in the aircraft or an FFS of the aircraft type to be used, and shall include at least the requirements described in points (b)(1) and (2) before he or she can exercise his/her privileges.

### **AMC1 FCL.060(b)(1) Recent experience**

When a pilot needs to carry out one or more flights with an instructor or an examiner to comply with the requirement of FCL.060(b)(1) before the pilot can carry passengers, the instructor or examiner on board those flights will not be considered as a passenger.

## **GM1 FCL.060(b)(1) Recent experience**

### **AEROPLANES, HELICOPTERS, POWERED-LIFT, AIRSHIPS AND SAILPLANES**

If a pilot or a PIC is operating under the supervision of an instructor to comply with the required three take-offs, approaches and landings, no passengers may be on board.

## **AMC1 FCL.060(b)(5) Recent experience**

### **NON-COMPLEX HELICOPTERS**

Grouping of non-complex helicopters with similar handling and operational characteristics:

- (a) Group 1: Bell 206/206L, Bell 407;
- (b) Group 2: Hughes 369, MD 500N, MD 520N, MD 600;
- (c) Group 3: SA 341/342, EC 120;
- (d) Group 4: SA 313/318, SA 315/316/319, AS 350, EC 130;
- (e) Group 5: all types listed in AMC1 FCL.740.H(a)(3) and R 22 and R 44.

## **FCL.065 Curtailment of privileges of licence holders aged 60 years or more in commercial air transport**

- (a) Age 60-64. Aeroplanes and helicopters. The holder of a pilot licence who has attained the age of 60 years shall not act as a pilot of an aircraft engaged in commercial air transport except as a member of a multi-pilot crew.

[applicable until 12 February 2025]

- (a) Age 60–64. Aeroplanes and helicopters. The holder of a pilot licence who has attained the age of 60 years shall not act as a pilot of an aircraft engaged in commercial air transport except as a member of a multi-pilot crew. By way of derogation, such holders shall be entitled to act as pilots of an aircraft engaged in single-pilot helicopter emergency medical service operations in accordance with the Civil Aviation Regulations, provided that they comply with the applicable requirements specified for that purpose in that Regulation and in MCAR-Part-MED.

[applicable from 13 February 2025]

- (b) Age 65. Holders of a pilot licence who has attained the age of 65 years shall not act as a pilot of an aircraft that is engaged in commercial air transport.

#### **FCL.070 Revocation, suspension and limitation of licences, ratings and certificates**

- (a) Licences, ratings and certificates issued in accordance with this MCAR may be limited, suspended or revoked by the Authority when the pilot does not comply with the requirements of this MCAR, MCAR-Part-MED or the applicable operational requirements, in accordance with the conditions and procedures laid down in MCAR-Part-ARA.
- (b) When the pilot has his/her licence suspended or revoked, he/she shall immediately return the licence or certificate to the Authority.

## **SUBPART B – LIGHT AIRCRAFT PILOT LICENCE – LAPL**

### **SECTION 1 – COMMON REQUIREMENTS**

#### **FCL.100 LAPL – Minimum age**

Applicants for the LAPL for aeroplanes or helicopters shall be at least 17 years old.

#### **FCL.105 LAPL – Privileges and conditions**

- (a) General. The privileges of the holder of an LAPL are to act without remuneration as PIC in non-commercial operations on the appropriate aircraft category.
- (b) Conditions. Applicants for the LAPL shall have fulfilled the requirements for the relevant aircraft category and, when applicable, for the class or type of aircraft used in the skill test.

#### **FCL.110 LAPL – Crediting for the same aircraft category**

- (a) Applicants for an LAPL who have held another licence in the same category of aircraft shall be fully credited towards the requirements of the LAPL in that category of aircraft.
- (b) Without prejudice to the paragraph above, if the licence has lapsed, the applicant shall have to pass a skill test in accordance with FCL.125 for the issue of an LAPL in the appropriate aircraft category.

#### **FCL.115 LAPL – Training course**

- (a) Applicants for an LAPL shall complete a training course at a DTO or an ATO. That training course shall include:
  - (1) theoretical knowledge and flight instruction appropriate to the privileges of the LAPL applied for;
  - (2) additionally, for the LAPL(H), the mandatory training elements for the relevant helicopter type as defined in the operational suitability data established in accordance with MCAR-Part-21.
- (b) Theoretical knowledge instruction and flight instruction may be completed at a DTO or at an ATO different from the one where applicants have commenced their training.

- (c) For the training for the SEP aeroplanes-sea class privilege, the elements of Section B (Specific requirements for the aeroplane category), point 7 (Class ratings — sea), of Appendix 9 shall be considered.
- (d) Applicants for an LAPL may receive credits for previous PPL training they have undergone in accordance with Subpart C in the same aircraft category, based on an assessment of the applicant by the ATO or the DTO that is responsible for the LAPL training course. In any case, applicants shall comply with the experience requirements set out in points FCL.110.A(a) or FCL.110.H(a), as applicable.

### **AMC1 FCL.115 LAPL(A) – Training course**

#### **FLIGHT INSTRUCTION FOR THE LAPL (A)**

- (a) Entry to training

Before being accepted for training an applicant should be informed that the appropriate medical certificate must be obtained before solo flying is permitted.

- (b) Flight instruction

- (1) The LAPL (A) flight instruction syllabus should take into account the principles of threat and error management and also cover:
  - (i) pre-flight operations, including mass and balance determination, aircraft inspection and servicing;
  - (ii) aerodrome and traffic pattern operations, collision avoidance precautions and procedures;
  - (iii) control of the aircraft by external visual reference;
  - (iv) flight at critically low air speeds, recognition of, and recovery from, incipient and full stalls;
  - (v) flight at critically high air speeds, recognition of, and recovery from, spiral dive;
  - (vi) normal and crosswind take-offs and landings;
  - (vii) maximum performance (short field and obstacle clearance) take-offs, short-field landings;
  - (viii) cross-country flying using visual reference, dead reckoning and radio navigation aids;

- (ix) emergency operations, including simulated aeroplane equipment malfunctions;
    - (x) operations to, from and transiting controlled aerodromes, compliance with air traffic services procedures and communication procedures.
  - (2) Before allowing applicants to undertake their first solo flight, the FI should ensure that the applicants can use R/T communication can operate the required systems and equipment.
- (c) Syllabus of flight instruction
- (1) The numbering of exercises should be used primarily as an exercise reference list and as a broad instructional sequencing guide; therefore the demonstrations and practices need not necessarily be given in the order listed. The actual order and content will depend upon the following interrelated factors:
    - (i) the applicant's progress and ability;
    - (ii) the weather conditions affecting the flight;
    - (iii) the flight time available;
    - (iv) instructional technique considerations;
    - (v) the local operating environment;
    - (vi) applicability of the exercises to the aeroplane or TMG type.
  - (2) Each of the exercises involves the need for the applicant to be aware of the needs of good airmanship and look-out, which should be emphasised at all times.
    - (i) Exercise 1a: Familiarisation with the aeroplane or TMG:
      - (A) characteristics of the aeroplane or TMG;
      - (B) cockpit layout;
      - (C) systems;
      - (D) checklists, drills and controls.
    - (ii) Exercise 1b: Emergency drills:

- (A) action if fire on the ground and in the air;
  - (B) engine cabin and electrical system fire;
  - (C) systems failure;
  - (D) escape drills, location and use of emergency equipment and exits.
- (iii) Exercise 2: Preparation for and action after flight:
- (A) flight authorisation and aeroplane or TMG acceptance;
  - (B) serviceability documents;
  - (C) equipment required, maps, etc.;
  - (D) external checks;
  - (E) internal checks;
  - (F) harness, seat or rudder panel adjustments;
  - (G) starting and warm-up checks;
  - (H) power checks;
  - (I) running down system checks and switching off the engine;
  - (J) parking, security and picketing (for example tie down);
  - (K) completion of authorisation sheet and serviceability documents.
- (iv) Exercise 3: Air experience: flight exercise.
- (v) Exercise 4: Effects of controls:
- (A) primary effects when laterally level and when banked;
  - (B) further effects of aileron and rudder;
  - (C) effects of:
    - (a) air speed;

- (b) slipstream;
  - (c) power;
  - (d) trimming controls;
  - (e) flaps;
  - (f) other controls, as applicable.
- (D) operation of:
  - (a) mixture control;
  - (b) carburettor heat;
  - (c) cabin heating or ventilation.
- (vi) Exercise 5a: Taxiing:
  - (A) pre-taxi checks;
  - (B) starting, control of speed and stopping;
  - (C) engine handling;
  - (D) control of direction and turning;
  - (E) turning in confined spaces;
  - (F) parking area procedure and precautions;
  - (G) effects of wind and use of flying controls;
  - (H) effects of ground surface;
  - (I) freedom of rudder movement;
  - (J) marshalling signals;
  - (K) instrument checks;
  - (L) air traffic control procedures.
- (vii) Exercise 5b: Emergencies: brake and steering failure.



- (viii) Exercise 6: Straight and level:
  - (A) at normal cruising power, attaining and maintaining straight and level flight;
  - (B) flight at critically high air speeds;
  - (C) demonstration of inherent stability;
  - (D) control in pitch, including use of trim;
  - (E) lateral level, direction and balance, trim;
  - (F) at selected air speeds (use of power);
  - (G) during speed and configuration changes;
  - (H) use of instruments for precision.
- (ix) Exercise 7: Climbing:
  - (A) entry, maintaining the normal and max rate climb, levelling off;
  - (B) levelling off at selected altitudes;
  - (C) en-route climb (cruise climb);
  - (D) climbing with flap down;
  - (E) recovery to normal climb;
  - (F) maximum angle of climb;
  - (G) use of instruments for precision.
- (x) Exercise 8: Descending:
  - (A) entry, maintaining and levelling off;
  - (B) levelling off at selected altitudes;
  - (C) glide, powered and cruise descent (including effect of power and air speed);
  - (D) side slipping (on suitable types);

- (E) use of instruments for precision flight.
- (xi) Exercise 9: Turning:
  - (A) entry and maintaining medium level turns;
  - (B) resuming straight flight;
  - (C) faults in the turn (in correct pitch, bank and balance);
  - (D) climbing turns;
  - (E) descending turns;
  - (F) slipping turns (for suitable types);
  - (G) turns onto selected headings, use of gyro heading indicator and compass;
  - (H) use of instruments for precision.
- (xii) Exercise 10a: Slow flight: Note: the objective is to improve the student's ability to recognise inadvertent flight at critically low speeds and provide practice in maintaining the aeroplane or TMG in balance while returning to normal air speed.
  - (A) safety checks;
  - (B) introduction to slow flight;
  - (C) controlled flight down to critically slow air speed;
  - (D) application of full power with correct attitude and balance to achieve normal climb speed.
- (xiii) Exercise 10b: Stalling:
  - (A) safety checks;
  - (B) symptoms;
  - (C) recognition;
  - (D) clean stall and recovery without power and with power;
  - (E) recovery when a wing drops;

- (F) approach to stall in the approach and in the landing configurations, with and without power and recovery at the incipient stage.
- (xiv) Exercise 11: Spin avoidance:
  - (A) safety checks;
  - (B) stalling and recovery at the incipient spin stage (stall with excessive wing drop, about 45°);
  - (C) instructor induced distractions during the stall.
- (xv) Exercise 12: Take-off and climb to downwind position:
  - (A) pre-take-off checks;
  - (B) into wind take-off;
  - (C) safeguarding the nose wheel (if applicable);
  - (D) crosswind take-off;
  - (E) drills during and after take-off;
  - (F) short take-off and soft field procedure or techniques including performance calculations;
  - (G) noise abatement procedures.
- (xvi) Exercise 13: Circuit, approach and landing:
  - (A) circuit procedures, downwind and base leg;
  - (B) powered approach and landing;
  - (C) safeguarding the nose wheel (if applicable);
  - (D) effect of wind on approach and touchdown speeds and use of flaps;
  - (E) crosswind approach and landing;
  - (F) glide approach and landing;
  - (G) short landing and soft field procedures or techniques;

- (H) flapless approach and landing;
- (I) wheel landing (tail wheel aeroplanes);
- (J) missed approach and go-around;
- (K) noise abatement procedures.

(xvii) Exercise 12/13: Emergencies:

- (A) abandoned take-off;
- (B) engine failure after take-off;
- (C) mislanding and go-around;
- (D) missed approach.

Note: in the interests of safety, it will be necessary for pilots trained on nose wheel aeroplanes or TMGs to undergo dual conversion training before flying tail wheel aeroplanes or TMGs, and vice versa.

(xviii) Exercise 14: First solo:

- (A) instructor's briefing including limitations;
- (B) use of required equipment;
- (C) observation of flight and de-briefing by instructor.

Note: during flights immediately following the solo circuit consolidation the following should be revised:

- (A) procedures for leaving and rejoining the circuit;
- (B) the local area, restrictions, map reading;
- (C) use of radio aids for homing;
- (D) turns using magnetic compass, compass errors.

(xix) Exercise 15: Advanced turning:

- (A) steep turns (45 °), level and descending;
- (B) stalling in the turn and recovery;

- (C) recoveries from unusual attitudes, including spiral dives.
- (xx) Exercise 16: Forced landing without power:
  - (A) forced landing procedure;
  - (B) choice of landing area, provision for change of plan;
  - (C) gliding distance;
  - (D) descent plan;
  - (E) key positions;
  - (F) engine cooling;
  - (G) engine failure checks;
  - (H) use of radio;
  - (I) base leg;
  - (J) final approach;
  - (K) landing;
  - (L) actions after landing.
- (xxi) Exercise 17: Precautionary landing:
  - (A) full procedure away from aerodrome to break-off height;
  - (B) occasions necessitating a precautionary landing;
  - (C) in-flight conditions;
  - (D) landing area selection:
    - (a) normal aerodrome;
    - (b) disused aerodrome;
    - (c) ordinary field.
  - (E) circuit and approach;

(F) actions after landing.

(xxii) Exercise 18a: Navigation:

(A) flight planning:

(a) weather forecast and actuals;

(b) map selection and preparation:

(1) choice of route;

(2) airspace structure;

(3) safety altitudes.

(c) calculations:

(1) magnetic heading(s) and time(s) en-route;

(2) fuel consumption;

(3) mass and balance;

(4) mass and performance.

(d) flight information:

(1) NOTAMs, etc.;

(2) radio frequencies;

(3) selection of alternate aerodromes.

(e) aeroplane or TMG documentation;

(f) notification of the flight:

(1) pre-flight administrative procedures;

(2) flight plan form.

(B) departure:

(a) organisation of cockpit workload;

- (b) departure procedures:
  - (1) altimeter settings;
  - (2) ATC liaison in regulated airspace;
  - (3) setting heading procedure;
  - (4) noting of ETAs.
- (c) maintenance of altitude and heading;
- (d) revisions of ETA and heading;
- (e) log keeping;
- (f) use of radio;
- (g) minimum weather conditions for continuation of flight;
- (h) in-flight decisions;
- (i) transiting controlled or regulated airspace;
- (j) diversion procedures;
- (k) uncertainty of position procedure;
- (l) lost procedure.
- (C) arrival and aerodrome joining procedure:
  - (a) ATC liaison in regulated airspace;
  - (b) altimeter setting;
  - (c) entering the traffic pattern;
  - (d) circuit procedures;
  - (e) parking;
  - (f) security of aeroplane or TMG;
  - (g) refuelling;

- (h) closing of flight plan, if appropriate;
  - (i) post-flight administrative procedures.
- (xxiii) Exercise 18b: Navigation problems at lower levels and in reduced visibility:
  - (A) actions before descending;
  - (B) hazards (for example obstacles, and terrain);
  - (C) difficulties of map reading;
  - (D) effects of wind and turbulence;
  - (E) vertical situational awareness (avoidance of controlled flight into terrain);
  - (F) avoidance of noise sensitive areas;
  - (G) joining the circuit;
  - (H) bad weather circuit and landing.
- (xxiv) Exercise 18c: Radio navigation (basics):
  - (A) use of GNSS or VOR/ADF:
    - (a) selection of waypoints or stations;
    - (b) to or from indications and orientation;
    - (c) error messages.
  - (B) use of VHF/DF:
    - (a) availability, AIP and frequencies;
    - (b) R/T procedures and ATC liaison;
    - (c) obtaining a QDM and homing.
  - (C) use of en-route or terminal radar:
    - (a) availability and AIP;



- (b) procedures and ATC liaison;
- (c) pilot's responsibilities;
- (d) secondary surveillance radar:
  - (1) transponders;
  - (2) code selection;
  - (3) interrogation and reply.
- (xxv) Exercise 19: Stopping and restarting the engine (in the case of TMGs only):
  - (A) engine cooling;
  - (B) switching-off procedure;
  - (C) restarting of the engine.

### **AMC2 FCL.115 LAPL(H) Training course**

#### **FLIGHT INSTRUCTION FOR THE LAPL(H)**

(a) Entry to training

Before being accepted for training an applicant should be informed that the appropriate medical certificate must be obtained before solo flying is permitted.

(b) Flight instruction

- (1) The LAPL(H) flight instruction syllabus should take into account the principles of threat and error management and also cover:
  - (i) pre-flight operations, including mass and balance determination, helicopter inspection and servicing;
  - (ii) aerodrome and traffic pattern operations, collision avoidance precautions and procedures;
  - (iii) control of the helicopter by external visual reference;
  - (iv) take-offs, landings, hovering, look-out turns and normal transitions from and to the hover;

- (v) emergency procedures, basic autorotations, simulated engine failure and ground resonance recovery if relevant to type;
  - (vi) sideways and backwards flight and turns on the spot;
  - (vii) incipient vortex ring recognition and recovery;
  - (viii) touchdown autorotations, simulated engine-off landings, practice forced landings. Simulated equipment malfunctions and emergency procedures relating to malfunctions of engines, controls, electrical and hydraulic circuits;
  - (ix) steep turns;
  - (x) transitions, quick stops, out of wind manoeuvres, sloping ground landings and take-offs;
  - (xi) limited power and confined area operations including selection of and operations to and from unprepared sites;
  - (xii) cross-country flying by using visual reference, dead reckoning and, where available and radio navigation aids;
  - (xiii) operations to and from aerodromes; compliance with air traffic services procedures and communication procedures.
- (2) Before allowing applicants to undertake their first solo flight, the FI should ensure that the applicants can use R/T communication and can operate the required systems and equipment.
- (c) Syllabus of flight instruction
- (1) The numbering of exercises should be used primarily as an exercise reference list and as a broad instructional sequencing guide; therefore the demonstrations and practices need not necessarily be given in the order listed. The actual order and content will depend upon the following interrelated factors:
    - (i) the applicant's progress and ability;
    - (ii) the weather conditions affecting the flight;
    - (iii) the flight time available;
    - (iv) instructional technique considerations;

- (v) the local operating environment;
  - (vi) applicability of the exercises to the helicopter type.
- (2) Each of the exercises involves the need for the applicant to be aware of the needs of good airmanship and look-out, which should be emphasised at all times.
- (i) Exercise 1a: Familiarisation with the helicopter:
    - (A) characteristics of the helicopter, external features;
    - (B) cockpit layout;
    - (C) systems;
    - (D) checklists, procedures, controls.
  - (ii) Exercise 1b: Emergency procedures:
    - (A) action if fire on the ground and in the air;
    - (B) engine, cabin and electrical system fire;
    - (C) systems failures;
    - (D) escape drills, location and use of emergency equipment and exits.
  - (iii) Exercise 2: Preparation for and action after flight:
    - (A) flight authorisation and helicopter acceptance;
    - (B) serviceability documents;
    - (C) equipment required, maps, etc.;
    - (D) external checks;
    - (E) internal checks;
    - (F) seat, harness and flight controls adjustments;
    - (G) starting and warm-up checks clutch engagement and starting rotors;

- (H) power checks;
- (I) running down system checks and switching off the engine;
- (J) parking, security and picketing;
- (K) completion of authorisation sheet and serviceability documents.
- (iv) Exercise 3: Air experience:
  - (A) to introduce the student to rotary wing flight;
  - (B) flight exercise.
- (v) Exercise 4: Effects of controls:
  - (A) function of flight controls, primary and secondary effect;
  - (B) effect of air speed;
  - (C) effect of power changes (torque);
  - (D) effect of yaw (sideslip);
  - (E) effect of disc loading (bank and flare);
  - (F) effect on controls of selecting hydraulics on/off;
  - (G) effect of control friction;
  - (H) instruments;
  - (I) use of carburettor heat or anti-icing control.
- (vi) Exercise 5: Power and attitude changes:
  - (A) relationship between cyclic control position, disc attitude, fuselage attitude and air speed;
  - (B) flapback;
  - (C) power required diagram in relation to air speed;
  - (D) power and air speed changes in level flight;

- (E) use of instruments for precision;
- (F) engine and air speed limitations.
- (vii) Exercise 6a: Straight and level:
  - (A) at normal cruising power, attaining and maintaining straight and level flight;
  - (B) control in pitch, including use of control friction or trim;
  - (C) maintaining direction and balance, (ball or yawstring use);
  - (D) setting power for selected air speeds and speed changes;
  - (E) use of instruments for precision.
- (viii) Exercise 6b: Climbing:
  - (A) optimum climb speed, best angle or rate of climb from power required diagram;
  - (B) initiation, maintaining the normal and maximum rate of climb, levelling off;
  - (C) levelling off at selected altitudes or heights;
  - (D) use of instruments for precision.
- (ix) Exercise 6c: Descending:
  - (A) optimum descent speed and best angle or rate of descent from power required diagram;
  - (B) initiation, maintaining and levelling off;
  - (C) levelling off at selected altitudes or heights;
  - (D) descent (including effect of power and air speed);
  - (E) use of instruments for precision.
- (x) Exercise 6d: Turning:
  - (A) initiation and maintaining medium level turns;

- (B) resuming straight flight;
  - (C) altitude, bank and coordination;
  - (D) climbing and descending turns and effect on rate of climb or descent;
  - (E) turns onto selected headings, use of gyro heading indicator and compass;
  - (F) use of instruments for precision.
- (xi) Exercise 7: Basic autorotation:
- (A) safety checks, verbal warning and look-out;
  - (B) entry, development and characteristics;
  - (C) control of air speed and RRPM, rotor and engine limitations;
  - (D) effect of AUM, IAS, disc loading, G-forces and density altitude
  - (E) re-engagement and go-around procedures (throttle over-ride or ERPM control);
  - (F) vortex condition during recovery;
  - (G) gentle and medium turns in autorotation;
  - (H) demonstration of variable flare simulated engine off landing.
- (xii) Exercise 8a: Hovering:
- (A) demonstrate hover IGE, importance of wind effect and attitude, ground cushion, stability in the hover, effects of over controlling;
  - (B) student holding cyclic stick only;
  - (C) student handling collective lever (and throttle) only;
  - (D) student handling collective lever, (throttle) and pedals;
  - (E) student handling all controls;
  - (F) demonstration of ground effect;

- (G) demonstration of wind effect;
  - (H) demonstrate gentle forward running touchdown;
  - (I) specific hazards, for example snow, dust and litter.
- (xiii) Exercise 8b: Hover taxiing and spot turns:
- (A) revise hovering;
  - (B) precise ground speed and height control;
  - (C) effect of wind direction on helicopter attitude and control margin;
  - (D) control and coordination during spot turns;
  - (E) carefully introduce gentle forward running touchdown.
- (xiv) Exercise 8c: Hovering and taxiing emergencies:
- (A) revise hovering and gentle forward running touchdown, explain (demonstrate where applicable) effect of hydraulics failure in the hover;
  - (B) demonstrate simulated engine failure in the hover and hover taxi.
  - (C) demonstrate dangers of mishandling and over-pitching.
- (xv) Exercise 9: Take-off and landing
- (A) pre-take-off checks or drills;
  - (B) look-out;
  - (C) lifting to hover;
  - (D) after take-off checks;
  - (E) danger of horizontal movement near ground;
  - (F) danger of mishandling and overpitching;
  - (G) landing (without sideways or backwards movement);

- (H) after landing checks or drills;
- (I) take-off and landing crosswind and downwind.
- (xvi) Exercise 10: Transitions from hover to climb and approach to hover:
  - (A) look-out;
  - (B) revise take-off and landing;
  - (C) ground effect, translational lift and its effects;
  - (D) flapback and its effects;
  - (E) effect of wind speed and direction during transitions from or to the hover;
  - (F) the constant angle approach;
  - (G) demonstration of variable flare simulated engine off landing.
- (xvii) Exercise 11a: Circuit, approach and landing:
  - (A) revise transitions from hover to climb and approach to hover;
  - (B) circuit procedures, downwind and base leg;
  - (C) approach and landing with power;
  - (D) pre-landing checks;
  - (E) effect of wind on approach and IGE hover
  - (F) crosswind approach and landing;
  - (G) go-around;
  - (H) noise abatement procedures.
- (xviii) Exercise 11b: Steep and limited power approaches and landings:
  - (A) revise the constant angle approach;
  - (B) the steep approach (explain danger of high sink rate and low air speed);



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- (C) limited power approach (explain danger of high speed at touch down);
  - (D) use of the ground effect;
  - (E) variable flare simulated engine off landing.
- (xix) Exercise 11c: Emergency procedures:
- (A) abandoned take-off;
  - (B) missed approach and go-around;
  - (C) hydraulic off landing (if applicable);
  - (D) tail rotor control or tail rotor drive failure (briefing only);
  - (E) simulated emergencies in the circuit to include:
  - (F) hydraulics failure;
  - (G) simulated engine failure on take-off, crosswind, downwind and base leg;
  - (H) governor failure.
- (xx) Exercise 12: First solo:
- (A) instructor's briefing, observation of flight and debriefing;
  - (B) warn of change of attitude from reduced and laterally displaced weight;
  - (C) warn of low tail, low skid or wheel during hover and landing;
  - (D) warn of dangers of loss of RRPM and overpitching;
  - (E) pre-take-off checks;
  - (F) into wind take-off;
  - (G) procedures during and after take-off;
  - (H) normal circuit, approaches and landings;
  - (I) action if an emergency.

- (xxi) Exercise 13: Sideways and backwards hover manoeuvring:
- (A) manoeuvring sideways flight heading into wind;
  - (B) manoeuvring backwards flight heading into wind;
  - (C) combination of sideways and backwards manoeuvring;
  - (D) manoeuvring sideways and backwards, heading out of wind;
  - (E) stability and weather cocking;
  - (F) recovery from backwards manoeuvring, (pitch nose down);
  - (G) groundspeed limitations for sideways and backwards manoeuvring.
- (xxii) Exercise 14: Spot turns:
- (A) revise hovering into wind and downwind;
  - (B) turn on spot through 360°:
    - (a) around pilots position;
    - (b) around tail rotor;
    - (c) around helicopter geometric centre;
    - (d) square and safe visibility clearing turn.
  - (C) rotor RPM control, torque effect, cyclic limiting stops due to CG position and wind speed and direction.
- (xxiii) Exercise 15: Hover OGE and vortex ring:
- (A) establishing hover OGE;
  - (B) drift, height or power control;
  - (C) demonstration of incipient stage of vortex ring, recognition and recovery (from a safe altitude);
  - (D) loss of tail rotor effectiveness.
- (xxiv) Exercise 16: Simulated EOL:

- (A) the effect of weight, disc loading, density altitude and RRPM decay;
  - (B) revise basic autorotation entry;
  - (C) optimum use of cyclic and collective to control speed or RRPM;
  - (D) variable flare simulated EOL;
  - (E) demonstrate constant attitude simulated EOL;
  - (F) demonstrate simulated EOL from hover or hover taxi;
  - (G) demonstrate simulated EOL from transition and low level.
- (xxv) Exercise 17: Advanced autorotation:
- (A) over a selected point at various height and speed;
  - (B) revise basic autorotation: note ground distance covered;
  - (C) range autorotation;
  - (D) low speed autorotation;
  - (E) constant attitude autorotation (terminate at safe altitude);
  - (F) 'S' turns;
  - (G) turns through 180° and 360°;
  - (H) effects on angles of descent, IAS, RRPM and effect of AUM.
- (xxvi) Exercise 18: Practice forced landings:
- (A) procedure and choice of the forced landing area;
  - (B) forced landing checks and crash action;
  - (C) re-engagement and go-around procedures.
- (xxvii) Exercise 19: Steep turns:
- (A) steep (level) turns (30° bank);

- (B) maximum rate turns (45° bank if possible);
- (C) steep autorotative turns;
- (D) faults in the turn: balance, attitude, bank and coordination;
- (E) RRPM control and disc loading;
- (F) vibration and control feedback;
- (G) effect of wind at low level.

(xxviii) Exercise 20: Transitions:

- (A) revise ground effect, translational lift and flapback;
- (B) maintaining constant height, (20–30 ft AGL):
- (C) transition from hover to minimum 50 knots IAS and back to hover;
- (D) demonstrate effect of wind.

(xxix) Exercise 21: Quick stops:

- (A) use of power and controls;
- (B) effect of wind;
- (C) quick stops into wind;
- (D) quick stops from crosswind and downwind terminating into wind;
- (E) danger of vortex ring;
- (F) danger of high disc loading.

(xxx) Exercise 22a: Navigation:

- (A) Flight planning:
  - (a) weather forecast and actuals;
  - (b) map selection and preparation and use:

- (1) choice of route;
    - (2) controlled airspace, danger and prohibited areas;
    - (3) safety altitudes and noise abatement considerations.
  - (c) calculations:
    - (1) magnetic heading(s) and time(s) en-route;
    - (2) fuel consumption;
    - (3) mass and balance.
  - (d) flight information:
    - (1) NOTAMs, etc.;
    - (2) radio frequencies;
    - (3) selection of alternate landing sites.
  - (e) helicopter documentation;
  - (f) notification of the flight:
    - (1) pre-flight administrative procedures;
    - (2) flight plan form (where appropriate).
- (B) Departure:
- (a) organisation of cockpit workload;
  - (b) departure procedures:
    - (1) altimeter settings;
    - (2) ATC liaison in regulated airspace;
    - (3) setting heading procedure;
    - (4) noting of ETAs.

- (c) maintenance of height or altitude and heading;
  - (d) revisions of ETA and heading:
    - (1) 10° line, double track, track error and closing angle;
    - (2) 1 in 60 rule;
    - (3) amending an ETA.
  - (e) log keeping;
  - (f) use of radio;
  - (g) minimum weather conditions for continuation of flight;
  - (h) in-flight decisions;
  - (i) transiting controlled or regulated airspace;
  - (j) uncertainty of position procedure;
  - (k) lost procedure.
- (C) Arrival and aerodrome joining procedure:
- (a) ATC liaison in regulated airspace;
  - (b) altimeter setting;
  - (c) entering the traffic pattern;
  - (d) circuit procedures;
  - (e) parking;
  - (f) security of helicopter;
  - (g) refuelling;
  - (h) closing of flight plan, (if appropriate);
  - (i) post-flight administrative procedures.

(xxxi) Exercise 22b: Navigation problems at low heights and in reduced visibility:

- (A) actions before descending;
- (B) hazards (for example obstacles and other aircraft);
- (C) difficulties in map reading;
- (D) effects of wind and turbulence;
- (E) avoidance of noise-sensitive areas;
- (F) actions in case of DVE;
- (G) decision to divert or make a precautionary landing;
- (H) bad-weather circuit and landing;
- (I) appropriate procedures and choice of landing area;
- (J) precautionary landing.

(xxxii) Exercise 22c: Radio navigation (basics):

- (A) Use of GNNS or VOR/NDB:
  - (a) selection of waypoints;
  - (b) to or from indications or orientation;
  - (c) error messages.
- (B) Use of VHF/DF:
  - (a) availability, AIP and frequencies;
  - (b) R/T procedures and ATC liaison;
  - (c) obtaining a QDM and homing.
- (C) Use of en-route or terminal radar:
  - (a) availability and AIP;
  - (b) procedures and ATC liaison;

- (c) pilot's responsibilities;
- (d) secondary surveillance radar:
  - (1) transponders;
  - (2) code selection;
  - (3) interrogation and reply.

(xxxiii) Exercise 23: Advanced take-off, landings and transitions:

- (A) landing and take-off out of wind (performance reduction);
- (B) ground effect, translational lift and directional stability variation when out of wind;
- (C) downwind transitions;
- (D) vertical take-off over obstacles;
- (E) reconnaissance of landing site;
- (F) running landing;
- (G) zero speed landing;
- (H) crosswind and downwind landings;
- (I) steep approach;
- (J) go-around.

(xxxiv) Exercise 24: Sloping ground:

- (A) limitations and assessing slope angle;
- (B) wind and slope relationship: blade and control stops;
- (C) effect of CG when on slope;
- (D) ground effect on slope and power required;
- (E) right skid up slope;
- (F) left skid up slope;



- (G) nose up slope;
- (H) avoidance of dynamic roll over, dangers soft ground and sideways movement on touchdown;
- (I) danger of striking main or tail rotor by harsh control movement near ground.

(xxxv) Exercise 25: Limited power:

- (A) take-off power check;
- (B) vertical take-off over obstacles;
- (C) in-flight power check;
- (D) running landing;
- (E) zero speed landing;
- (F) approach to low hover;
- (G) approach to hover;
- (H) approach to hover OGE;
- (I) steep approach;
- (J) go-around.

(xxxvi) Exercise 26: Confined areas:

- (A) landing capability and performance assessment;
- (B) locating landing site and assessing wind speed and direction;
- (C) reconnaissance of landing site;
- (D) select markers;
- (E) select direction and type of approach;
- (F) circuit;
- (G) approach to committed point and go-around;

- (H) approach;
- (I) clearing turn;
- (J) landing;
- (K) power check and performance assessment in and OGE;
- (L) normal take-off to best angle of climb speed;
- (M) vertical take-off from hover.

### **AMC1 FCL.115(c) LAPL – Training course**

#### **CHANGE OF TRAINING ORGANISATION**

In cases where the applicant completes the training course (theoretical knowledge instruction or flight instruction) at a different DTO or ATO ('completing training organisation') from the one where they have started the training course ('starting training organisation'), the applicant should request from the starting training organisation a copy of the records kept in accordance with point DTO.GEN.220 or point ORA.ATO.120.

### **FCL.120 LAPL – Theoretical knowledge examination**

Applicants for an LAPL shall demonstrate a level of theoretical knowledge appropriate to the privileges granted, through examinations on the following:

- (a) common subjects:
  - Air law,
  - Human performance,
  - Meteorology,
  - Communications, and
  - Navigation.
- (b) specific subjects concerning the different aircraft categories:
  - Principles of flight,
  - Operational procedures,

- Flight performance and planning, and
- Aircraft general knowledge.

## **AMC1 FCL.115; FCL.120 LAPL training course and theoretical knowledge examination**

### **SYLLABUS OF THEORETICAL KNOWLEDGE FOR THE LAPL**

- (a) The training and examination should cover aspects related to non-technical skills in an integrated manner, taking into account the particular risks associated with the licence and the activity. The DTO or the ATO responsible for the training has to check if all the appropriate elements of the training course of theoretical knowledge instruction have been completed to a satisfactory standard before recommending the applicant for the examination.
- (b) The following tables contain the syllabi for the courses of theoretical knowledge, as well as for the theoretical knowledge examinations for the LAPL(B) and LAPL(S). The syllabi for the theoretical knowledge instruction and examination for the PPL(A) and PPL(H) in AMC1 FCL.210; FCL.215 should be used for the LAPL(A) and the LAPL(H), respectively.

#### **I. COMMON SUBJECTS**

[FOR LAPL(S) AND LAPL(B)]

<b>1.</b>	<b>AIR LAW AND ATC PROCEDURES</b>
1.1.	International law: conventions, agreements and organisations
1.2.	Airworthiness of aircraft
1.3.	Aircraft nationality and registration marks
1.4.	Personnel licensing
1.5.	Rules of the air
1.6.	Procedures for air navigation: aircraft operations
1.7.	Air traffic regulations: airspace structure
1.8.	ATS and air traffic management
1.9.	AIS
1.10.	Aerodromes, external take-off sites
1.11.	Search and rescue
1.12.	Security
1.13.	Accident reporting
1.14.	National law

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2.	<b>HUMAN PERFORMANCE</b>
2.1.	Human factors: basic concepts
2.2.	Basic aviation physiology and health maintenance
2.3.	Basic aviation psychology
3.	<b>METEOROLOGY</b>
3.1.	The atmosphere
3.2.	Wind
3.3.	Thermodynamics
3.4.	Clouds and fog
3.5.	Precipitation
3.6.	Air masses and fronts
3.7.	Pressure systems
3.8.	Climatology
3.9.	Flight hazards
3.10.	Meteorological information
4.	<b>COMMUNICATIONS</b>
4.1.	VFR communications
4.2.	Definitions
4.3.	General operating procedures
4.4.	Relevant weather information terms (VFR)
4.5.	Action required to be taken in case of communication failure
4.6.	Distress and urgency procedures
4.7.	General principles of VHF propagation and allocation of frequencies

**II. ADDITIONAL SUBJECTS FOR EACH CATEGORY**

**II.A SAILPLANES**

5.	<b>PRINCIPLES OF FLIGHT - SAILPLANE</b>
5.1.	Aerodynamics (airflow)
5.2.	Flight mechanics
5.3.	Stability
5.4.	Control
5.5.	Limitations (load factor and manoeuvres)
5.6.	Stalling and spinning
6.	<b>OPERATIONAL PROCEDURES - SAILPLANE</b>
6.1.	General requirements
6.2.	Launch methods

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6.3.	Soaring techniques
6.4.	Circuits and landing
6.5.	Outlanding
6.6.	Special operational procedures and hazards
6.7.	Emergency procedures
<b>7.</b>	<b>FLIGHT PERFORMANCE AND PLANNING - SAILPLANE</b>
7.1.	Verifying mass and balance
7.2.	Speed polar of sailplanes or cruising speed
7.3.	Flight planning and task setting
7.4.	ICAO flight plan (ATS flight plan)
7.5.	Flight monitoring and in-flight re-planning
<b>8.</b>	<b>AIRCRAFT GENERAL KNOWLEDGE, AIRFRAME AND SYSTEMS AND EMERGENCY EQUIPMENT – SAILPLANE</b>
8.1.	Airframe
8.2.	System design, loads and stresses
8.3.	Landing gear, wheels, tyres and brakes
8.4.	Mass and balance
8.5.	Flight controls
8.6.	Instruments
8.7.	Manuals and documents
8.8.	Airworthiness and maintenance
<b>9.</b>	<b>NAVIGATION – SAILPLANE</b>
9.1.	Basics of navigation
9.2.	Magnetism and compasses
9.3.	Charts
9.4.	Dead reckoning navigation
9.5.	In-flight navigation
9.6.	Global navigation satellite systems

## **II.B. BALLOONS**

<b>5.</b>	<b>PRINCIPLES OF FLIGHT – BALLOON</b>
5.1.	Principles of flight
5.2.	Aerostatics
5.3.	Loading limitations
5.4.	Operational limitations
<b>6.</b>	<b>OPERATIONAL PROCEDURES – BALLOON</b>
6.1.	General requirements

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6.2.	Special operational procedures and hazards (general aspects)
6.3.	Emergency procedures
<b>7.</b>	<b>FLIGHT PERFORMANCE AND PLANNING – BALLOON</b>
7.1.	Mass
7.1.1.	Purpose of mass considerations
7.1.2.	Loading
7.2.	Performance
7.2.1.	Performance: general
7.3.	Flight planning and flight monitoring
7.3.1.	Flight planning: general
7.3.2.	Fuel planning
7.3.3.	Pre-flight preparation
7.3.4.	ICAO flight plan (ATS flight plan)
7.3.5.	Flight monitoring and in-flight re-planning
<b>8.</b>	<b>AIRCRAFT GENERAL KNOWLEDGE, ENVELOPE AND SYSTEMS AND EMERGENCY EQUIPMENT – BALLOON</b>
8.1.	System design, loads, stresses and maintenance
8.2.	Envelope
8.3.	Burner (hot-air balloon and hot-air airship)
8.4.	Fuel cylinders (hot-air balloon or hot-air airship)
8.5.	Basket or gondola
8.6.	Lifting gas (gas balloon)
8.7.	Burning gas (hot-air balloon or hot-air airship)
8.8.	Ballast (gas balloon)
8.9.	Engine (hot-air airship only)
8.10.	Instruments
8.11.	Emergency equipment
<b>9.</b>	<b>NAVIGATION – BALLOON</b>
9.1.	General navigation
9.2.	Basics of navigation
9.3.	Magnetism and compasses
9.4.	Charts
9.5.	Dead reckoning navigation
9.6.	In-flight navigation
9.7.	GNSS

### **FCL.125 LAPL – Skill test**

- (a) Applicants for an LAPL shall demonstrate through the completion of a skill test the ability to perform, as PIC on the appropriate aircraft category, the relevant procedures and manoeuvres with competency appropriate to the privileges granted.
- (b) Applicants for the skill test shall have received flight instruction on the same class or type of aircraft to be used for the skill test. The privileges will be restricted to the class or type used for the skill test until further extensions are endorsed on the licence, in accordance with this Subpart.
- (c) Pass marks
  - (1) The skill test shall be divided into different sections, representing all the different phases of flight appropriate to the category of aircraft flown.
  - (2) Failure in any item of a section will cause the applicant to fail the entire section. If the applicant fails only 1 section, he/she shall repeat only that section. Failure in more than 1 section will cause the applicant to fail the entire test.
  - (3) When the test needs to be repeated in accordance with (2), failure in any section, including those that have been passed on a previous attempt, will cause the applicant to fail the entire test.
  - (4) Failure to achieve a pass in all sections of the test in 2 attempts will require further practical training.

### **AMC1 FCL.120; FCL.125**

#### **THEORETICAL KNOWLEDGE EXAMINATION AND SKILL TEST FOR THE LAPL**

- (a) Theoretical knowledge examination
  - (1) The examinations should be in written form and should comprise a total of 120 multiple-choice questions covering all the subjects.
  - (2) For the subject 'communication' practical classroom testing may be conducted.
  - (3) The Authority should inform applicants of the language(s) in which the examinations will be conducted.

(b) Skill test

Further training may be required following any failed skill test or part thereof. There should be no limit to the number of skill tests that may be attempted.

(c) Conduct of the test

- (1) If the applicant chooses to terminate a skill test for reasons considered inadequate by the FE, the applicant should retake the entire skill test. If the test is terminated for reasons considered adequate by the FE, only those sections not completed should be tested in a further flight.
- (2) Any manoeuvre or procedure of the test may be repeated once by the applicant. The FE may stop the test at any stage if it is considered that the applicant's demonstration of flying skill requires a complete retest.
- (3) An applicant should be required to fly the aircraft from a position where the PIC functions can be performed and to carry out the test as if there is no other crew member. Responsibility for the flight should be allocated in accordance with national regulations.

### **AMC1 FCL.125 LAPL – Skill test**

#### **CONTENTS OF THE SKILL TEST FOR THE ISSUE OF A LAPL(A)**

- (a) The route to be flown for the skill test should be chosen by the FE. The route should end at the aerodrome of departure or at another aerodrome. The applicant should be responsible for the flight planning and should ensure that all equipment and documentation for the execution of the flight are on board. The navigation section of the test should have a duration of at least 30 minutes which allows the pilot to demonstrate his/her ability to complete a route with at least two identified waypoints and may, as agreed between applicant and FE, be flown as a separate test.
- (b) An applicant should indicate to the FE the checks and duties carried out, including the identification of radio facilities. Checks should be completed in accordance with the flight manual or the authorised checklist for the aeroplane or TMG on which the test is being taken. During pre-flight preparation for the test the applicant should be required to determine power settings and speeds. Performance data for take-off, approach and landing should be calculated by the applicant in compliance with the operations manual or flight manual for the aeroplane or TMG used.



## **FLIGHT TEST TOLERANCE**

- (c) The applicant should demonstrate the ability to:
- (1) operate the aeroplane or TMG within its limitations;
  - (2) complete all manoeuvres with smoothness and accuracy;
  - (3) exercise good judgment and airmanship;
  - (4) apply aeronautical knowledge;
  - (5) maintain control of the aeroplane or TMG at all times in such a manner that the successful outcome of a procedure or manoeuvre is never seriously in doubt.
- (d) The following limits are for general guidance. The FE should make allowance for turbulent conditions and the handling qualities and performance of the aeroplane or TMG used:
- (1) height: normal flight  $\pm 150$  ft
  - (2) speed:
    - (i) take-off and approach  $+15/-5$  knots
    - (ii) all other flight regimes  $\pm 15$  knots

## **CONTENT OF THE SKILL TEST**

- (e) The skill test contents and sections set out in this AMC should be used for the skill test for the issue of a LAPL(A):

### **SECTION 1 PRE-FLIGHT OPERATIONS AND DEPARTURE**

Use of checklist, airmanship, control of aeroplane or TMG by external visual reference, anti/de-icing procedures, etc. apply in all sections.

a	Pre-flight documentation, NOTAM and weather briefing
b	Mass and balance and performance calculation
c	Aeroplane or TMG inspection and servicing
d	Engine starting and after starting procedures
e	Taxiing and aerodrome procedures, pre-take-off procedures
f	Take-off and after take-off checks
g	Aerodrome departure procedures
h	ATC liaison: compliance

## **SECTION 2 GENERAL AIRWORK**

a	ATC liaison
b	Straight and level flight, with speed changes
c	Climbing: <ul style="list-style-type: none"><li>i. best rate of climb;</li><li>ii. climbing turns</li><li>iii. levelling off.</li></ul>
d	Medium (30° bank) turns, look-out procedures and collision avoidance
e	Steep (45 ° bank) turns
f	Flight at critically low air speed with and without flaps
g	Stalling: <ul style="list-style-type: none"><li>i. clean stall and recover with power;</li><li>ii. approach to stall descending turn with bank angle 20 °, approach configuration;</li><li>iii. approach to stall in landing configuration.</li></ul>
h	Descending: <ul style="list-style-type: none"><li>i. with and without power;</li><li>ii. descending turns (steep gliding turns);</li><li>iii. levelling off.</li></ul>

## **SECTION 3 EN-ROUTE PROCEDURES**

a	Flight plan, dead reckoning and map reading
b	Maintenance of altitude, heading and speed
c	Orientation, airspace structure, timing and revision of ETAs, log keeping
d	Diversion to alternate aerodrome (planning and implementation)
e	Flight management (checks, fuel systems, carburettor icing, etc.)
f	ATC liaison: compliance

## **SECTION 4 APPROACH AND LANDING PROCEDURES**

a	Aerodrome arrival procedures
b	Collision avoidance (look-out procedures)
c	Precision landing (short field landing) and crosswind, if suitable conditions available
d	Flapless landing (if applicable)
e	Approach to landing with idle power
f	Touch and go
g	Go-around from low height
h	ATC liaison
i	Actions after flight

## **SECTION 5 ABNORMAL AND EMERGENCY PROCEDURES**

This section may be combined with Sections 1 through 4

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a	Simulated engine failure after take-off
b	* Simulated forced landing
c	* Simulated precautionary landing
d	Simulated emergencies
e	Oral questions

**AMC2 FCL.125 LAPL – Skill test**

**CONTENTS OF THE SKILL TEST FOR THE ISSUE OF A LAPL(H)**

- (a) The area and route to be flown for the skill test should be chosen by the FE. The route should end at the aerodrome of departure or at another aerodrome. The applicant should be responsible for the flight planning and should ensure that all equipment and documentation for the execution of the flight are on board. The navigation section of the test should consist of at least two legs, each leg of a minimum duration of 10 minutes. The skill test may be conducted in two flights.
- (b) An applicant should indicate to the FE the checks and duties carried out, including the identification of radio facilities. Checks should be completed in accordance with the flight manual or the authorised checklist or pilot operating handbook for the helicopter on which the test is being taken. During pre-flight preparation for the test the applicant should be required to determine power settings and speeds. Performance data for take-off, approach and landing should be calculated by the applicant in compliance with the operations manual or flight manual for the helicopter used.

**FLIGHT TEST TOLERANCE**

- (c) The applicant should demonstrate the ability to:
  - (1) operate the helicopter within its limitations;
  - (2) complete all manoeuvres with smoothness and accuracy;
  - (3) exercise good judgment and airmanship;
  - (4) apply aeronautical knowledge;
  - (5) maintain control of the helicopter at all times in such a manner that the successful outcome of a procedure or manoeuvre is never seriously in doubt.

- (d) The following limits are for general guidance. The FE should make allowance for turbulent conditions and the handling qualities and performance of the helicopter used:
- (1) height:
    - (i) normal forward flight  $\pm 150$  ft
    - (ii) with simulated major emergency  $\pm 200$  ft
    - (iii) hovering IGE flight  $\pm 2$  ft
  - (2) speed:
    - (i) take-off approach  $+15$  knots  $-10$  knots
    - (ii) all other flight regimes  $\pm 15$  knots
  - (3) round drift:
    - (i) take-off hover IGE  $\pm 3$  ft
    - (ii) landing no sideways or backward movement

### **CONTENT OF THE SKILL TEST**

- (e) The skill test contents and sections set out in this AMC should be used for the skill test for the issue of a LAPL(H):

#### **SECTION 1 PRE-FLIGHT OR POST-FLIGHT CHECKS AND PROCEDURES**

Use of checklist, airmanship, control of helicopter by external visual reference, anti/de-icing procedures, etc. apply in all sections.

a	Helicopter knowledge (for example technical log, fuel, mass and balance, performance), flight planning, NOTAM, and weather briefing
b	Pre-flight inspection or action, location of parts and purpose
c	Cockpit inspection, starting procedure
d	Communication and navigation equipment checks, selecting and setting frequencies
e	Pre-take-off procedure and ATC liaison
f	Parking, shutdown and post-flight procedure

**SECTION 2 HOVER MANOEUVRES, ADVANCED HANDLING AND CONFINED AREAS**

a	Take-off and landing (lift off and touch down)
b	Taxi and hover taxi
c	Stationary hover with head, cross and tail wind
d	Stationary hover turns, 360° left and right (spot turns)
e	Forward, sideways and backwards hover manoeuvring
f	Simulated engine failure from the hover
g	Quick stops into and downwind
h	Sloping ground or unprepared sites landings and take-offs
i	Take-offs (various profiles)
j	Crosswind and downwind take-off (if practicable)
k	Take-off at maximum take-off mass (actual or simulated)
l	Approaches (various profiles)
m	Limited power take-off and landing
n	Autorotations (FE to select two items from the following: basic, range, low speed, and 360° turns)
o	Autorotative landing
p	Practice forced landing with power recovery
q	Power checks, reconnaissance technique, approach and departure technique

**SECTION 3 NAVIGATION AND EN-ROUTE PROCEDURES**

a	Navigation and orientation at various altitudes or heights and map reading
b	Altitude or height, speed, heading control, observation of airspace and altimeter setting
c	Monitoring of flight progress, flight-log, fuel usage, endurance, ETA, assessment of track error, re-establishment of correct track and instrument monitoring
d	Observation of weather conditions and diversion planning
e	Collision avoidance (look-out procedures)
f	ATC liaison with due observance of regulations

**SECTION 4 FLIGHT PROCEDURES AND MANOEUVRES**

a	Level flight, control of heading, altitude or height and speed
b	Climbing and descending turns to specified headings
c	Level turns with up to 30 ° bank, 180 ° to 360 ° left and right

**SECTION 5 ABNORMAL AND EMERGENCY PROCEDURES (SIMULATED WHERE APPROPRIATE)**

Note: The FE selects 4 items from the following:

a	Engine malfunctions, including governor failure, carburettor or engine icing and oil system, as appropriate
b	Fuel system malfunction
c	Electrical system malfunction
d	Hydraulic system malfunction, including approach and landing without hydraulics, as applicable
e	Main rotor or anti-torque system malfunction (FFS or discussion only)
f	Fire drills, including smoke control and removal, as applicable
g	Other abnormal and emergency procedures as outlined in appropriate flight manual

**AMC1 FCL.125; FCL.235**

**CONTENTS OF THE SKILL TEST FOR THE ISSUE OF A LAPL(S) AND OF AN SPL**

- (a) An applicant should be responsible for the flight planning and should ensure that all equipment and documentation for the execution of the flight are on board.
- (b) The applicant should indicate to the FE the checks and duties carried out.

Checks should be completed in accordance with the flight manual or the authorised checklist for the sailplane on which the test is being taken.

**FLIGHT TEST TOLERANCE**

- (c) The applicant should demonstrate the ability to:
  - (1) operate the sailplane within its limitations;
  - (2) complete all manoeuvres with smoothness and accuracy;
  - (3) exercise good judgment and airmanship;
  - (4) apply aeronautical knowledge;
  - (5) maintain control of the sailplane at all times in such a manner that the successful outcome of a procedure or manoeuvre is never seriously in doubt.

## **CONTENT OF THE SKILL TEST**

- (d) The skill test contents and sections set out in this AMC should be used for the skill test for the issue of a LAPL(S) and of an SPL:

### **SECTION 1 PRE-FLIGHT OPERATIONS AND DEPARTURE**

Use of checklist, airmanship (control of sailplane by external visual reference), look-out. Apply in all sections.

- |   |  |
|---|--|
| a | Pre-flight sailplane (daily) inspection, documentation, NOTAM and weather briefing |
| b | Verifying in-limits mass and balance and performance calculation                   |
| c | Sailplane servicing compliance   |
| d | Pre-take-off checks  |

### **SECTION 2 LAUNCH METHOD**

**Note: at least for one of the three launch methods all the mentioned items are fully exercised during the skill test**

#### **SECTION 2 (A) WINCH OR CAR LAUNCH**

- |   |  |
|---|--|
| a | Signals before and during launch, including messages to winch driver |
| b | Adequate profile of winch launch                                     |
| c | Simulated launch failure   |
| d | Situational awareness  |

#### **SECTION 2 (B) AEROTOW LAUNCH**

- |   |  |
|---|--|
| a | Signals before and during launch, including signals to or communications with tow plane pilot for any problems |
| b | Initial roll and take-off climb  |
| c | Launch abandonment (simulation only or 'talk-through')   |
| d | Correct positioning during straight flight and turns   |
| e | Out of position and recovery   |
| f | Correct release from tow   |
| g | Look-out and airmanship through whole launch phase   |

#### **SECTION 2 (C) SELF-LAUNCH (powered sailplanes only)**

- |   |   |
|---|---|
| a | ATC compliance (if applicable)                    |
| b | Aerodrome departure procedures                    |
| c | Initial roll and take-off climb                   |
| d | Look-out and airmanship during the whole take-off |
| e | Simulated engine failure after take-off           |
| f | Engine shut down and stowage                      |

**SECTION 3 GENERAL AIRWORK**

a	Maintain straight flight: attitude and speed control
b	Coordinated medium (30 ° bank) turns, look-out procedures and collision avoidance
c	Turning on to selected headings visually and with use of compass
d	Flight at high angle of attack (critically low air speed)
e	Clean stall and recovery
f	Spin avoidance and recovery
g	Steep (45 ° bank) turns, look-out procedures and collision avoidance
h	Local area navigation and awareness

**SECTION 4 CIRCUIT, APPROACH AND LANDING**

a	Aerodrome circuit joining procedure
b	Collision avoidance: look-out procedures
c	Pre-landing checks
d	Circuit, approach control and landing
e	Precision landing (simulation of out-landing and short field)
f	Crosswind landing if suitable conditions available

**AMC2 FCL.125; FCL.235**

**CONTENTS OF THE SKILL TEST FOR THE ISSUE OF A LAPL(B) AND A BPL**

- (a) The take-off site should be chosen by the applicant depending on the actual meteorological conditions, the area which has to be over flown and the possible options for suitable landing sites. The applicant should be responsible for the flight planning and should ensure that all equipment and documentation for the execution of the flight are on board.
- (b) An applicant should indicate to the FE the checks and duties carried out. Checks should be completed in accordance with the flight manual or the authorised checklist for the balloon on which the test is being taken. During pre-flight preparation for the test the applicant should be required to perform crew and passenger briefings and demonstrate crowd control. The load calculation should be performed by the applicant in compliance with the operations manual or flight manual for the balloon used.

**FLIGHT TEST TOLERANCE**

- (c) The applicant should demonstrate the ability to:
  - (1) operate the balloon within its limitations;



- (2) complete all manoeuvres with smoothness and accuracy
- (3) exercise good judgment and airmanship;
- (4) apply aeronautical knowledge;
- (5) maintain control of the balloon at all times in such a manner that the successful outcome of a procedure or manoeuvre is never seriously in doubt.

### **CONTENT OF THE SKILL TEST**

- (d) The skill test contents and sections set out in this paragraph should be used for the skill test for the issue of a LAPL(B) (hot-air balloon) and a BPL (hot-air balloon):

#### **SECTION 1 PRE-FLIGHT OPERATIONS, INFLATION AND TAKE-OFF**

Use of checklist, airmanship, control of balloon by external visual reference, look-out procedures, etc. apply in all sections.

- a Pre-flight documentation, flight planning, NOTAM and weather briefing
- b Balloon inspection and servicing
- c Load calculation
- d Crowd control, crew and passenger briefings
- e Assembly and layout
- f Inflation and pre-take-off procedures
- g Take-off
- h ATC compliance(if applicable)

#### **SECTION 2 GENERAL AIRWORK**

- a Climb to level flight
- b Level flight
- c Descent to level flight
- d Operating at low level
- e ATC compliance (if applicable)

#### **SECTION 3 EN-ROUTE PROCEDURES**

- a Dead reckoning and map reading
- b Marking positions and time
- c Orientation and airspace structure
- d Maintenance of altitude
- e Fuel management
- f Communication with retrieve crew
- g ATC compliance

**SECTION 4 APPROACH AND LANDING PROCEDURES**

- |   |  |
|---|--|
| a | Approach from low level, missed approach and fly on  |
| b | Approach from high level, missed approach and fly on |
| c | Pre-landing checks                                   |
| d | Passenger pre-landing briefing                       |
| e | Selection of landing field                           |
| f | Landing, dragging and deflation                      |
| g | ATC compliance (if applicable)                       |
| h | Actions after flight                                 |

**SECTION 5 ABNORMAL AND EMERGENCY PROCEDURES**

- |   |   |
|---|---|
| a | Simulated fire on the ground and in the air   |
| b | Simulated pilot light and burner failures   |
| c | Other abnormal and emergency procedures as outlined in the appropriate flight manual. |
| d | Oral questions  |

- (e) The skill test contents and sections set out in this paragraph should be used for the skill test for the issue of a LAPL(B) (gas balloon) and a BPL (gas balloon):

**SECTION 1 PRE-FLIGHT OPERATIONS, INFLATION AND TAKE-OFF**

Use of checklist, airmanship, control of balloon by external visual reference, look-out procedures, etc. apply in all sections.

- |   |   |
|---|---|
| a | Pre-flight documentation, flight planning, NOTAM and weather briefing |
| b | Balloon inspection and servicing                                      |
| c | Load calculation  |
| d | Crowd control, crew and passenger briefings                           |
| e | Assembly and layout   |
| f | Inflation and pre-take-off procedures                                 |
| g | Take-off  |
| h | ATC compliance (if applicable)  |

**SECTION 2 GENERAL AIRWORK**

- |   |                                |
|---|--------------------------------|
| a | Climb to level flight          |
| b | Level flight                   |
| c | Descent to level flight        |
| d | Operating at low level         |
| e | ATC compliance (if applicable) |

**SECTION 3 EN-ROUTE PROCEDURES**

- |   |                                |
|---|--------------------------------|
| a | Dead reckoning and map reading |
|---|--------------------------------|

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b	Marking positions and time
c	Orientation and airspace structure
d	Maintenance of altitude
e	Ballast management
f	Communication with retrieve crew
g	ATC compliance
<b>SECTION 4 APPROACH AND LANDING PROCEDURES</b>	
a	Approach from low level, missed approach and fly on
b	Approach from high level, missed approach and fly on
c	Pre-landing checks
d	Passenger pre-landing briefing
e	Selection of landing field
f	Landing, dragging and deflation
g	ATC compliance (if applicable)
h	Actions after flight
<b>SECTION 5 ABNORMAL AND EMERGENCY PROCEDURES</b>	
a	Simulated closed appendix during take-off and climb
b	Simulated parachute or valve failure
c	Other abnormal and emergency procedures as outlined in the appropriate flight manual
d	Oral questions

## **SECTION 2 – SPECIFIC REQUIREMENTS FOR THE LAPL FOR AERO- PLANES – LAPL(A)**

### **FCL.105.A LAPL(A) – Privileges and conditions**

**(a) Privileges**

The privileges of the holder of an LAPL for aeroplanes are to act as PIC on SEP aeroplanes-land (SEP(land)), SEP aeroplanes-sea (SEP(sea)) or TMG with a maximum certified take-off mass of 2 000 kg or less, carrying a maximum of three passengers, such that there are never more than four persons on board the aircraft.

**(b) Conditions**

- (1) Holders of a LAPL(A) shall carry passengers only if they have completed 10 hours of flight time as PIC on aeroplanes or TMG after the issuance of the licence.
- (2) Holders of a LAPL(A) who previously held an ATPL(A), an MPL(A), a CPL(A) or a PPL(A), are exempted from the requirements laid down in point (b)(1).

### **AMC1 FCL.105.A(b)(2) Privileges and conditions**

In the case of previous MPL(A) holders, only those who extended their MPL(A) to include CPL privileges or PPL privileges in accordance with point FCL.405.A(b) may benefit from the exemption of point FCL.105.A(b)(2).

### **FCL.110.A LAPL(A) – Experience requirements and crediting**

- (a) Applicants for an LAPL(A) shall have completed at least 30 hours of flight instruction on aeroplanes or TMGs, including at least:**
- (1) 15 hours of dual flight instruction in the class in which the skill test will be taken;
  - (2) 6 hours of supervised solo flight time, including at least 3 hours of solo cross-country flight time with at least 1 cross-country flight of at least 150 km (80 NM), during which 1 full stop landing at an aerodrome different from the aerodrome of departure shall be made.

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- (b) Specific requirements for applicants who hold an SPL issued in accordance with MCAR-Part-SFCL, including privileges to fly TMGs. Applicants for an LAPL(A) who hold an SPL with the privileges to fly TMGs shall have completed at least 21 hours of flight time on TMGs after the endorsement of the TMG privileges and shall comply with the requirements of point FCL.135.A(a) on aeroplanes.
- (c) Crediting. Applicants with prior experience as PIC may be credited towards the requirements of point (a) under the following conditions:
  - (1) the amount of credit shall be decided by the DTO or the ATO where the pilot undergoes the training course, on the basis of a pre-entry flight assessment, but shall in any case:
    - (i) not exceed the total flight time as PIC;
    - (ii) not exceed 50 % of the hours required in point (a);
    - (iii) not include the requirements of point (a)(2);
  - (2) previous experience as PIC in aircraft that are subject to a decision of the State taken in accordance with the Civil Aviation Regulations or that fall within the scope of the MCAR's may be considered, provided that the aircraft match the definition of the respective aircraft category under this MCAR-Part-FCL.

**AMC1 FCL.115.A LAPL(A) – Training course**

**CREDITING: PRE-ENTRY FLIGHT TEST**

The pre-entry flight test referred to in FCL.110.A(c) should cover the total content of the syllabus of flight instruction for the issuance of the LAPL(A), in accordance with AMC1 FCL.115.

**FCL.135.A LAPL(A) – Extension of privileges to another class or variant of aeroplane**

- (a) Applicants for an LAPL(A) shall be issued with privileges for the class of aeroplanes or TMGs in which the skill test was taken. In order to extend their privileges to another class, holders of an LAPL(A) shall complete, in that other class, all of the following:
  - (1) 3 hours of flight instruction, including the following:
    - (i) 10 dual take-offs and landings;

- (ii) 10 supervised solo take-offs and landings;
- (2) a skill test to demonstrate an adequate level of practical skill in the new class. During that skill test, the applicant shall also demonstrate to the examiner an adequate level of theoretical knowledge for the other class in the following subjects:
  - (i) Operational procedures;
  - (ii) Flight performance and planning;
  - (iii) Aircraft general knowledge.
- (b) In order to extend the privileges to another variant within a class, the pilot shall either undergo differences training or do familiarisation. The differences training shall be entered in the pilot's logbook or in an equivalent record and shall be signed by the instructor. When extending the privileges for an SEP aeroplane class to a variant with another type of engine which may be converted to an MCAR-Part-FCL licence, the differences training shall consist of dual flight instruction and theoretical knowledge instruction which shall include, with regard to that other type of engine and related aircraft systems, at least all of the following subjects:
  - (1) Operational procedures;
  - (2) Flight performance and planning;
  - (3) Aircraft general knowledge.
- (c) Applicants for the extension of privileges of the LAPL(A) to TMG who also hold an SPL in accordance with MCAR-Part-SFCL, including the privileges to fly on TMGs, shall receive full credits towards the requirements in paragraph (a).

## **GM1 FCL.135.A; FCL.135.H**

### **DIFFERENCES AND FAMILIARISATION TRAINING**

- (a) Differences training requires the acquisition of additional knowledge and training on an appropriate training device or the aircraft.
- (b) Familiarisation training requires the acquisition of additional knowledge.

### **FCL.140.A LAPL(A) – Recency requirements**

- (a) Holders of a LAPL(A) shall exercise the privileges of their licence only if in the last 2 years they have met any of the following conditions as pilots of aeroplanes or TMGs:
  - (1) they have completed at least 12 hours of flight time as PIC or flying dual or solo under the supervision of an instructor, including:
    - (i) 12 take-offs and landings;
    - (ii) refresher training of at least 1 hour of total flight time with and to the satisfaction of an instructor who shall select those flight exercises that allow the applicant to refresh their competence in safely operating the aircraft and applying normal, abnormal and emergency procedures;
  - (2) they have passed a LAPL(A) proficiency check with an examiner. The proficiency check programme shall be based on the skill test for the LAPL(A);
- (b) If holders of a LAPL(A) hold both a SEP(land) and a SEP(sea) privilege, they may comply with the requirements in point (a)(1) in either class or a combination thereof which shall be valid for both privileges. For this purpose, at least 1 hour of the required flight time and 6 out of the required 12 take-offs and landings shall be completed in each class.
- (c) Holders of an LAPL(A) with privileges for SEP aeroplanes who, in accordance with point FCL.135.A(b), have extended their privileges to a variant with a different type of engine which may be converted into an MCAR-Part-FCL licence, if they have not flown that variant within the preceding 2 years, shall complete any of the following in that variant, before exercising their privileges in that variant:
  - (1) further differences training in accordance with point FCL.135.A(b);
  - (2) a proficiency check;
  - (3) refresher training in accordance with point FCL.140.A(a)(1)(ii).
- (d) The dual flights, flights under supervision referred to in the introductory phrase of point (a)(1), the refresher training referred to in point (a)(1)(ii) and point (c)(3) and the proficiency check referred to in point (a)(2) and point (c)(2) shall be entered in the pilot's logbook or equivalent record and shall be signed by the instructor or examiner, as applicable.

**AMC1 FCL.140.A; FCL.140.S; FCL.740.A(b)(1)(ii) Recency and revalidation requirements**

All hours flown on aeroplanes or sailplanes that are subject to a decision as per the Civil Aviation Regulations or that are specified in its associated MCAR's should count in full towards fulfilling the hourly requirements of points FCL.140.A, FCL.140.S, and FCL.740.A(b)(1)(ii) under the following conditions:

- (a) the aircraft matches the definition and criteria of the respective MCAR-Part-FCL aircraft category, class, and type ratings; and
- (b) the aircraft that is used for training flights with an instructor is an Annex-I aircraft of type (a), (b), (c), or (d) that is subject to an authorisation specified in points ORA.ATO.135 or DTO.GEN.240.

**AMC1 FCL.140.A; FCL.140.H; FCL.140.S; FCL.140.B Recency requirements**

Training flight items should be based on the exercise items of the proficiency check, as deemed relevant by the instructor, and depending on the experience of the candidate. For aeroplanes and helicopters, the briefing should include a discussion on TEM with special emphasis on decision-making when encountering adverse meteorological conditions or unintentional IMC, as well as on navigation flight capabilities. For sailplanes and balloons, the discussion should place special emphasis on principal occurrence categories of the activity that is covered by the licence.

**AMC1 FCL.140.A(b)(1) LAPL(A) Recency requirements**

The proficiency check should follow the content of the skill test that is set out in AMC1 FCL.125, point (e).



## **SECTION 3 – SPECIFIC REQUIREMENTS FOR THE LAPL FOR HELI- COPTERS – LAPL(H)**

### **FCL.105.H LAPL(H) – Privileges**

The privileges of the holder of an LAPL for helicopters are to act as PIC on single-engine helicopters with a maximum certificated take-off mass of 2 000 kg or less, carrying a maximum of 3 passengers, such that there are never more than 4 persons on board.

### **FCL.110.H LAPL(H) – Experience requirements and crediting**

- (a) Applicants for the LAPL(H) shall have completed 40 hours of flight instruction on helicopters. At least 35 hours of which shall be flown on the type of helicopter that is to be used for the skill test. The flight instruction shall include at least:
  - (1) 20 hours of dual flight instruction; and
  - (2) 10 hours of supervised solo flight time, including at least 5 hours of solo cross-country flight time with at least 1 cross-country flight of at least 150 km (80 NM), during which one full stop landing at an aerodrome different from the aerodrome of departure shall be made.
- (b) Crediting. Applicants with prior experience as PIC may be credited towards the requirements of point (a) under the following conditions:
  - (1) the amount of credit shall be decided by the DTO or the ATO where the pilot undergoes the training course, on the basis of a pre-entry flight assessment, but shall in any case:
    - (i) not exceed the total flight time as PIC;
    - (ii) not exceed 50 % of the hours required in point (a);
    - (iii) not include the requirements of point (a)(2);
  - (2) previous experience as PIC in aircraft that are subject to a decision of the State taken in accordance with the Civil Aviation Regulations or that fall within the scope of its associated MCAR's may be considered, provided that the aircraft match the definition of the helicopter category under this MCAR-Part-FCL.

**AMC1 FCL.110.H LAPL(H) Experience requirements and crediting**

**CREDITING: PRE-ENTRY FLIGHT TEST**

The pre-entry flight test referred to in FCL.110.H(b) should cover the total content of the syllabus of flight instruction for the issuance of the LAPL(H), in accordance with AMC2 FCL.115.

**FCL.135.H LAPL(H) – Extension of privileges to another type or variant of helicopter**

- (a) Applicants for an LAPL(H) shall be issued with privileges for the specific type of helicopter in which the skill test was taken. In order to extend their privileges to another type of helicopter, holders of an LAPL(H) shall complete, in that other type, all of the following:
  - (1) unless otherwise specified in the operational suitability data established in accordance with MCAR-Part-21, at least 5 hours of flight instruction, including:
    - (i) 15 dual take-offs, approaches and landings;
    - (ii) 15 supervised solo take-offs, approaches and landings;
  - (2) a skill test to demonstrate an adequate level of practical skill in the new type. During that skill test, the applicant shall also demonstrate to the examiner an adequate level of theoretical knowledge for the other type in the following subjects:
    - (i) Operational procedures,
    - (ii) Flight performance and planning,
    - (iii) Aircraft general knowledge.
- (b) Before the holder of an LAPL(H) can exercise the privileges of the licence in another variant of helicopter than the one used for the skill test, the pilot shall undergo differences training or do familiarisation, as determined in the operational suitability data established in accordance with MCAR-Part-21. The differences training shall be entered in the pilot's logbook or equivalent record and shall be signed by the instructor.

## **GM1 FCL.135.A; FCL.135.H**

### **DIFFERENCES AND FAMILIARISATION TRAINING**

- (a) Differences training requires the acquisition of additional knowledge and training on an appropriate training device or the aircraft.
- (b) Familiarisation training requires the acquisition of additional knowledge.

## **FCL.140.H LAPL(H) – Recency requirements**

- (a) Holders of an LAPL(H) shall exercise the privileges of their licence on a specific type only if in the last 12 months they have, in the relevant type, taken one of the following steps:
  - (1) completed both of the following:
    - (i) at least 6 hours of flight time on helicopters of that type as PIC, or flying dual or solo under the supervision of an instructor, including six take-offs, approaches and landings;
    - (ii) a refresher training of at least 1 hour of total flight time with and to the satisfaction of an instructor who shall select those flight exercises that allow the applicant to refresh their competence in safely operating the aircraft and applying normal, abnormal and emergency procedures;
  - (2) passed a proficiency check with an examiner on the specific type before resuming the exercise of the privileges of their licence. That proficiency check programme shall be based on the skill test for the LAPL(H).
- (b) Applicants may choose to complete the refresher training referred to in point (a)(1)(ii) in the aircraft or an FSTD representing the relevant type, or in a combination of both.
- (c) The dual flights, flights under supervision referred to in point (a)(1)(i), the refresher training referred to in point (a)(1)(ii) and the proficiency check referred to in point (a)(2) shall be entered in the pilot's logbook or equivalent record and shall be signed by the instructor or examiner, as applicable.

## **AMC1 FCL.140.H(b)(1) LAPL(H) Recency requirements**

The proficiency check should follow the content of the skill test that is set out in AMC2 FCL.125, point (e).

## **SUBPART C – PRIVATE PILOT LICENCE (PPL)**

### **SECTION 1 – COMMON REQUIREMENTS**

#### **FCL.200 Minimum age**

Applicants for a PPL shall be at least 17 years old.

#### **FCL.205 Conditions**

Applicants for the issue of a PPL shall have fulfilled the requirements for the class or type rating for the aircraft used in the skill test, as established in Subpart H.

#### **FCL.210 Training course**

- (a) Applicants for a PPL shall complete a training course at an ATO or a DTO.
- (b) The course shall include theoretical knowledge and flight instruction appropriate to the privileges of the PPL applied for.
- (c) Theoretical knowledge instruction and flight instruction may be completed at a DTO or at an ATO different from the one where applicants have commenced their training.

#### **AMC1 FCL.210 PPL(A) Training course**

##### **FLIGHT INSTRUCTION FOR THE PPL(A)**

- (a) Entry to training

Before being accepted for training an applicant should be informed that the appropriate medical certificate must be obtained before solo flying is permitted.

- (b) Flight instruction

- (1) The PPL(A) flight instruction syllabus takes into account the principles of threat and error management and also covers:
  - (i) pre-flight operations, including mass and balance determination, aircraft inspection and servicing;

- (ii) aerodrome and traffic pattern operations, collision avoidance precautions and procedures;
  - (iii) control of the aircraft by external visual reference;
  - (iv) flight at critically low air speeds, recognition of, and recovery from, incipient and full stalls;
  - (v) flight at critically high air speeds, recognition of, and recovery from, spiral dive;
  - (vi) normal and crosswind take-offs and landings;
  - (vii) maximum performance (short field and obstacle clearance) takeoffs, short-field landings;
  - (viii) light by reference solely to instruments, including the completion of a level 180 ° turn;
  - (ix) cross-country flying using visual reference, dead reckoning and radio navigation aids;
  - (x) emergency operations, including simulated aeroplane equipment malfunctions;
  - (xi) operations to, from and transiting controlled aerodromes, compliance with air traffic services procedures, communication procedures and phraseology.
- (2) Before allowing applicants for a PPL(A) to undertake their first solo flight, the FI should ensure that the applicants can use R/T communication and can operate the required systems and equipment.
- (c) Syllabus of flight instruction
- (1) The numbering of exercises should be used primarily as an exercise reference list and as a broad instructional sequencing guide; therefore the demonstrations and practices need not necessarily be given in the order listed. The actual order and content will depend upon the following interrelated factors:
- (i) the applicant's progress and ability;
  - (ii) the weather conditions affecting the flight;

- (iii) the flight time available;
  - (iv) instructional technique considerations;
  - (v) the local operating environment;
  - (vi) applicability of the exercises to the aeroplane.
- (2) Each of the exercises involves the need for the applicant to be aware of the needs of good airmanship and look-out, which should be emphasised at all times.
- (i) Exercise 1a: Familiarisation with the aeroplane:
    - (A) characteristics of the aeroplane;
    - (B) cockpit layout;
    - (C) systems;
    - (D) checklists, drills and controls.
  - (ii) Exercise 1b: Emergency drills:
    - (A) action if fire on the ground and in the air;
    - (B) engine cabin and electrical system fire;
    - (C) systems failure;
    - (D) escape drills, location and use of emergency equipment and exits.
  - (iii) Exercise 2: Preparation for and action after flight:
    - (A) flight authorisation and aeroplane acceptance;
    - (B) serviceability documents;
    - (C) equipment required, maps, etc.;
    - (D) external checks;
    - (E) internal checks;
    - (F) harness, seat or rudder panel adjustments;

- (G) starting and warm-up checks;
  - (H) power checks;
  - (I) running down system checks and switching off the engine;
  - (J) parking, security and picketing (for example tie down);
  - (K) completion of authorisation sheet and serviceability documents.
- (iv) Exercise 3: Air experience: flight exercise.
- (v) Exercise 4: Effects of controls:
- (A) primary effects when laterally level and when banked;
  - (B) further effects of aileron and rudder;
  - (C) effects of:
    - (a) air speed;
    - (b) slipstream;
    - (c) power;
    - (d) trimming controls;
    - (e) flaps;
    - (f) other controls, as applicable.
  - (D) operation of:
    - (a) mixture control;
    - (b) carburettor heat;
    - (c) cabin heating or ventilation.
- (vi) Exercise 5a: Taxiing:
- (A) pre-taxi checks;
  - (B) starting, control of speed and stopping;

- (C) engine handling;
  - (D) control of direction and turning;
  - (E) turning in confined spaces;
  - (F) parking area procedure and precautions;
  - (G) effects of wind and use of flying controls;
  - (H) effects of ground surface;
  - (I) freedom of rudder movement;
  - (J) marshalling signals;
  - (K) instrument checks;
  - (L) air traffic control procedures.
- (vii) Exercise 5b: Emergencies: brake and steering failure.
- (viii) Exercise 6: Straight and level:
- (A) at normal cruising power, attaining and maintaining straight and level flight;
  - (B) flight at critically high air speeds;
  - (C) demonstration of inherent stability;
  - (D) control in pitch, including use of trim;
  - (E) lateral level, direction and balance and trim;
  - (F) at selected air speeds (use of power);
  - (G) during speed and configuration changes;
  - (H) use of instruments for precision.
- (ix) Exercise 7: Climbing:
- (A) entry, maintaining the normal and max rate climb and levelling off;



- (B) levelling off at selected altitudes;
  - (C) en-route climb (cruise climb);
  - (D) climbing with flap down;
  - (E) recovery to normal climb;
  - (F) maximum angle of climb;
  - (G) use of instruments for precision.
- (x) Exercise 8: Descending:
- (A) entry, maintaining and levelling off;
  - (B) levelling off at selected altitudes;
  - (C) glide, powered and cruise descent (including effect of power and air speed);
  - (D) side slipping (on suitable types);
  - (E) use of instruments for precision flight.
- (xi) Exercise 9: Turning:
- (A) entry and maintaining medium level turns;
  - (B) resuming straight flight;
  - (C) faults in the turn (for example in correct pitch, bank and balance);
  - (D) climbing turns;
  - (E) descending turns;
  - (F) faults in the turns (slipping and skidding on suitable types);
  - (G) turns onto selected headings, use of gyro heading indicator and compass;
  - (H) use of instruments for precision.
- (xii) Exercise 10a: Slow flight:

Note: the objective is to improve the student's ability to recognise inadvertent flight at critically low speeds and provide practice in maintaining the aeroplane in balance while returning to normal air speed.

- (A) safety checks;
- (B) introduction to slow flight;
- (C) controlled flight down to critically slow air speed;
- (D) application of full power with correct attitude and balance to achieve normal climb speed.

(xiii) Exercise 10b: Stalling:

- (A) safety checks;
- (B) symptoms;
- (C) recognition;
- (D) clean stall and recovery without power and with power;
- (E) recovery when a wing drops;
- (F) approach to stall in the approach and in the landing configurations, with and without power and recovery at the incipient stage.

(xiv) Exercise 11: Spin avoidance:

- (A) safety checks;
- (B) stalling and recovery at the incipient spin stage (stall with excessive wing drop, about 45°);
- (C) instructor induced distractions during the stall.

Note 1: at least two hours of stall awareness and spin avoidance flight training should be completed during the course.

Note 2: consideration of manoeuvre limitations and the need to refer to the aeroplane manual and mass and balance calculations.

(xv) Exercise 12: Take-off and climb to downwind position:

- (A) pre-take-off checks;
  - (B) into wind take-off;
  - (C) safeguarding the nose wheel;
  - (D) crosswind take-off;
  - (E) drills during and after take-off;
  - (F) short take-off and soft field procedure/techniques including performance calculations;
  - (G) noise abatement procedures.
- (xvi) Exercise 13: Circuit, approach and landing:
- (A) circuit procedures, downwind and base leg;
  - (B) powered approach and landing;
  - (C) safeguarding the nose wheel;
  - (D) effect of wind on approach and touchdown speeds and use of flaps;
  - (E) crosswind approach and landing;
  - (F) glide approach and landing;
  - (G) short landing and soft field procedures or techniques;
  - (H) flapless approach and landing;
  - (I) wheel landing (tail wheel aeroplanes);
  - (J) missed approach and go-around;
  - (K) noise abatement procedures.
- (xvii) Exercise 12/13: Emergencies:
- (A) abandoned take-off;
  - (B) engine failure after take-off;

- (C) mislanding and go-around;
- (D) missed approach.

Note: in the interests of safety it will be necessary for pilots trained on nose wheel aeroplanes to undergo dual conversion training before flying tail wheel aeroplanes, and vice-versa.

(xviii) Exercise 14: First solo:

- (A) instructor's briefing, observation of flight and de-briefing;

Note: during flights immediately following the solo circuit consolidation the following should be revised:

- (B) procedures for leaving and rejoining the circuit;
- (C) the local area, restrictions, map reading;
- (D) use of radio aids for homing;
- (E) turns using magnetic compass, compass errors.

(xix) Exercise 15: Advanced turning:

- (A) steep turns (45°), level and descending;
- (B) stalling in the turn and recovery;
- (C) recoveries from unusual attitudes, including spiral dives.

(xx) Exercise 16: Forced landing without power:

- (A) forced landing procedure;
- (B) choice of landing area, provision for change of plan;
- (C) gliding distance;
- (D) descent plan;
- (E) key positions;
- (F) engine cooling;
- (G) engine failure checks;

- (H) use of radio;
  - (I) base leg;
  - (J) final approach;
  - (K) landing;
  - (L) actions after landing.
- (xxi) Exercise 17: Precautionary landing:
- (A) full procedure away from aerodrome to break-off height;
  - (B) occasions necessitating;
  - (C) in-flight conditions;
  - (D) landing area selection:
    - (a) normal aerodrome;
    - (b) disused aerodrome;
    - (c) ordinary field.
  - (E) circuit and approach;
  - (F) actions after landing.
- (xxii) Exercise 18a: Navigation:
- (A) flight planning:
    - (a) weather forecast and actuals;
    - (b) map selection and preparation:
      - (1) choice of route;
      - (2) controlled airspace;
      - (3) danger, prohibited and restricted areas;
      - (4) safety altitudes.

- (c) calculations:
  - (1) magnetic heading(s) and time(s) en-route;
  - (2) fuel consumption;
  - (3) mass and balance;
  - (4) mass and performance.
- (d) flight information:
  - (1) NOTAMs etc.;
  - (2) radio frequencies;
  - (3) selection of alternate aerodromes.
- (e) aeroplane documentation;
- (f) notification of the flight:
  - (1) pre-flight administrative procedures;
  - (2) flight plan form.
- (B) departure:
  - (a) organisation of cockpit workload;
  - (b) departure procedures:
    - (1) altimeter settings;
    - (2) ATC liaison in controlled or regulated airspace;
    - (3) setting heading procedure;
    - (4) noting of ETAs.
  - (c) maintenance of altitude and heading;
  - (d) revisions of ETA and heading;
  - (e) log keeping;

- (f) use of radio;
  - (g) use of navaids;
  - (h) minimum weather conditions for continuation of flight;
  - (i) in-flight decisions;
  - (j) transiting controlled or regulated airspace;
  - (k) diversion procedures;
  - (l) uncertainty of position procedure;
  - (m) lost procedure.
- (C) arrival and aerodrome joining procedure:
- (a) ATC liaison in controlled or regulated airspace;
  - (b) altimeter setting;
  - (c) entering the traffic pattern;
  - (d) circuit procedures;
  - (e) parking;
  - (f) security of aeroplane;
  - (g) refuelling;
  - (h) closing of flight plan, if appropriate;
  - (i) post-flight administrative procedures.
- (xxiii) Exercise 18b: Navigation problems at lower levels and in reduced visibility:
- (A) actions before descending;
  - (B) hazards (for example obstacles and terrain);
  - (C) difficulties of map reading;
  - (D) effects of wind and turbulence;

- (E) vertical situational awareness (avoidance of controlled flight into terrain);
  - (F) avoidance of noise sensitive areas;
  - (G) joining the circuit;
  - (H) bad weather circuit and landing.
- (xxiv) Exercise 18c: Radio navigation:
- (A) use of GNSS:
    - (a) selection of waypoints;
    - (b) to or from indications and orientation;
    - (c) error messages.
  - (B) use of VHF omni range:
    - (a) availability, AIP and frequencies;
    - (b) selection and identification;
    - (c) OBS;
    - (d) to or from indications and orientation;
    - (e) CDI;
    - (f) determination of radial;
    - (g) intercepting and maintaining a radial;
    - (h) VOR passage;
    - (i) obtaining a fix from two VORs.
  - (C) use of ADF equipment: NDBs:
    - (a) availability, AIP and frequencies;
    - (b) selection and identification;
    - (c) orientation relative to the beacon;



- (d) homing.
- (D) use of VHF/DF:
  - (a) availability, AIP, frequencies;
  - (b) R/T procedures and ATC liaison;
  - (c) obtaining a QDM and homing.
- (E) use of en-route or terminal radar:
  - (a) availability and AIP;
  - (b) procedures and ATC liaison;
  - (c) pilot's responsibilities;
  - (d) secondary surveillance radar:
    - (1) transponders;
    - (2) code selection;
    - (3) interrogation and reply.
- (F) use of DME:
  - (a) station selection and identification;
  - (b) modes of operation: distance, groundspeed and time to run.
- (xxv) Exercise 19: Basic instrument flight:
  - (A) physiological sensations;
  - (B) instrument appreciation; attitude instrument flight;
  - (C) instrument limitations;
  - (D) basic manoeuvres:
    - (a) straight and level at various air speeds and configurations;

- (b) climbing and descending;
  - (c) standard rate turns, climbing and descending, onto selected headings;
  - (d) recoveries from climbing and descending turns.
- (d) BITD
  - (1) A BITD may be used for flight training for:
    - (i) flight by reference solely to instruments;
    - (ii) navigation using radio navigation aids;
    - (iii) basic instrument flight.
  - (2) The use of the BITD should be subject to the following:
    - (i) the training should be complemented by exercises on an aeroplane;
    - (ii) the record of the parameters of the flight must be available;
    - (iii) A FI(A) or STI(A) should conduct the instruction.

## **AMC2 FCL.210 PPL(H) – Training course**

### **FLIGHT INSTRUCTION FOR THE PPL(H)**

- (a) Entry to training

Before being accepted for training an applicant should be informed that the appropriate medical certificate must be obtained before solo flying is permitted.
- (b) Ground instruction

Enhanced ground instruction in weather interpretation, planning and route assessment, decision making on encountering DVE including reversing course or conducting a precautionary landing.
- (c) Flight instruction
  - (1) The PPL(H) flight instruction syllabus should take into account the principles of threat and error management and cover:

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- (i) pre-flight operations, including mass and balance determination, helicopter inspection and servicing;
- (ii) aerodrome and traffic pattern operations, collision avoidance precautions and procedures;
- (iii) control of the helicopter by external visual reference;
- (iv) take-offs, landings, hovering, look-out turns and normal transitions from and to the hover;
- (v) emergency procedures, basic autorotations, simulated engine failure, ground resonance recovery if relevant to type;
- (vi) sideways and backwards flight, turns on the spot;
- (vii) incipient vortex ring recognition and recovery;
- (viii) touchdown autorotations, simulated engine-off landings, practice forced landings. Simulated equipment malfunctions and emergency procedures relating to malfunctions of engines, controls, electrical and hydraulic circuits;
- (ix) steep turns;
- (x) transitions, quick stops, out of wind manoeuvres, sloping ground landings and take-offs;
- (xi) limited power and confined area operations, including selection of and operations to and from unprepared sites;
- (xii) flight by sole reference to basic flight instruments, including completion of a level 180° turn and recovery from unusual attitudes to simulate inadvertent entry into cloud (this training may be conducted by an FI(H));
- (xiii) cross-country flying by using visual reference, DR, GNNS and, where available, radio navigation aids; simulation of deteriorating weather conditions and actions to divert or conduct precautionary landing;
- (xiv) operations to, from and transiting controlled aerodromes; compliance with air traffic services procedures, communication procedures and phraseology.

- (2) Before allowing applicants for a PPL(H) to undertake their first solo flight, the FI should ensure that the applicants can use R/T communication and can operate the required systems and equipment.
  - (3) Wherever possible, flight simulation should be used to demonstrate to student pilots the effects of flight into DVE and to enhance their understanding and need for avoidance of this potentially fatal flight regime.
- (d) Syllabus of flight instruction
- (1) The numbering of exercises should be used primarily as an exercise reference list and as a broad instructional sequencing guide; therefore the demonstrations and practices need not necessarily be given in the order listed. The actual order and content will depend upon the following interrelated factors:
    - (i) the applicant's progress and ability;
    - (ii) the weather conditions affecting the flight;
    - (iii) the flight time available;
    - (iv) instructional technique considerations;
    - (v) the local operating environment;
    - (vi) applicability of the exercises to the helicopter.
  - (2) Each of the exercises involves the need for the applicant to be aware of the needs of good airmanship and look-out, which should be emphasised at all times.
    - (i) Exercise 1a: Familiarisation with the helicopter:
      - (A) characteristics of the helicopter, external features;
      - (B) cockpit layout;
      - (C) systems;
      - (D) checklists, procedures and controls.
    - (ii) Exercise 1b: Emergency procedures:
      - (A) action if fire on the ground and in the air;

- (B) engine, cabin and electrical system fire;
  - (C) systems failures;
  - (D) escape drills, location and use of emergency equipment and exits.
- (iii) Exercise 2: Preparation for and action after flight:
- (A) flight authorisation and helicopter acceptance;
  - (B) serviceability documents;
  - (C) equipment required, maps, etc.;
  - (D) external checks;
  - (E) internal checks;
  - (F) seat, harness and flight controls adjustments;
  - (G) starting and warm-up checks clutch engagement and starting rotors;
  - (H) power checks;
  - (I) running down system checks and switching off the engine;
  - (J) parking, security and picketing;
  - (K) completion of authorisation sheet and serviceability documents.
- (iv) Exercise 3: Air experience:
- (A) to introduce the student to rotary wing flight;
  - (B) flight exercise.
- (v) Exercise 4: Effects of controls:
- (A) function of flight controls, primary and secondary effect;
  - (B) effects of:
    - (a) air speed;

- (b) power changes (torque);
  - (c) yaw (sideslip);
  - (d) disc loading (bank and flare);
  - (e) controls of selecting hydraulics on/off
  - (f) control friction.
- (C) instruments;
- (D) use of carburettor heat or anti-icing control.
- (vi) Exercise 5: Power and attitude changes:
  - (A) relationship between cyclic control position, disc attitude, fuselage attitude and air speed;
  - (B) flapback;
  - (C) power required diagram in relation to air speed;
  - (D) power and air speed changes in level flight;
  - (E) use of instruments for precision;
  - (F) engine and air speed limitations.
- (vii) Exercise 6: Straight and level:
  - (A) at normal cruising power, attaining and maintaining straight and level flight;
  - (B) control in pitch, including use of control friction or trim;
  - (C) maintaining direction and balance, (ball or yawstring use);
  - (D) setting power for selected air speeds and speed changes;
  - (E) use of instruments for precision.
- (viii) Exercise 7: Climbing:
  - (A) optimum climb speed, best angle or rate of climb from power required diagram;

- (B) initiation, maintaining the normal and maximum rate of climb, levelling off;
- (C) levelling off at selected altitudes or heights
- (D) use of instruments for precision.
- (ix) Exercise 8: Descending:
  - (A) optimum descent speed, best angle or rate of descent from power required diagram;
  - (B) initiation, maintaining and levelling off;
  - (C) levelling off at selected altitudes or heights;
  - (D) descent (including effect of power and air speed);
  - (E) use of instruments for precision.
- (x) Exercise 9: Turning:
  - (A) initiation and maintaining medium level turns;
  - (B) resuming straight flight;
  - (C) altitude, bank and co-ordination;
  - (D) climbing and descending turns and effect on rate of climb or descent;
  - (E) turns onto selected headings, use of gyro heading indicator and compass;
  - (F) use of instruments for precision.
- (xi) Exercise 10: Basic autorotation:
  - (A) safety checks, verbal warning and look-out;
  - (B) entry, development and characteristics;
  - (C) control of air speed and RRPM, rotor and engine limitations;
  - (D) effect of AUM, IAS, disc loading, G forces and density altitude;

- (E) re-engagement and go-around procedures (throttle over-ride or ERPM control);
  - (F) vortex condition during recovery;
  - (G) gentle and medium turns in autorotation;
  - (H) demonstration of variable flare simulated engine off landing.
- (xii) Exercise 11a: Hovering:
- (A) demonstrate hover IGE, importance of wind effect and attitude, ground cushion, stability in the hover and effects of over controlling;
  - (B) student holding cyclic stick only;
  - (C) student handling collective lever (and throttle) only;
  - (D) student handling collective lever, (throttle) and pedals;
  - (E) student handling all controls;
  - (F) demonstration of ground effect;
  - (G) demonstration of wind effect;
  - (H) demonstrate gentle forward running touchdown;
  - (I) specific hazards for example snow, dust and litter.
- (xiii) Exercise 11b: Hover taxiing and spot turns:
- (A) revise hovering;
  - (B) precise ground speed and height control;
  - (C) effect of wind direction on helicopter attitude and control margin;
  - (D) control and co-ordination during spot turns;
  - (E) carefully introduce gentle forward running touchdown.
- (xiv) Exercise 11c: Hovering and taxiing emergencies:



- (A) revise hovering and gentle forward running touchdown, explain (demonstrate where applicable) effect of hydraulics failure in the hover;
  - (B) demonstrate simulated engine failure in the hover and hover taxi;
  - (C) demonstrate dangers of mishandling and over-pitching.
- (xv) Exercise 12: Take-off and landing:
- (A) pre-take-off checks or drills;
  - (B) look-out;
  - (C) lifting to hover;
  - (D) after take-off checks;
  - (E) danger of horizontal movement near ground;
  - (F) danger of mishandling and overpitching;
  - (G) landing (without sideways or backwards movement);
  - (H) after landing checks or drills;
  - (I) take-off and landing crosswind and downwind.
- (xvi) Exercise 13: Transitions from hover to climb and approach to hover:
- (A) look-out;
  - (B) revise take-off and landing;
  - (C) ground effect, translational lift and its effects;
  - (D) flapback and its effects;
  - (E) effect of wind speed and direction during transitions from or to the hover;
  - (F) the constant angle approach;
  - (G) demonstration of variable flare simulated engine off landing.

- (xvii) Exercise 14a: Circuit, approach and landing:
  - (A) revise transitions from hover to climb and approach to hover;
  - (B) circuit procedures, downwind and base leg;
  - (C) approach and landing with power;
  - (D) pre-landing checks;
  - (E) effect of wind on approach and IGE hover;
  - (F) crosswind approach and landing;
  - (G) go-around;
  - (H) noise abatement procedures.
- (xviii) Exercise 14b: Steep and limited power approaches and landings:
  - (A) revise the constant angle approach;
  - (B) the steep approach (explain danger of high sink rate and low air speed)
  - (C) limited power approach (explain danger of high speed at touch down);
  - (D) use of the ground effect;
  - (E) variable flare simulated engine off landing.
- (xix) Exercise 14c: Emergency procedures:
  - (A) abandoned take-off;
  - (B) missed approach and go-around;
  - (C) hydraulic off landing (if applicable);
  - (D) tail rotor control or tail rotor drive failure (briefing only)
  - (E) simulated emergencies in the circuit to include:
    - (a) hydraulics failure;

- (b) simulated engine failure on take-off, crosswind, downwind and base leg;
  - (c) governor failure.
- (xx) Exercise 15: First solo:
  - (A) instructor's briefing, observation of flight and debriefing;
  - (B) warn of change of attitude from reduced and laterally displaced weight;
  - (C) warn of low tail, low skid or wheel during hover, landing;
  - (D) warn of dangers of loss of RRPM and overpitching;
  - (E) pre-take-off checks;
  - (F) into wind take-off;
  - (G) procedures during and after take-off;
  - (H) normal circuit, approaches and landings;
  - (I) action if an emergency.
- (xxi) Exercise 16: Sideways and backwards hover manoeuvring:
  - (A) manoeuvring sideways flight heading into wind;
  - (B) manoeuvring backwards flight heading into wind;
  - (C) combination of sideways and backwards manoeuvring;
  - (D) manoeuvring sideways and backwards and heading out of wind;
  - (E) stability and weather cocking;
  - (F) recovery from backwards manoeuvring (pitch nose down);
  - (G) limitations for sideways and backwards manoeuvring.
- (xxii) Exercise 17: Spot turns:
  - (A) revise hovering into wind and downwind;

- (B) turn on spot through 360°:
    - (a) around pilots position;
    - (b) around tail rotor;
    - (c) around helicopter geometric centre;
    - (d) square and safe visibility clearing turn.
  - (C) rotor RPM control, torque effect, cyclic limiting stops due to CG position and wind speed and direction.
- (xxiii) Exercise 18: Hover OGE and vortex ring:
- (A) establishing hover OGE;
  - (B) drift, height or power control;
  - (C) demonstration of incipient stage of vortex ring, recognition and recovery (from a safe altitude);
  - (D) loss of tail rotor effectiveness.
- (xxiv) Exercise 19: Simulated EOL:
- (A) the effect of weight, disc loading, density altitude and RRPM decay;
  - (B) revise basic autorotation entry;
  - (C) optimum use of cyclic and collective to control speed or RRPM;
  - (D) variable flare simulated EOL;
  - (E) demonstrate constant attitude simulated EOL;
  - (F) demonstrate simulated EOL from hover or hover taxi;
  - (G) demonstrate simulated EOL from transition and low level.
- (xxv) Exercise 20: Advanced autorotation:
- (A) over a selected point at various height and speed;

- (B) revise basic autorotation: note ground distance covered;
- (C) range autorotation;
- (D) low speed autorotation;
- (E) constant attitude autorotation (terminate at safe altitude);
- (F) 'S' turns;
- (G) turns through 180° and 360°;
- (H) effects on angles of descent, IAS, RRPM and effect of AUM.

(xxvi) Exercise 21: Practice forced landings:

- (A) procedure and choice of the forced landing area;
- (B) forced landing checks and crash action;
- (C) re-engagement and go-around procedures.

(xxvii) Exercise 22: Steep turns:

- (A) steep (level) turns (30° bank);
- (B) maximum rate turns (45° bank if possible);
- (C) steep autorotative turns;
- (D) faults in the turn: balance, attitude, bank and co-ordination;
- (E) RRPM control and disc loading;
- (F) vibration and control feedback;
- (G) effect of wind at low level.

(xxviii) Exercise 23: Transitions:

- (A) revise ground effect, translational lift and flapback;
- (B) maintaining constant height, (20-30 ft AGL);
- (C) transition from hover to minimum 50 knots IAS and back to hover;

(D) demonstrate effect of wind.

(xxix) Exercise 24: Quick stops:

(A) use of power and controls;

(B) effect of wind;

(C) quick stops into wind;

(D) quick stops from crosswind and downwind terminating into wind;

(E) danger of vortex ring;

(F) danger of high disc loading.

(xxx) Exercise 25a: Navigation:

(A) flight planning:

(a) weather forecast and actuals;

(b) map selection and preparation and use;

(1) choice of route:

(2) controlled airspace, danger and prohibited areas;

(3) safety altitudes and noise abatement considerations.

(c) calculations:

(1) magnetic heading(s) and time(s) en-route;

(2) fuel consumption;

(3) mass and balance.

(d) flight information:

(1) NOTAMs, etc.;

(2) radio frequencies;

- (e) helicopter documentation;
- (f) notification of the flight:
  - (1) pre-flight administrative procedures;
  - (2) flight plan form (where appropriate).
- (B) departure:
  - (a) organisation of cockpit workload;
  - (b) departure procedures:
    - (1) altimeter settings;
    - (2) ATC liaison in controlled or regulated airspace;
    - (3) setting heading procedure;
    - (4) noting of ETAs.
  - (c) maintenance of height or altitude and heading;
  - (d) revisions of ETA and heading:
    - (1) 10° line, double track and track error and closing angle;
    - (2) 1 in 60 rule;
    - (3) amending an ETA.
  - (e) log keeping;
  - (f) use of radio;
  - (g) use of nav aids (if fitted);
  - (h) minimum weather conditions for continuation of flight;
  - (i) in-flight decisions;
  - (j) transiting controlled or regulated airspace;
  - (k) uncertainty of position procedure;

- (l) lost procedure.
- (C) arrival and aerodrome joining procedure:
  - (a) ATC liaison in controlled or regulated airspace;
  - (b) altimeter setting;
  - (c) entering the traffic pattern;
  - (d) circuit procedures.
  - (e) parking;
  - (f) security of helicopter;
  - (g) refuelling;
  - (h) closing of flight plan (if appropriate);
  - (i) post-flight administrative procedures.
- (xxxi) Exercise 25b: Navigation problems at low heights and in reduced visibility:
  - (A) actions before descending;
  - (B) hazards (for example obstacles and other aircraft);
  - (C) difficulties of map reading;
  - (D) effects of wind and turbulence;
  - (E) avoidance of noise sensitive areas;
  - (F) actions in the event of encountering DVE;
  - (G) decision to divert or conduct precautionary landing;
  - (H) bad weather circuit and landing;
  - (I) appropriate procedures and choice of landing area;
  - (J) precautionary landing.
- (xxxii) Exercise 25c: Radio navigation:



- (A) use of GNSS:
  - (a) selection of waypoints;
  - (b) to or from indications and orientation;
  - (c) error messages;
  - (d) hazards of over-reliance on the use of GNSS in the continuation of flight in DVE.
- (B) use of VHF omni range:
  - (a) availability, AIP and frequencies;
  - (b) selection and identification;
  - (c) OBS;
  - (d) to or from indications and orientation;
  - (e) CDI;
  - (f) determination of radial;
  - (g) intercepting and maintaining a radial;
  - (h) VOR passage;
  - (i) obtaining a fix from two VORs.
- (C) use of ADF equipment: NDBs:
  - (a) availability, AIP and frequencies;
  - (b) selection and identification;
  - (c) orientation relative to the beacon;
  - (d) homing.
- (D) use of VHF/DF:
  - (a) availability, AIP and frequencies;
  - (b) RTF procedures and ATC liaison;

- (c) obtaining a QDM and homing.
- (E) use of en-route or terminal radar:
  - (a) availability and AIP;
  - (b) procedures and ATC liaison;
  - (c) pilots responsibilities;
  - (d) secondary surveillance radar (if transponder fitted):
    - (1) transponders;
    - (2) code selection;
    - (3) interrogation and reply.
- (F) use of DME:
  - (a) station selection and identification;
  - (b) modes of operation: distance, groundspeed and time to run.

(xxxiii) Exercise 26: Advanced take-off, landings and transitions:

- (A) landing and take-off out of wind (performance reduction);
- (B) ground effect, translational lift and directional stability variation when out of wind;
- (C) downwind transitions;
- (D) vertical take-off over obstacles;
- (E) running take-off;
- (F) cushion creep take-off;
- (G) reconnaissance of landing site;
- (H) running landing;
- (I) zero speed landing;

- (J) crosswind and downwind landings;
- (K) steep approach;
- (L) go-around.

(xxxiv) Exercise 27: Sloping ground:

- (A) limitations and assessing slope angle;
- (B) wind and slope relationship: blade and control stops;
- (C) effect of CG when on slope;
- (D) ground effect on slope and power required;
- (E) right skid up slope;
- (F) left skid up slope;
- (G) nose up slope;
- (H) avoidance of dynamic roll over, dangers of soft ground and sideways movement on touchdown;
- (I) danger of striking main or tail rotor by harsh control movement near ground.

(xxxv) Exercise 28: Limited power:

- (A) take-off power check;
- (B) vertical take-off over obstacles;
- (C) in-flight power check;
- (D) running landing;
- (E) zero speed landing;
- (F) approach to low hover;
- (G) approach to hover;
- (H) approach to hover OGE;

(I) steep approach;

(J) go-around.

(xxxvi) Exercise 29: Confined areas:

(A) landing capability and performance assessment;

(B) locating landing site and assessing wind speed and direction;

(C) reconnaissance of landing site;

(D) select markers;

(E) select direction and type of approach;

(F) circuit;

(G) approach to committed point and go-around;

(H) approach;

(I) clearing turn;

(J) landing;

(K) power check and performance assessment in and out of ground effect;

(L) normal take-off to best angle of climb speed;

(M) vertical take-off from hover.

(xxxvii) Exercise 30: Basic instrument flight:

(A) physiological sensations;

(B) instrument appreciation:

(a) attitude instrument flight;

(b) instrument scan.

(C) instrument limitations;

(D) basic manoeuvres:

- (a) straight and level at various air speeds and configurations;
- (b) climbing and descending;
- (c) standard rate turns, climbing and descending, onto selected headings.
- (E) recoveries from climbing and descending turns;
- (F) recoveries from unusual attitudes.

### **AMC1 FCL.210(c) Training course**

#### **CHANGE OF TRAINING ORGANISATION**

In cases where the applicant completes the training course (theoretical knowledge instruction or flight instruction) at a different DTO or ATO ('completing training organisation') from the one where they have started the training course ('starting training organisation'), the applicant should request from the starting training organisation a copy of the records kept in accordance with point DTO.GEN.220 or point ORA.ATO.120

### **FCL.215 Theoretical knowledge examination**

Applicants for a PPL shall demonstrate a level of theoretical knowledge appropriate to the privileges granted through examinations in the following subjects:

- (a) common subjects:
  - Air law,
  - Human performance,
  - Meteorology,
  - Communications, and
  - Navigation.
- (b) specific subjects concerning the different aircraft categories:
  - Principles of flight,
  - Operational procedures,

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- Flight performance and planning, and
- Aircraft general knowledge.

**AMC1 FCL.210; FCL.215 Training course and theoretical knowledge examination**

**SYLLABUS OF THEORETICAL KNOWLEDGE FOR THE PPL(A) AND PPL(H)**

The following tables contain the syllabi for the courses of theoretical knowledge, as well as for the theoretical knowledge examinations for the PPL(A) and PPL(H). The training and examination should cover aspects related to non-technical skills in an integrated manner, taking into account the particular risks associated to the licence and the activity.

The DTO or the ATO responsible for the training should check if all the appropriate elements of the training course of theoretical knowledge instruction have been completed to a satisfactory standard before recommending the applicant for the examination.

The applicable items for each licence are marked with 'x'. An 'x' on the main title of a subject means that all the sub-divisions are applicable.

		<b>Aeroplane</b>		<b>Helicopter</b>	
		PPL	Bridge course	PPL	Bridge course
<b>1.</b>	<b>AIR LAW AND ATC PROCEDURES</b>				
	<b>International law: conventions, agreements and organisations</b>				
	<b>The Convention on international civil aviation (Chicago) Doc. 7300/6</b>				
	Part I Air Navigation: relevant parts of the following chapters: (a) general principles and application of the convention; (b) flight over territory of Contracting States; (c) nationality of aircraft; (d) measures to facilitate air navigation; (e) conditions to be fulfilled on aircraft; (f) international standards and recommended practices; (g) validity of endorsed certificates and licences; (h) notification of differences.	x		x	
	Part II The International Civil Aviation Organisation (ICAO): objectives and composition	x		x	
	<b>Annex 8: Airworthiness of aircraft</b>				
	Foreword and definitions	x		x	
	Certificate of airworthiness	x		x	
	<b>Annex 7: Aircraft nationality and registration marks</b>				
	Foreword and definitions	x		x	

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		<b>Aeroplane</b>		<b>Helicopter</b>	
		PPL	Bridge course	PPL	Bridge course
	Common- and registration marks	X		X	
	Certificate of registration and aircraft nationality	X		X	
	<b>Annex 1: Personnel licensing</b>				
	Definitions	X		X	
	Relevant parts of Annex 1 connected to MCAR-Part-FCL and Part-Medical	X		X	
	<b>Annex 2: Rules of the air</b>				
	Essential definitions, applicability of the rules of the air, general rules (except water operations), visual flight rules, signals and interception of civil aircraft	X		X	
	<b>Procedures for air navigation: aircraft operations doc. 8168-ops/611, volume 1</b>				
	<b>Altimeter setting procedures (including IACO doc. 7030 – regional supplementary procedures)</b>				
	Basic requirements (except tables), procedures applicable to operators and pilots (except tables)	X		X	
	<b>Secondary surveillance radar transponder operating procedures (including ICAO Doc. 7030 – regional supplementary procedures)</b>				
	Operation of transponders	X		X	
	Phraseology	X		X	
	<b>Annex 11: Doc. 4444 air traffic management</b>				
	Definitions	X		X	
	General provisions for air traffic services	X		X	
	Visual separation in the vicinity of aerodromes	X		X	
	Procedures for aerodrome control services	X		X	
	Radar services	X		X	
	Flight information service and alerting service	X		X	
	Phraseologies	X		X	
	Procedures related to emergencies, communication failure and contingencies	X		X	
	<b>Annex 15: Aeronautical information service</b>				
	Introduction, essential definitions	X		X	
	AIP, NOTAM, AIRAC and AIC	X		X	
	<b>Annex 14, volume 1 and 2: Aerodromes</b>				
	Definitions	X		X	
	Aerodrome data: conditions of the movement area and related facilities	X		X	
	Visual aids for navigation: (a) indicators and signalling devices; (b) markings; (c) lights; (d) signs; (e) markers.	X		X	
	Visual aids for denoting obstacles: (a) marking of objects; (b) lighting of objects.	X		X	

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		<b>Aeroplane</b>		<b>Helicopter</b>	
		PPL	Bridge course	PPL	Bridge course
	Visual aids for denoting restricted use of areas	X		X	
	Emergency and other services: (a) rescue and fire fighting; (b) apron management service.	X		X	
	<b>Annex 12: Search and rescue</b>				
	Essential definitions	X		X	
	Operating procedures: (a) procedures for PIC at the scene of an accident; (b) procedures for PIC intercepting a distress transmission; (c) search and rescue signals.	X		X	
	Search and rescue signals: (a) signals with surface craft; (b) ground or air visual signal code; (c) air or ground signals.	X		X	
	<b>Annex 17: Security</b>				
	General: aims and objectives	X		X	
	<b>Annex 13: Aircraft accident investigation</b>				
	Essential definitions	X		X	
	Applicability	X		X	
	<b>National law</b>				
	National law and differences to relevant ICAO Annexes and relevant EU regulations.	X		X	
<b>2.</b>	<b>HUMAN PERFORMANCE</b>				
	<b>Human factors: basic concepts</b>				
	<b>Human factors in aviation</b>				
	Becoming a competent pilot	X		X	
	<b>Basic aviation physiology and health maintenance</b>				
	The atmosphere: (a) composition; (b) gas laws.	X		X	
	Respiratory and circulatory systems: (a) oxygen requirement of tissues; (b) functional anatomy; (c) main forms of hypoxia (hypoxic and anaemic): (1) sources, effects and countermeasures of carbon monoxide; (2) counter measures and hypoxia; (3) symptoms of hypoxia. (d) hyperventilation; (e) the effects of accelerations on the circulatory system; (f) hypertension and coronary heart disease.	X		X	
	<b>Man and environment</b>				
	Central, peripheral and autonomic nervous systems	X		X	



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		<b>Aeroplane</b>		<b>Helicopter</b>	
		PPL	Bridge course	PPL	Bridge course
	Vision: (a) functional anatomy; (b) visual field, foveal and peripheral vision; (c) binocular and monocular vision; (d) monocular vision cues; (e) night vision; (f) visual scanning and detection techniques and importance of 'look-out'; (g) defective vision.	X		X	
	Hearing: (a) descriptive and functional anatomy; (b) flight related hazards to hearing; (c) hearing loss.	X		X	
	Equilibrium: (a) functional anatomy; (b) motion and acceleration; (c) motion sickness.	X		X	
	Integration of sensory inputs: (a) spatial disorientation: forms, recognition and avoidance;	X		X	
	(b) illusions: forms, recognition and avoidance: (1) physical origin; (2) physiological origin; (3) psychological origin. (c) approach and landing problems.				
	<b>Health and hygiene</b>				
	Personal hygiene: personal fitness	X		X	
	Body rhythm and sleep: (a) rhythm disturbances; (b) symptoms, effects and management.	X		X	
	Problem areas for pilots: (a) common minor ailments including cold, influenza and gastro-intestinal upset; (b) entrapped gases and barotrauma, (scuba diving); (c) obesity; (d) food hygiene; (e) infectious diseases; (f) nutrition; (g) various toxic gases and materials.	X		X	
	Intoxication:	X		X	
	(a) prescribed medication; (b) tobacco; (c) alcohol and drugs; (d) caffeine; (e) self-medication.				
	<b>Basic aviation psychology</b>				
	<b>Human information processing</b>				
	Attention and vigilance:	X		X	

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		<b>Aeroplane</b>		<b>Helicopter</b>	
		PPL	Bridge course	PPL	Bridge course
	(a) selectivity of attention; (b) divided attention.				
	Perception: (A) perceptual illusions; (B) subjectivity of perception; (C) processes of perception.	X		X	
	Memory: (a) sensory memory; (b) working or short term memory; (c) long term memory to include motor memory (skills).	X		X	
	<b>Human error and reliability</b>				
	Reliability of human behaviour	X		X	
	Error generation: social environment (group, organisation)	X		X	
	<b>Decision making</b>				
	Decision-making concepts:	X		X	
	(a) structure (phases);				
	(b) limits;				
	(c) risk assessment;				
	(d) practical application.				
	<b>Avoiding and managing errors: cockpit management</b>				
	Safety awareness: (a) risk area awareness; (b) situational awareness.	X		X	
	Communication: verbal and non-verbal communication	X		X	
	<b>Human behaviour</b>				
	Personality and attitudes: (a) development; (b) environmental influences.	X		X	
	Identification of hazardous attitudes (error proneness)	X		X	
	<b>Human overload and underload</b>				
	Arousal	X		X	
	Stress: (a) definition(s); (b) anxiety and stress; (c) effects of stress.	X		X	
	Fatigue and stress management: (a) types, causes and symptoms of fatigue; (b) effects of fatigue; (c) coping strategies; (d) management techniques; (e) health and fitness programmes;	X		X	
<b>3.</b>	<b>METEOROLOGY</b>				
	<b>The atmosphere</b>				
	<b>Composition, extent and vertical division</b>				
	Structure of the atmosphere	X		X	
	Troposphere	X		X	
	<b>Air temperature</b>				

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		<b>Aeroplane</b>		<b>Helicopter</b>	
		PPL	Bridge course	PPL	Bridge course
	Definition and units	X		X	
	Vertical distribution of temperature	X		X	
	Transfer of heat	X		X	
	Lapse rates, stability and instability	X		X	
	Development of inversions and types of inversions	X		X	
	Temperature near the earth's surface, surface effects, diurnal and seasonal variation, effect of clouds and effect of wind	X		X	
	<b>Atmospheric pressure</b>				
	Barometric pressure and isobars	X		X	
	Pressure variation with height	X		X	
	Reduction of pressure to mean sea level	X		X	
	Relationship between surface pressure centres and pressure centres aloft	X		X	
	<b>Air density</b>				
	Relationship between pressure, temperature and density	X		X	
	ISA				
	<b>ICAO standard atmosphere</b>	X		X	
	<b>Altimetry</b>				
	Terminology and definitions	X		X	
	Altimeter and altimeter settings	X		X	
	Calculations	X		X	
	Effect of accelerated airflow due to topography	X		X	
	<b>Wind</b>				
	<b>Definition and measurement of wind</b>				
	Definition and measurement	X		X	
	<b>Primary cause of wind</b>				
	Primary cause of wind, pressure gradient, coriolis force and gradient wind	X		X	
	Variation of wind in the friction layer	X		X	
	Effects of convergence and divergence	X		X	
	<b>General global circulation</b>				
	General circulation around the globe	X		X	
	<b>Local winds</b>				
	Anabatic and katabatic winds, mountain and valley winds, Venturi effects, land and sea breezes	X		X	
	<b>Mountain waves (standing waves, lee waves)</b>				
	Origin and characteristics	X		X	
	<b>Turbulence</b>				
	Description and types of turbulence	X		X	
	Formation and location of turbulence	X		X	
	<b>THERMODYNAMICS</b>				
	<b>Humidity</b>				
	Water vapour in the atmosphere	X		X	
	Mixing ratio	X		X	
	Temperature/dew point, relative humidity	X		X	
	<b>Change of state of aggregation</b>				

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		<b>Aeroplane</b>		<b>Helicopter</b>	
		PPL	Bridge course	PPL	Bridge course
	Condensation, evaporation, sublimation, freezing and melting, latent heat	X		x	
	<b>Adiabatic processes</b>				
	Adiabatic processes, stability of the atmosphere	X		x	
	<b>CLOUDS AND FOG</b>				
	<b>Cloud formation and description</b>				
	Cooling by adiabatic expansion and by advection	X		x	
	Cloud types and cloud classification	X		x	
	Influence of inversions on cloud development	X		x	
	<b>Fog, mist, haze</b>				
	General aspects	X		x	
	Radiation fog	X		x	
	Advection fog	X		x	
	Steaming fog	X		x	
	Frontal fog	X		x	
	Orographic fog (hill fog)	X		x	
	<b>PRECIPITATION</b>				
	<b>Development of precipitation</b>				
	Processes of development of precipitation	X		x	
	<b>Types of precipitation</b>				
	Types of precipitation, relationship with cloud types	X		x	
	<b>AIR MASSES AND FRONTS</b>				
	<b>Air masses</b>				
	Description, classification and source regions of air masses	X		x	
	Modifications of air masses	X		x	
	<b>Fronts</b>				
	General aspects	X		x	
	Warm front, associated clouds, and weather	X		x	
	Cold front, associated clouds, and weather	X		x	
	Warm sector, associated clouds, and weather	X		x	
	Weather behind the cold front	X		x	
	Occlusions, associated clouds, and weather	X		x	
	Stationary front, associated clouds, and weather	X		x	
	Movement of fronts and pressure systems, life cycle	X		x	
	Changes of meteorological elements at a frontal wave	X		x	
	<b>PRESSURE SYSTEMS</b>				
	<b>Anticyclone</b>				
	Anticyclones, types, general properties, cold and warm anticyclones, ridges and wedges, subsidence	X		x	
	<b>Non-frontal depressions</b>				
	Thermal, orographic and polar depressions, troughs	X		x	
	<b>CLIMATOLOGY</b>				
	<b>Climatic zones</b>				
	General seasonal circulation in the troposphere	X		x	
	<b>Typical weather situations in the mid-latitudes</b>				
	Westerly situation	X		x	

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		<b>Aeroplane</b>		<b>Helicopter</b>	
		PPL	Bridge course	PPL	Bridge course
	High-pressure area	X		x	
	Flat-pressure pattern	X		x	
	<b>Local winds and associated weather</b>				
	<i>e.g. Foehn</i>	X		x	
	<b>FLIGHT HAZARDS</b>				
	<b>Icing</b>				
	Conditions for ice accretion	X		x	
	Types of ice accretion	X		x	
	Hazards of ice accretion, avoidance	X		x	
	<b>Turbulence</b>				
	Effects on flight, avoidance	X		x	
	<b>Wind shear</b>				
	Definition of wind shear	X		x	
	Weather conditions for wind shear	X		x	
	Effects on flight, avoidance	X		x	
	<b>Thunderstorms</b>				
	Conditions for, and process of, development, forecast, location, type specification	X		x	
	Structure of thunderstorms, life cycle, squall lines, electricity in the atmosphere, static charges	X		x	
	Electrical discharges				
	Development and effects of downbursts	X		x	
	Thunderstorm avoidance	X		x	
	<b>Inversions</b>				
	Influence on aircraft performance	X		x	
	<b>Hazards in mountainous areas</b>				
	Influence of terrain on clouds and precipitation, frontal passage	X		x	
	Vertical movements, mountain waves, wind shear, turbulence, ice accretion	X		x	
	Development and effect of valley inversions	X		x	
	<b>Visibility-reducing phenomena</b>				
	Reduction of visibility caused by precipitation and obscuration	X		x	
	Reduction of visibility caused by other phenomena	X		x	
	<b>METEOROLOGICAL INFORMATION</b>				
	<b>Observation</b>				
	Surface observations	X		x	
	Radiosonde observations	X		x	
	Satellite observations	X		x	
	Weather radar observations	X		x	
	Aircraft observations and reporting	X		x	
	<b>Weather charts</b>				
	Significant weather charts	X		x	
	Surface charts	X		x	
	<b>Information for flight planning</b>				
	Aviation weather messages	X		x	

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		<b>Aeroplane</b>		<b>Helicopter</b>	
		PPL	Bridge course	PPL	Bridge course
	Meteorological broadcasts for aviation	X		x	
	Use of meteorological documents	X		x	
	Meteorological warnings	X		x	
	<b>Meteorological services</b>				
	World area forecast system (WAFS) and meteorological offices	X		x	
<b>4.</b>	<b>COMMUNICATIONS</b>				
	<b>VFR COMMUNICATIONS</b>				
	<b>Definitions</b>				
	Meanings and significance of associated terms	x		x	
	ATS abbreviations	x		x	
	Q-code groups commonly used in RTF airground communications	x		x	
	Categories of messages	x		x	
	<b>General operating procedures</b>				
	Transmission of letters	x		x	
	Transmission of numbers (including level information)	x		x	
	Transmission of time	x		x	
	Transmission technique	x		x	
	Standard words and phrases (relevant RTF phraseology included)	x		x	
	R/T call signs for aeronautical stations including use of abbreviated call signs	x		x	
	R/T call signs for aircraft including use of abbreviated call signs	x		x	
	Transfer of communication	x		x	
	Test procedures including readability scale	x		x	
	Read back and acknowledgement requirements	x		x	
	<b>Relevant weather information terms (VFR)</b>				
	Aerodrome weather	x		x	
	Weather broadcast	x		x	
	<b>Action required to be taken in case of communication failure</b>	x		x	
	<b>Distress and urgency procedures</b>				
	Distress (definition, frequencies, watch of distress frequencies, distress signal and distress message)	x		x	
	Urgency (definition, frequencies, urgency signal and urgency message)	x		x	
	<b>General principles of VHF propagation and allocation of frequencies</b>	x		x	
<b>5.</b>	<b>PRINCIPLES OF FLIGHT</b>				
<b>5.1.</b>	<b>PRINCIPLES OF FLIGHT: AEROPLANE</b>				
	<b>Subsonic aerodynamics</b>				
	<b>Basics concepts, laws and definitions</b>				
	Laws and definitions:	x	x		

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		<b>Aeroplane</b>		<b>Helicopter</b>	
		PPL	Bridge course	PPL	Bridge course
	(a) conversion of units; (b) Newton's laws; (c) Bernoulli's equation and venture; (d) static pressure, dynamic pressure and total pressure; (e) density; (f) IAS and TAS.				
	Basics about airflow: (a) streamline; (b) two-dimensional airflow; (c) three-dimensional airflow.	X	X		
	Aerodynamic forces on surfaces: (a) resulting airforce; (b) lift; (c) drag; (d) angle of attack.	X	X		
	Shape of an aerofoil section: (a) thickness to chord ratio; (b) chord line; (c) camber line; (d) camber; (e) angle of attack.	X	X		
	The wing shape: (a) aspect ratio; (b) root chord; (c) tip chord; (d) tapered wings; (e) wing planform.	X	X		
	<b>The two-dimensional airflow about an aerofoil</b>				
	Streamline pattern	X	X		
	Stagnation point	X	X		
	Pressure distribution	X	X		
	Centre of pressure	X	X		
	Influence of angle of attack	X	X		
	Flow separation at high angles of attack	X	X		
	The lift – $\alpha$ graph	X	X		
	<b>The coefficients</b>				
	The lift coefficient $C_l$ : the lift formula	X	X		
	The drag coefficient $C_d$ : the drag formula	X	X		
	<b>The three-dimensional airflow round a wing and a fuselage</b>				
	Streamline pattern: (a) span-wise flow and causes; (b) tip vortices and angle of attack; (c) upwash and downwash due to tip vortices; (d) wake turbulence behind an aeroplane (causes, distribution and duration of the phenomenon).	X	X		
	Induced drag:	X	X		

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		<b>Aeroplane</b>		<b>Helicopter</b>	
		PPL	Bridge course	PPL	Bridge course
	(a) influence of tip vortices on the angle of attack; (b) the induced local $\alpha$ ; (c) influence of induced angle of attack on the direction of the lift vector; (d) induced drag and angle of attack.				
	<b>Drag</b>				
	The parasite drag: (a) pressure drag; (b) interference drag; (c) friction drag.	x	x		
	The parasite drag and speed	x	x		
	The induced drag and speed	x	x		
	The total drag	x	x		
	<b>The ground effect</b>				
	Effect on take off and landing characteristics of an aeroplane	x	x		
	<b>The stall</b>				
	Flow separation at increasing angles of attack: (a) the boundary layer: (1) laminar layer; (2) turbulent layer; (3) transition. (b) separation point; (c) influence of angle of attack; (d) influence on: (1) pressure distribution; (2) location of centre of pressure; (3) $C_L$ ; (4) $C_D$ ; (5) pitch moments. (e) buffet; (f) use of controls.	x	x		
	The stall speed: (a) in the lift formula; (b) 1g stall speed; (c) influence of: (1) the centre of gravity; (2) power setting; (3) altitude (IAS); (4) wing loading; (5) load factor n: (i) definition; (ii) turns; (iii) forces.	x	x		
	The initial stall in span-wise direction: (a) influence of planform; (b) geometric twist (wash out); (c) use of ailerons.	x	x		



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		<b>Aeroplane</b>		<b>Helicopter</b>	
		PPL	Bridge course	PPL	Bridge course
	Stall warning: (a) importance of stall warning; (b) speed margin; (c) buffet; (d) stall strip; (e) flapper switch; (f) recovery from stall.	X	X		
	Special phenomena of stall: (a) the power-on stall; (b) climbing and descending turns; (c) t-tailed aeroplane; (d) avoidance of spins: (1) spin development; (2) spin recognition; (3) spin recovery. (e) ice (in stagnation point and on surface): (1) absence of stall warning; (2) abnormal behaviour of the aircraft during stall.	X	X		
	<b>CL augmentation</b>				
	Trailing edge flaps and the reasons for use in take-off and landing: (a) influence on $C_L$ - $\alpha$ -graph; (b) different types of flaps; (c) flap asymmetry; (d) influence on pitch movement.	X	X		
	Leading edge devices and the reasons for use in take-off and landing	X	X		
	<b>The boundary layer</b>				
	Different types: (a) laminar; (b) turbulent.	X	X		
	<b>Special circumstances</b>				
	Ice and other contamination: (a) ice in stagnation point; (b) ice on the surface (frost, snow and clear ice); (c) rain; (d) contamination of the leading edge; (e) effects on stall; (f) effects on loss of controllability; (g) effects on control surface moment; (h) influence on high lift devices during takeoff, landing and low speeds.	X	X		
	<b>Stability</b>				
	<b>Condition of equilibrium in steady horizontal flight</b>				
	Precondition for static stability	X	X		
	Equilibrium: (a) lift and weight;	X	X		

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		<b>Aeroplane</b>		<b>Helicopter</b>	
		PPL	Bridge course	PPL	Bridge course
	(b) drag and thrust.				
	<b>Methods of achieving balance</b>				
	Wing and empennage (tail and canard)	x	x		
	Control surfaces	x	x		
	Ballast or weight trim	x	x		
	<b>Static and dynamic longitudinal stability</b>				
	Basics and definitions:	x	x		
	(a) static stability, positive, neutral and negative;				
	(b) precondition for dynamic stability;				
	(c) dynamic stability, positive, neutral and negative.				
	Location of centre of gravity:	x	x		
	(a) aft limit and minimum stability margin;				
	(b) forward position;				
	(c) effects on static and dynamic stability.				
	<b>Dynamic lateral or directional stability</b>				
	Spiral dive and corrective actions	x	x		
	<b>Control</b>				
	<b>General</b>				
	Basics, the three planes and three axis	x	x		
	Angle of attack change	x	x		
	<b>Pitch control</b>				
	Elevator	x	x		
	Downwash effects	x	x		
	Location of centre of gravity	x	x		
	<b>Yaw control</b>				
	Pedal or rudder	x	x		
	<b>Roll control</b>				
	Ailerons: function in different phases of flight	x	x		
	Adverse yaw	x	x		
	Means to avoid adverse yaw:	x	x		
	(a) frise ailerons;				
	(b) differential ailerons deflection.				
	<b>Means to reduce control forces</b>				
	Aerodynamic balance:	x	x		
	(a) balance tab and anti-balance tab;				
	(b) servo tab.				
	<b>Mass balance</b>				
	Reasons to balance: means	x	x		
	<b>Trimming</b>				
	Reasons to trim	x	x		
	Trim tabs	x	x		
	<b>Limitations</b>				
	<b>Operating limitations</b>				
	Flutter	x	x		
	V <sub>fe</sub>	x	x		
	V <sub>no</sub> , V <sub>ne</sub>	x	x		
	<b>Manoeuvring envelope</b>				

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		<b>Aeroplane</b>		<b>Helicopter</b>	
		PPL	Bridge course	PPL	Bridge course
	Manoeuvring load diagram: (a) load factor; (b) accelerated stall speed; (c) $V_a$ ; (d) manoeuvring limit load factor or certification category.	X	X		
	Contribution of mass	X	X		
	<b>Gust envelope</b>				
	Gust load diagram	X	X		
	Factors contributing to gust loads	X	X		
	<b>Propellers</b>				
	<b>Conversion of engine torque to thrust</b>				
	Meaning of pitch	X	X		
	Blade twist	X	X		
	Effects of ice on propeller	X	X		
	<b>Engine failure or engine stop</b>				
	Windmilling drag	X	X		
	<b>Moments due to propeller operation</b>				
	Torque reaction	X	X		
	Asymmetric slipstream effect	X	X		
	Asymmetric blade effect	X	X		
	<b>Flight mechanics</b>				
	<b>Forces acting on an aeroplane</b>				
	Straight horizontal steady flight	X	X		
	Straight steady climb	X	X		
	Straight steady descent	X	X		
	Straight steady glide	X	X		
	Steady coordinated turn: (a) bank angle; (b) load factor; (c) turn radius; (d) rate one turn.	X	X		
<b>5.2.</b>	<b>PRINCIPLES OF FLIGHT: HELICOPTER</b>				
	<b>Subsonic aerodynamics</b>				
	Basic concepts, laws and definitions			X	X
	Conversion of units			X	X
	Definitions and basic concepts about air:			X	X
	(a) the atmosphere and International Standard Atmosphere; (b) density; (c) influence of pressure and temperature on density.				
	Newton's laws: (a) Newton's second law: Momentum equation; (b) Newton's third law: action and reaction.			X	X

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		<b>Aeroplane</b>		<b>Helicopter</b>	
		PPL	Bridge course	PPL	Bridge course
	Basic concepts about airflow: (a) steady airflow and unsteady airflow; (b) Bernoulli's equation; (c) static pressure, dynamic pressure, total pressure and stagnation point; (d) TAS and IAS; (e) two-dimensional airflow and three-dimensional airflow; (f) viscosity and boundary layer.			X	X
	Two-dimensional airflow			X	X
	Aerofoil section geometry: (a) aerofoil section; (b) chord line, thickness and thickness to chord ratio of a section; (c) camber line and camber; (d) symmetrical and asymmetrical aerofoils sections.			X	X
	Aerodynamic forces on aerofoil elements: (a) angle of attack; (b) pressure distribution; (c) lift and lift coefficient (d) relation lift coefficient: angle of attack; (e) profile drag and drag coefficient; (f) relation drag coefficient: angle of attack; (g) resulting force, centre of pressure and pitching moment.			X	X
	Stall: (a) boundary layer and reasons for stalling; (b) variation of lift and drag as a function of angle of attack; (c) displacement of the centre of pressure and pitching moment.			X	X
	Disturbances due to profile contamination: (a) ice contamination; (b) ice on the surface (frost, snow and clear ice).			X	X
	The three-dimensional airflow round a wing and a fuselage			X	X
	The wing:			X	X
	(a) planform, rectangular and tapered wings;				
	(b) wing twist.				
	Airflow pattern and influence on lift:			X	X
	(a) span wise flow on upper and lower surface; (b) tip vortices; (c) span-wise lift distribution.				
	Induced drag: causes and vortices			X	X
	The airflow round a fuselage: (a) components of a fuselage; (b) parasite drag; (c) variation with speed.			X	X
	<b>Transonic aerodynamics and compressibility effects</b>				

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		<b>Aeroplane</b>		<b>Helicopter</b>	
		PPL	Bridge course	PPL	Bridge course
	Airflow velocities			x	x
	Airflow speeds: (a) speed of sound; (b) subsonic, high subsonic and supersonic flows.			x	x
	Shock waves: (a) compressibility and shock waves; (b) the reasons for their formation at upstream high subsonic airflow; (c) their effect on lift and drag.			x	x
	Influence of wing planform: sweep-angle			x	x
	<b>Rotorcraft types</b>			x	x
	Rotorcraft			x	x
	Rotorcraft types: (a) autogyro; (b) helicopter.			x	x
	Helicopters			x	x
	Helicopters configurations: the single main rotor helicopter			x	x
	The helicopter, characteristics and associated terminology: (a) general lay-out, fuselage, engine and gearbox; (b) tail rotor, fenestron and NOTAR;			x	x
	(c) engines (reciprocating and turbo shaft engines); (d) power transmission;				
	(e) rotor shaft axis, rotor hub and rotor blades; (f) rotor disc and rotor disc area; (g) teetering rotor (two blades) and rotors with more than two blades;				
	(h) skids and wheels; (i) helicopter axes and fuselage centre line;				
	(j) roll axis, pitch axis and normal or yaw axis; (k) gross mass, gross weight and disc loading.				
	<b>Main rotor aerodynamics</b>			x	x
	Hover flight outside ground effect			x	x
	Airflow through the rotor discs and round the blades: (a) circumferential velocity of the blade sections; (b) induced airflow, through the disc and downstream; (c) downward fuselage drag; (d) equilibrium of rotor thrust, weight and fuselage drag; (e) rotor disc induced power; (f) relative airflow to the blade; (g) pitch angle and angle of attack of a blade section; (h) lift and profile drag on the blade element; (i) resulting lift and thrust on the blade and rotor thrust; (j) collective pitch angle changes and necessity of blade feathering; (k) required total main rotor-torque and rotor-power; (l) influence of the air density.			x	x

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		<b>Aeroplane</b>		<b>Helicopter</b>	
		<b>PPL</b>	<b>Bridge course</b>	<b>PPL</b>	<b>Bridge course</b>
	Anti-torque force and tail rotor: (a) force of tail rotor as a function of main rotor-torque; (b) anti-torque rotor power; (c) necessity of blade feathering of tail rotor blades and yaw pedals.			X	X
	Maximum hover altitude OGE: (a) total power required and power available; (b) maximum hover altitude as a function of pressure altitude and OAT.			X	X
	Vertical climb			X	X
	Relative airflow and angles of attack:			X	X
	(a) climb velocity $V_c$ , induced and relative velocity and angle of attack; (b) collective pitch angle and blade feathering.				
	Power and vertical speed: (a) induced power, climb power and profile power; (b) total main rotor power and main rotor torque; (c) tail rotor power; (d) total power requirement in vertical flight.			X	X
	Forward flight			X	X
	Airflow and forces in uniform inflow distribution: (a) assumption of uniform inflow distribution on rotor disc; (b) advancing blade ( $90^\circ$ ) and retreating blade ( $270^\circ$ ); (c) airflow velocity relative to the blade sections, area of reverse flow; (d) lift on the advancing and retreating blades at constant pitch angles; (e) necessity of cyclic pitch changes; (f) compressibility effects on the advancing blade tip and speed limitations; (g) high angle of attack on the retreating blade, blade stall and speed limitations; (h) thrust on rotor disc and tilt of thrust vector; (i) vertical component of the thrust vector and gross weight equilibrium; (j) horizontal component of the thrust vector and drag equilibrium.			X	X
	The flare (power flight): (a) thrust reversal and increase in rotor thrust; (b) increase of rotor RPM on non governed rotor.			X	X
	Power and maximum speed: (a) induced power as a function of helicopter speed; (b) rotor profile power as a function of helicopter speed; (c) fuselage drag and parasite power as a function of forward speed; (d) tail rotor power and power ancillary equipment;			X	X

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		<b>Aeroplane</b>		<b>Helicopter</b>	
		PPL	Bridge course	PPL	Bridge course
	(e) total power requirement as a function of forward speed;				
	(f) influence of helicopter mass, air density and drag of additional external equipment;				
	(g) translational lift and influence on power required.				
	Hover and forward flight in ground effect			x	x
	Airflow in ground effect and downwash: rotor power decrease as a function of rotor height above the ground at constant helicopter mass			x	x
	Vertical descent			x	x
	Vertical descent, power on:			x	x
	(a) airflow through the rotor, low and moderate descent speeds;				
	(b) vortex ring state, settling with power and consequences.				
	Autorotation:			x	x
	(a) collective lever position after failure;				
	(b) up flow through the rotor, auto-rotation and anti-autorotation rings;				
	(c) tail rotor thrust and yaw control;				
	(d) control of rotor RPM with collective lever;				
	(e) landing after increase of rotor thrust by pulling collective and reduction in vertical speed.				
	Forward flight: Autorotation			x	x
	Airflow through the rotor disc:			x	x
	(a) descent speed and up flow through the disc;				
	(b) the flare, increase in rotor thrust, reduction of vertical speed and ground speed.				
	Flight and landing:			x	x
	(a) turning;				
	(b) flare;				
	(c) autorotative landing;				
	(d) height or velocity avoidance graph and dead man's curve.				
	<b>Main rotor mechanics</b>			x	x
	Flapping of the blade in hover			x	x
	Forces and stresses on the blade:			x	x
	(a) centrifugal force on the blade and attachments;				
	(b) limits of rotor RPM;				
	(c) lift on the blade and bending stresses on a rigid attachment;				
	(d) the flapping hinge of the articulated rotor and flapping hinge offset;				
	(e) the flapping of the hinge less rotor and flexible element.				
	Coning angle in hover:			x	x
	(a) lift and centrifugal force in hover and blade weight negligible				

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		<b>Aeroplane</b>		<b>Helicopter</b>	
		PPL	Bridge course	PPL	Bridge course
	(b) flapping, tip path plane and disc area.				
	Flapping angles of the blade in forward flight			x	x
	Forces on the blade in forward flight without cyclic feathering: (a) aerodynamic forces on the advancing and retreating blades without cyclic feathering; (b) periodic forces and stresses, fatigue and flapping hinge; (c) phase lag between the force and the flapping angle (about 90°); (d) flapping motion of the hinged blades and tilting of the cone and flap back of rotor; (e) rotor disc attitude and thrust vector tilt.			x	x
	Cyclic pitch (feathering) in helicopter mode, forward flight: (a) necessity of forward rotor disc tilt and thrust vector tilt; (b) flapping and tip path plane, virtual rotation axis or no flapping axis and plane of rotation; (c) shaft axis and hub plane; (d) cyclic pitch change (feathering) and rotor thrust vector tilt; (e) collective pitch change, collective lever, swash plate, pitch link and pitch horn; (f) cyclic stick, rotating swash plate and pitch link movement and phase angle.			x	x
	Blade lag motion			x	x
	Forces on the blade in the disc plane (tip path plane) in forward flight: (a) forces due to the Coriolis effect because of the flapping; (b) alternating stresses and the need of the drag or lag hinge.			x	x
	The drag or lag hinge: (a) the drag hinge in the fully articulated rotor; (b) the lag flexure in the hinge less rotor; (c) drag dampers.			x	x
	Ground resonance: (a) blade lag motion and movement of the centre of gravity of the blades and the rotor; (b) oscillating force on the fuselage; (c) fuselage, undercarriage and resonance.			x	x
	Rotor systems			x	x
	See-saw or teetering rotor			x	x
	Fully articulated rotor: (a) three hinges arrangement; (b) bearings and elastomeric hinges.			x	x
	Hinge less rotor and bearing less rotor			x	x
	Blade sailing:			x	x



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		<b>Aeroplane</b>		<b>Helicopter</b>	
		PPL	Bridge course	PPL	Bridge course
	(a) low rotor RPM and effect of adverse wind;				
	(b) minimising the danger;				
	(c) droop stops.				
	Vibrations due to main rotor:			X	X
	(a) origins of the vibrations: in plane and vertical;				
	(b) blade tracking and balancing.				
	<b>Tail rotors</b>			X	X
	Conventional tail rotor			X	X
	Rotor description:			X	X
	(a) two-blades tail rotors with teetering hinge;				
	(b) rotors with more than two blades;				
	(c) feathering bearings and flapping hinges;				
	(d) dangers to people and to the tail rotor, rotor height and safety.				
	Aerodynamics:			X	X
	(a) induced airflow and tail rotor thrust;				
	(b) thrust control by feathering, tail rotor drift and roll;				
	(c) effect of tail rotor failure and vortex ring.				
	The fenestron: technical lay-out			X	X
	The NOTAR: technical lay-out			X	X
	Vibrations: high frequency vibrations due to the tail rotors			X	X
	<b>Equilibrium, stability and control</b>			X	X
	Equilibrium and helicopter attitudes			X	X
	Hover:			X	X
	(a) forces and equilibrium conditions;				
	(b) helicopter pitching moment and pitch angle;				
	(c) helicopter rolling moment and roll angle.				
	Forward flight:			X	X
	(a) forces and equilibrium conditions;				
	(b) helicopter moments and angles;				
	(c) effect of speed on fuselage attitude.				
	Control			X	X
	Control power			X	X
	(a) fully articulated rotor;				
	(b) hinge less rotor;				
	(c) teetering rotor.				
	Static and dynamic roll over			X	X
	<b>Helicopter performances</b>				
	Engine performances			X	X
	Piston engines:			X	X
	(a) power available;				
	(b) effects of density altitude.				
	Turbine engines:			X	X
	(a) power available;				
	(b) effects of ambient pressure and temperature.				
	Helicopter performances			X	X

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		<b>Aeroplane</b>		<b>Helicopter</b>	
		PPL	Bridge course	PPL	Bridge course
	Hover and vertical flight: (a) power required and power available; (b) OGE and IGE maximum hover height; (c) influence of AUM, pressure, temperature and density.			X	X
	Forward flight: (a) maximum speed; (b) maximum rate of climb speed; (c) maximum angle of climb speed; (d) range and endurance; (e) influence of AUM, pressure, temperature and density.			X	X
	Manoeuvring: (a) load factor; (b) bank angle and number of g's; (c) manoeuvring limit load factor.			X	X
	Special conditions: (a) operating with limited power; (b) over pitch and over torque.			X	X
<b>6.</b>	<b>OPERATIONAL PROCEDURES</b>				
	<b>General</b>				
	<b>Operation of aircraft: ICAO Annex 6, General requirements</b>				
	Definitions	X	X	X	X
	Applicability	X	X	X	X
	<b>Special operational procedures and hazards (general aspects)</b>	X	X	X	X
	<b>Noise abatement</b>				
	Noise abatement procedures	X	X	X	X
	Influence of the flight procedure (departure, cruise and approach)	X	X	X	X
	Runway incursion awareness (meaning of surface markings and signals)	X	X	X	X
	<b>Fire or smoke</b>				
	Carburettor fire	X	X	X	X
	Engine fire	X	X	X	X
	Fire in the cabin and cockpit, (choice of extinguishing agents according to fire classification and use of the extinguishers)	X	X	X	X
	Smoke in the cockpit and (effects and action to be taken) and smoke in the cockpit and cabin (effects and actions taken)	X	X	X	X
	<b>Windshear and microburst</b>				
	Effects and recognition during departure and approach	X	X	X	X
	Actions to avoid and actions taken during encounter	X	X	X	X
	<b>Wake turbulence</b>				
	Cause	X	X	X	X
	List of relevant parameters	X	X	X	X

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		<b>Aeroplane</b>		<b>Helicopter</b>	
		PPL	Bridge course	PPL	Bridge course
	Actions taken when crossing traffic, during take-off and landing	X	X	X	X
	<b>Emergency and precautionary landings</b>				
	Definition	X	X	X	X
	Cause	X	X	X	X
	Passenger information	X	X	X	X
	Evacuation	X	X	X	X
	Action after landing	X	X	X	X
	<b>Contaminated runways</b>				
	Kinds of contamination	X	X		
	Estimated surface friction and friction coefficient	X	X		
	<b>Rotor downwash</b>			X	X
	<b>Operation influence by meteorological conditions (helicopter)</b>				
	White out, sand or dust			X	X
	Strong winds			X	X
	Mountain environment			X	X
	<b>Emergency procedures</b>				
	<b>Influence by technical problems</b>				
	Engine failure			X	X
	Fire in cabin, cockpit or engine			X	X
	Tail, rotor or directional control failure			X	X
	Ground resonance			X	X
	Blade stall			X	X
	Settling with power (vortex ring)			X	X
	Overpitch			X	X
	Overspeed: rotor or engine			X	X
	Dynamic rollover			X	X
	Mast bumping			X	X
<b>7.</b>	<b>FLIGHT PERFORMANCE AND PLANNING</b>				
<b>7.1.</b>	<b>MASS AND BALANCE: AEROPLANES OR HELICOPTERS</b>				
	<b>Purpose of mass and balance considerations</b>				
	<b>Mass limitations</b>				
	Importance in regard to structural limitations	X	X	X	X
	Importance in regard to performance limitations	X	X	X	X
	<b>CG limitations</b>				
	Importance in regard to stability and controllability	X	X	X	X
	Importance in regard to performance	X	X	X	X
	<b>Loading</b>				
	<b>Terminology</b>				
	Mass terms	X	X	X	X
	Load terms (including fuel terms)	X	X	X	X
	<b>Mass limits</b>				
	Structural limitations	X	X	X	X
	Performance limitations	X	X	X	X
	Baggage compartment limitations	X	X	X	X

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		<b>Aeroplane</b>		<b>Helicopter</b>	
		PPL	Bridge course	PPL	Bridge course
	<b>Mass calculations</b>				
	Maximum masses for take-off and landing	X	X	X	X
	Use of standard masses for passengers, baggage and crew	X	X	X	X
	<b>Fundamentals of CG calculations</b>				
	Definition of centre of gravity	X	X	X	X
	Conditions of equilibrium (balance of forces and balance of moments)	X	X	X	X
	Basic calculations of CG	X	X	X	X
	<b>Mass and balance details of aircraft</b>				
	<b>Contents of mass and balance documentation</b>				
	Datum and moment arm	X	X	X	X
	CG position as distance from datum	X	X	X	X
	<b>Extraction of basic mass and balance data from aircraft documentation</b>				
	BEM	X	X	X	X
	CG position or moment at BEM	X	X	X	X
	Deviations from standard configuration	X	X	X	X
	<b>Determination of CG position</b>				
	<b>Methods</b>				
	Arithmetic method	X	X	X	X
	Graphic method	X	X	X	X
	<b>Load and trim sheet</b>				
	General considerations	X	X	X	X
	Load sheet and CG envelope for light aeroplanes and for helicopters	X	X	X	X
<b>7.2.</b>	<b>PERFORMANCE: AEROPLANES</b>				
	<b>Introduction</b>				
	Performance classes	X	X		
	Stages of flight	X	X		
	Effect of aeroplane mass, wind, altitude, runway slope and runway conditions	X	X		
	Gradients	X	X		
	<b>SE aeroplanes</b>				
	Definitions of terms and speeds	X	X		
	<b>Take-off and landing performance</b>				
	Use of aeroplane flight manual data	X	X		
	<b>Climb and cruise performance</b>				
	Use of aeroplane flight data	X	X		
	Effect of density altitude and aeroplane mass	X	X		
	Endurance and the effects of the different recommended power or thrust settings	X	X		
	Still air range with various power or thrust settings	X	X		
<b>7.3.</b>	<b>FLIGHT PLANNING AND FLIGHT MONITORING</b>				
	<b>Flight planning for VFR flights</b>				
	<b>VFR navigation plan</b>				
	Routes, airfields, heights and altitudes from VFR charts	X	X	X	X

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		<b>Aeroplane</b>		<b>Helicopter</b>	
		PPL	Bridge course	PPL	Bridge course
	Courses and distances from VFR charts	X	X	X	X
	Aerodrome charts and aerodrome directory	X	X	X	X
	Communications and radio navigation planning data	X	X	X	X
	Completion of navigation plan	X	X	X	X
	<b>Fuel planning</b>				
	General knowledge	X	X	X	X
	<b>Pre-flight calculation of fuel required</b>				
	Calculation of extra fuel	X	X	X	X
	Completion of the fuel section of the navigation plan (fuel log) and calculation of total fuel	X	X	X	X
	<b>Pre-flight preparation</b>				
	<b>AIP and NOTAM briefing</b>				
	Ground facilities and services	X	X	X	X
	Departure, destination and alternate aerodromes	X	X	X	X
	Airway routings and airspace structure	X	X	X	X
	<b>Meteorological briefing</b>				
	Extraction and analysis of relevant data from meteorological documents	X	X	X	X
	<b>ICAO flight plan (ATS flight plan)</b>				
	<b>Individual flight plan</b>				
	Format of flight plan	X	X	X	X
	Completion of the flight plan	X	X	X	X
	Submission of the flight plan	X	X	X	X
	<b>Flight monitoring and in-flight replanning</b>				
	<b>Flight monitoring</b>				
	Monitoring of track and time	X	X	X	X
	In-flight fuel management	X	X	X	X
	In-flight re-planning in case of deviation from planned data	X	X	X	X
<b>7.4.</b>	<b>PERFORMANCE: HELICOPTERS</b>				
	<b>General</b>				
	<b>Introduction</b>				
	Stages of flight			X	X
	Effect on performance of atmospheric, airport or heliport and helicopter conditions			X	X
	<b>Applicability of airworthiness requirements</b>			X	X
	<b>Definitions and terminology</b>			X	X
	<b>Performance: SE helicopters</b>				
	<b>Definitions of terms</b>			X	X
	(a) masses;				
	(b) velocities: $v_x$ , $v_y$ ;				
	(c) velocity of best range and of maximum endurance;				
	(d) power limitations;				
	(e) altitudes.				

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		<b>Aeroplane</b>		<b>Helicopter</b>	
		PPL	Bridge course	PPL	Bridge course
	<b>Take-off, cruise and landing performance</b> <b>Use and interpretation of diagrams and tables:</b> (a) Take-off: (1) take-off run and distance available; (2) take-off and initial climb; (3) effects of mass, wind and density altitude; (4) effects of ground surface and gradient. (b) Landing: (1) effects of mass, wind, density altitude and approach speed; (2) effects of ground surface and gradient. (c) In-flight: (1) relationship between power required and power available; (2) performance diagram; (3) effects of configuration, mass, temperature and altitude; (4) reduction of performance during climbing turns; (5) autorotation; (6) adverse effects (icing, rain and condition of the airframe).			X	X
<b>8.</b>	<b>AIRCRAFT GENERAL KNOWLEDGE</b>				
<b>8.1.</b>	<b>AIRFRAME AND SYSTEMS, ELECTRICS, POWERPLANT AND EMERGENCY EQUIPMENT</b>				
	<b>System design, loads, stresses, maintenance</b>				
	Loads and combination loadings applied to an aircraft's structure	X	X	X	X
	<b>Airframe</b>				
	<b>Wings, tail surfaces and control surfaces</b>				
	Design and constructions	X	X		
	Structural components and materials	X	X		
	Stresses	X	X		
	Structural limitations	X	X		
	<b>Fuselage, doors, floor, wind-screen and windows</b>				
	Design and constructions	X	X	X	X
	Structural components and materials	X	X	X	X
	Stresses	X	X	X	X
	Structural limitations	X	X	X	X
	<b>Flight and control surfaces</b>				
	Design and constructions			X	X
	Structural components and materials			X	X
	Stresses and aero elastic vibrations			X	X
	Structural limitations			X	X
	<b>Hydraulics</b>				
	<b>Hydromechanics: basic principles</b>	X	X	X	X
	<b>Hydraulic systems</b>	X	X	X	X

**DEPARTMENT OF CIVIL AVIATION**  
**MCAR-PART-FCL**

		<b>Aeroplane</b>		<b>Helicopter</b>	
		PPL	Bridge course	PPL	Bridge course
	Hydraulic fluids: types and characteristics, limitations	X	X	X	X
	System components: design, operation, degraded modes of operation, indications and warnings	X	X	X	X
	<b>Landing gear, wheels, tyres and brakes</b>				
	<b>Landing gear</b>				
	Types and materials	X	X	X	X
	<b>Nose wheel steering: design and operation</b>	X	X		
	<b>Brakes</b>				
	Types and materials	X	X	X	X
	System components: design, operation, indications and warnings	X	X	X	X
	<b>Wheels and tyres</b>				
	Types and operational limitations	X	X	X	X
	<b>Helicopter equipments</b>			X	X
	<b>Flight controls</b>				
	Mechanical or powered	X	X	X	X
	Control systems and mechanical	X	X	X	X
	System components: design, operation, indications and warnings, degraded modes of operation and jamming	X	X	X	X
	<b>Secondary flight controls</b>				
	System components: design, operation, degraded modes of operation, indications and warnings	X	X		
	<b>Anti-icing systems</b>				
	Types and operation (pitot and windshield)	X	X	X	X
	<b>Fuel system</b>				
	<b>Piston engine</b>				
	System components: design, operation, degraded modes of operation, indications and warnings	X	X	X	X
	<b>Turbine engine</b>				
	System components: design, operation, degraded modes of operation, indications and warnings			X	X
	<b>Electrics</b>				
	<b>Electrics: general and definitions</b>				
	Direct current: voltage, current, resistance, conductivity, Ohm's law, power and work	X	X	X	X
	Alternating current: voltage, current, amplitude, phase, frequency and resistance	X	X	X	X
	Circuits: series and parallel	X	X	X	X
	Magnetic field: effects in an electrical circuit	X	X	X	X
	<b>Batteries</b>				
	Types, characteristics and limitations	X	X	X	X
	Battery chargers, characteristics and limitations	X	X	X	X
	<b>Static electricity: general</b>				
	Basic principles	X	X	X	X
	Static dischargers	X	X	X	X
	Protection against interference	X	X	X	X
	Lightning effects	X	X	X	X

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		<b>Aeroplane</b>		<b>Helicopter</b>	
		PPL	Bridge course	PPL	Bridge course
	<b>Generation: production, distribution and use</b>				
	DC generation: types, design, operation, degraded modes of operation, indications and warnings	X	X	X	X
	AC generation: types, design, operation, degraded modes of operation, indications and warnings	X	X	X	X
	<b>Electric components</b>				
	Basic elements: basic principles of switches, circuit-breakers and relays	X	X	X	X
	<b>Distribution</b>				
	General:	X	X	X	X
	(a) bus bar, common earth and priority;				
	(b) AC and DC comparison.				
	<b>Piston engines</b>				
	<b>General</b>				
	Types of internal combustion engine: basic principles and definitions	X	X	X	X
	Engine: design, operation, components and materials	X	X	X	X
	<b>Fuel</b>				
	Types, grades, characteristics and limitations	X	X	X	X
	Alternate fuel: characteristics and limitations	X	X	X	X
	<b>Carburettor or injection system</b>				
	Carburettor: design, operation, degraded modes of operation, indications and warnings	X	X	X	X
	Injection: design, operation, degraded modes of operation, indications and warnings	X	X	X	X
	Icing	X	X	X	X
	<b>Air cooling systems</b>				
	Design, operation, degraded modes of operation, indications and warnings	X	X	X	X
	<b>Lubrication systems</b>				
	Lubricants: types, characteristics and limitations	X	X	X	X
	Design, operation, degraded modes of operation, indications and warnings	X	X	X	X
	<b>Ignition circuits</b>				
	Design, operation, degraded modes of operation	X	X	X	X
	<b>Mixture</b>				
	Definition, characteristic mixtures, control instruments, associated control levers and indications	X	X	X	X
	<b>Propellers</b>				
	Definitions and general:	X	X		
	(a) aerodynamic parameters;				
	(b) types;				
	(c) operating modes.				
	Constant speed propeller: design, operation and system components	X	X		
	Propeller handling: associated control levers, degraded modes of operation, indications and warnings	X	X		



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		<b>Aeroplane</b>		<b>Helicopter</b>	
		PPL	Bridge course	PPL	Bridge course
	<b>Performance and engine handling</b>				
	Performance: influence of engine parameters, influence of atmospheric conditions, limitations and power augmentation systems	X	X	X	X
	Engine handling: power and mixture settings during various flight phases and operational limitations	X	X	X	X
	<b>Turbine engines</b>				
	<b>Definitions</b>			X	X
	Coupled turbine engine: design, operation, components and materials			X	X
	Free turbine engine: design, operation, components and materials			X	X
	<b>Fuel</b>				
	Types, characteristics and limitations			X	X
	<b>Main engine components</b>				
	Compressor: (a) types, design, operation, components and materials; (b) stresses and limitations; (c) stall, surge and means of prevention.			X	X
	Combustion chamber: (a) types, design, operation, components and materials; (b) stresses and limitations; (c) emission problems.			X	X
	Turbine: (a) types, design, operation, components and materials; (b) stresses, creep and limitations.			X	X
	Exhaust: (a) design, operation and materials; (b) noise reduction.			X	X
	Fuel control units: types, operation and sensors			X	X
	Helicopter air intake: different types, design, operation, materials and optional equipments			X	X
	<b>Additional components and systems</b>				
	Helicopter additional components and systems: lubrication system, ignition circuit, starter, accessory gearbox, free wheel units: design, operation and components			X	X
	<b>Performance aspects</b>				
	Torque, performance aspects, engine handling and limitations: (a) engine ratings; (b) engine performance and limitations; (c) engine handling.			X	X
	<b>Protection and detection systems</b>				
	<b>Fire detection systems</b>				
	Operation and indications			X	X

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		<b>Aeroplane</b>		<b>Helicopter</b>	
		PPL	Bridge course	PPL	Bridge course
	<b>Miscellaneous systems</b>				
	<b>Rotor design</b>			X	X
	<b>Rotor heads</b>				
	<b>Main rotor</b>				
	Types			X	X
	Structural components and materials, stresses and structural limitations			X	X
	Design and construction			X	X
	Adjustment			X	X
	<b>Tail rotor</b>				
	Types			X	X
	Structural components and materials, stresses and structural limitations			X	X
	Design and construction			X	X
	Adjustment			X	X
	<b>Transmission</b>				
	<b>Main gear box</b>				
	Different types, design, operation and limitations			X	X
	<b>Rotor brake</b>				
	Different types, design, operation and limitations			X	X
	<b>Auxiliary systems</b>			X	X
	<b>Drive shaft and associated installation</b>			X	X
	<b>Intermediate and tail gear box</b>				
	Different types, design, operation and limitations			X	X
	<b>Blades</b>				
	<b>Main rotor blade</b>				
	Design and construction			X	X
	Structural components and materials			X	X
	Stresses			X	X
	Structural limitations			X	X
	Adjustment			X	X
	Tip shape			X	X
	<b>Tail rotor blade</b>				
	Design and construction			X	X
	Structural components and materials			X	X
	Stresses			X	X
	Structural limitations			X	X
	Adjustment			X	X
<b>8.2.</b>	<b>INSTRUMENTATION</b>				
	<b>Instrument and indication systems</b>				
	<b>Pressure gauge</b>				
	Different types, design, operation, characteristics and accuracy	X	X	X	X
	<b>Temperature sensing</b>				
	Different types, design, operation, characteristics and accuracy	X	X	X	X
	<b>Fuel gauge</b>				

**DEPARTMENT OF CIVIL AVIATION**  
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		<b>Aeroplane</b>		<b>Helicopter</b>	
		<b>PPL</b>	<b>Bridge course</b>	<b>PPL</b>	<b>Bridge course</b>
	Different types, design, operation, characteristics and accuracy	x	x	x	x
	<b>Flow meter</b>				
	Different types, design, operation, characteristics and accuracy	x	x	x	x
	<b>Position transmitter</b>				
	Different types, design, operation, characteristics and accuracy	x	x	x	x
	<b>Torque meter</b>				
	Design, operation, characteristics and accuracy			x	x
	<b>Tachometer</b>				
	Design, operation, characteristics and accuracy	x	x	x	x
	<b>Measurement of aerodynamic parameters</b>				
	<b>Pressure measurement</b>				
	Static pressure, dynamic pressure, density and definitions	x	x	x	x
	Design, operation, errors and accuracy	x	x	x	x
	<b>Temperature measurement: aeroplane</b>				
	Design, operation, errors and accuracy	x	x		
	Displays	x	x		
	<b>Temperature measurement: helicopter</b>				
	Design, operation, errors and accuracy			x	x
	Displays			x	x
	<b>Altimeter</b>				
	Standard atmosphere	x	x	x	x
	The different barometric references (QNH, QFE and 1013.25)	x	x	x	x
	Height, indicated altitude, true altitude, pressure altitude and density altitude	x	x	x	x
	Design, operation, errors and accuracy	x	x	x	x
	Displays	x	x	x	x
	<b>Vertical speed indicator</b>				
	Design, operation, errors and accuracy	x	x	x	x
	Displays	x	x	x	x
	<b>Air speed indicator</b>				
	The different speeds IAS, CAS, TAS: definition, usage and relationships	x	x	x	x
	Design, operation, errors and accuracy	x	x	x	x
	Displays	x	x	x	x
	<b>Magnetism: direct reading compass</b>				
	<b>Earth magnetic field</b>	x	x	x	x
	<b>Direct reading compass</b>				
	Design, operation, data processing, accuracy and deviation	x	x	x	x
	Turning and acceleration errors	x	x	x	x
	<b>Gyroscopic instruments</b>				
	<b>Gyroscope: basic principles</b>				

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		<b>Aeroplane</b>		<b>Helicopter</b>	
		PPL	Bridge course	PPL	Bridge course
	Definitions and design	X	X	X	X
	Fundamental properties	X	X	X	X
	Drifts	X	X	X	X
	<b>Turn and bank indicator</b>				
	Design, operation and errors	X	X	X	X
	<b>Attitude indicator</b>				
	Design, operation, errors and accuracy	X	X	X	X
	<b>Directional gyroscope</b>				
	Design, operation, errors and accuracy	X	X	X	X
	<b>Communication systems</b>				
	<b>Transmission modes: VHF, HF and SATCOM</b>				
	Principles, bandwidth, operational limitations and use	X	X	X	X
	<b>Voice communication</b>				
	Definitions, general and applications	X	X	X	X
	<b>Alerting systems and proximity systems</b>				
	<b>Flight warning systems</b>				
	Design, operation, indications and alarms	X	X	X	X
	<b>Stall warning</b>				
	Design, operation, indications and alarms	X	X		
	<b>Radio-altimeter</b>				
	Design, operation, errors, accuracy and indications			X	X
	<b>Rotor or engine over speed alert system</b>				
	Design, operation, displays and alarms			X	X
	<b>Integrated instruments: electronic displays</b>				
	<b>Display units</b>				
	Design, different technologies and limitations	X	X	X	X
<b>9.</b>	<b>NAVIGATION</b>				
<b>9.1.</b>	<b>GENERAL NAVIGATION</b>				
	<b>Basics of navigation</b>				
	<b>The solar system</b>				
	Seasonal and apparent movements of the sun	X		X	
	<b>The earth</b>				
	Great circle, small circle and rhumb line	X		X	
	Latitude and difference of latitude	X		X	
	Longitude and difference of longitude	X		X	
	Use of latitude and longitude co-ordinates to locate any specific position	X		X	
	<b>Time and time conversions</b>				
	Apparent time	X		X	
	UTC	X		X	
	LMT	X		X	
	Standard times	X		X	
	Dateline	X		X	
	Definition of sunrise, sunset and civil twilight	X		X	
	<b>Directions</b>				
	True north, magnetic north and compass north	X		X	
	Compass deviation	X		X	

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		<b>Aeroplane</b>		<b>Helicopter</b>	
		PPL	Bridge course	PPL	Bridge course
	Magnetic poles, isogonals, relationship between true and magnetic	x		x	
	<b>Distance</b>				
	Units of distance and height used in navigation: nautical miles, statute miles, kilometres, metres and ft	x		x	
	Conversion from one unit to another	x		x	
	Relationship between nautical miles and minutes of latitude and minutes of longitude	x		x	
	<b>Magnetism and compasses</b>				
	<b>General principles</b>				
	Terrestrial magnetism	x		x	
	Resolution of the earth's total magnetic force into vertical and horizontal components	x		x	
	Variation-annual change	x		x	
	<b>Aircraft magnetism</b>				
	The resulting magnetic fields	x		x	
	Keeping magnetic materials clear of the compass	x		x	
	<b>Charts</b>				
	<b>General properties of miscellaneous types of projections</b>				
	Direct Mercator	x		x	
	Lambert conformal conic	x		x	
	<b>The representation of meridians, parallels, great circles and rhumb lines</b>				
	Direct Mercator	x		x	
	Lambert conformal conic	x		x	
	<b>The use of current aeronautical charts</b>				
	Plotting positions	x		x	
	Methods of indicating scale and relief (ICAO topographical chart)	x		x	
	Conventional signs	x		x	
	Measuring tracks and distances	x		x	
	Plotting bearings and distances	x		x	
	<b>DR navigation</b>				
	<b>Basis of DR</b>				
	Track	x		x	
	Heading (compass, magnetic and true)	x		x	
	Wind velocity	x		x	
	Air speed (IAS, CAS and TAS)	x		x	
	Groundspeed	x		x	
	ETA	x		x	
	Drift and wind correction angle	x		x	
	DR position fix	x		x	
	<b>Use of the navigational computer</b>				
	Speed	x		x	
	Time	x		x	
	Distance	x		x	

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		<b>Aeroplane</b>		<b>Helicopter</b>	
		PPL	Bridge course	PPL	Bridge course
	Fuel consumption	X		X	
	Conversions	X		X	
	Air speed	X		X	
	Wind velocity	X		X	
	True altitude	X		X	
	<b>The triangle of velocities</b>				
	Heading	X		X	
	Ground speed	X		X	
	Wind velocity	X		X	
	Track and drift angle	X		X	
	<b>Measurement of DR elements</b>				
	Calculation of altitude	X		X	
	Determination of appropriate speed	X		X	
	<b>In-flight navigation</b>				
	<b>Use of visual observations and application to in-flight navigation</b>	X		X	
	<b>Navigation in cruising flight, use of fixes to revise navigation data</b>				
	Ground speed revision	X		X	
	Off-track corrections	X		X	
	Calculation of wind speed and direction	X		X	
	ETA revisions	X		X	
	<b>Flight log</b>	X		X	
<b>9.2.</b>	<b>RADIO NAVIGATION</b>				
	<b>Basic radio propagation theory</b>				
	<b>Antennas</b>				
	Characteristics	X		X	
	<b>Wave propagation</b>				
	Propagation with the frequency bands	X		X	
	<b>Radio aids</b>				
	<b>Ground DF</b>				
	Principles	X		X	
	Presentation and interpretation	X		X	
	Coverage	X		X	
	Range	X		X	
	Errors and accuracy	X		X	
	Factors affecting range and accuracy	X		X	
	<b>NDB/ADF</b>				
	Principles	X		X	
	Presentation and interpretation	X		X	
	Coverage	X		X	
	Range	X		X	
	Errors and accuracy	X		X	
	Factors affecting range and accuracy	X		X	
	<b>VOR</b>				
	Principles	X		X	
	Presentation and interpretation	X		X	

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		<b>Aeroplane</b>		<b>Helicopter</b>	
		PPL	Bridge course	PPL	Bridge course
	Coverage	X		X	
	Range	X		X	
	Errors and accuracy	X		X	
	Factors affecting range and accuracy	X		X	
	<b>DME</b>				
	Principles	X		X	
	Presentation and interpretation	X		X	
	Coverage	X		X	
	Range	X		X	
	Errors and accuracy	X		X	
	Factors affecting range and accuracy	X		X	
	<b>Radar</b>				
	<b>Ground radar</b>				
	Principles	X		X	
	Presentation and interpretation	X		X	
	Coverage	X		X	
	Range	X		X	
	Errors and accuracy	X		X	
	Factors affecting range and accuracy	X		X	
	<b>Secondary surveillance radar and transponder</b>				
	Principles	X		X	
	Presentation and interpretation	X		X	
	Modes and codes	X		X	
	<b>GNSS</b>				
	<b>GPS, GLONASS OR GALILEO</b>				
	Principles	X		X	
	Operation	X		X	
	Errors and accuracy	X		X	
	Factors affecting accuracy	X		X	

**AMC2 FCL.210; FCL.215**

**SYLLABUS OF THEORETICAL KNOWLEDGE FOR THE PPL(AS)**

The following table contains the syllabi for the courses of theoretical knowledge, as well as for the theoretical knowledge examinations for the PPL(As). The training and examination should cover aspects related to non-technical skills in an integrated manner, taking into account the particular risks associated to the licence and the activity.

		<b>PPL</b>
<b>1.</b>	<b>AIR LAW AND ATC PROCEDURES</b>	
	International law: conventions, agreements and organisations	X
	Airworthiness of aircraft	X
	Aircraft nationality and registration marks	X
	Personnel licensing	X

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	Rules of the air	X
	Procedures for air navigation services: aircraft operations	X
	Air traffic services and air traffic management	X
	Aeronautical information service	X
	Aerodromes	X
	Search and rescue	X
	Security	X
	Aircraft accident and incident investigation	X
	National law	X

		<b>PPL</b>
<b>2.</b>	<b>HUMAN PERFORMANCE</b>	
	Human factors: basic concepts	X
	Basic aviation physiology and health maintenance	X
	Basic aviation psychology	X

		<b>PPL</b>
<b>3.</b>	<b>METEOROLOGY</b>	
	The atmosphere	X
	Wind	X
	Thermodynamics	X
	Clouds and fog	X
	Precipitation	X
	Air masses and fronts	X
	Pressure systems	X
	Climatology	X
	Flight hazards	X
	Meteorological information	X

		<b>PPL</b>
<b>4.</b>	<b>COMMUNICATIONS</b>	
	<b>VFR COMMUNICATIONS</b>	
	Definitions	X
	General operating procedures	X
	Relevant weather information terms (VFR)	X
	Action required to be taken in case of communication failure	X
	Distress and urgency procedures	X
	General principles of VHF propagation and allocation of frequencies	X



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		<b>PPL</b>
<b>5.</b>	<b>PRINCIPLES OF FLIGHT</b>	
	Basics of aerostatics	X
	Basics of subsonic aerodynamics	X
	Aerodynamics of airships	X
	Stability	X
	Controllability	X
	Limitations	X
	Propellers	X
	Basics of airship flight mechanics	X

		<b>PPL</b>
<b>6.</b>	<b>OPERATIONAL PROCEDURES</b>	
	General requirements	X
	Special operational procedures and hazards (general aspects)	X
	Emergency procedures	X

		<b>PPL</b>
<b>7.</b>	<b>FLIGHT PERFORMANCE AND PLANNING</b>	
<b>7.1</b>	<b>MASS AND BALANCE</b>	
	Purpose of mass and balance considerations	X
	Loading	X
	Fundamentals of CG calculations	X
	Mass and balance details of aircraft	X
	Determination of CG position	X
	Passenger, cargo and ballast handling	X
<b>7.2</b>	<b>PERFORMANCE</b>	
	Airworthiness requirements	X
	Basics of airship performance	X
	Definitions and terms	X
	Stages of flight	X
	Use of flight manual	X
<b>7.3</b>	<b>FLIGHT PLANNING AND FLIGHT MONITORING</b>	
	Flight planning for VFR flights	X
	Fuel planning	X
	Pre-flight preparation	X
	ATS flight plan	X
	Flight monitoring and in-flight re-planning	X

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		<b>PPL</b>
<b>8.</b>	<b>AIRCRAFT GENERAL KNOWLEDGE</b>	
<b>8.1</b>	<b>ENVELOPE, AIRFRAME AND SYSTEMS, ELECTRICS, POWERPLANT AND EMERGENCY EQUIPMENT</b>	
	Design, materials, loads and stresses	X
	Envelope and airbags	X
	Framework	X
	Gondola	X
	Flight controls	X
	Landing gear	X
	Hydraulics and pneumatics	X
	Heating and air conditioning	X
	Fuel system	X
	Piston engines (propellers)	X
	Turbine engines (basics)	X
	Electrics	X
	Fire protection and detection systems	X
	Maintenance	X
<b>8.2</b>	<b>INSTRUMENTATION</b>	
	Sensors and instruments	X
	Measurement of air data and gas parameters	X
	Magnetism: direct reading compass and flux valve	X
	Gyroscopic instruments	X
	Communication systems	X
	Alerting systems	X
	Integrated instruments: electronic displays	X
	Flight management system (general basics)	X
	Digital circuits and computers	X

		<b>PPL</b>
<b>9.</b>	<b>NAVIGATION</b>	
<b>9.1.</b>	<b>GENERAL NAVIGATION</b>	
	Basics of navigation	X
	Magnetism and compasses	X
	Charts	X
	DR navigation	X
	In-flight navigation	X
<b>9.2.</b>	<b>RADIO NAVIGATION</b>	
	Basic radio propagation theory	X
	Radio aids	X

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	Radar	x
	GNSS	x

**AMC3 FCL.210; FCL.215 Training course and theoretical knowledge examination**

**SYLLABUS OF THEORETICAL KNOWLEDGE FOR THE BPL AND SPL**

The syllabi for the theoretical knowledge instruction and examination for the LAPL(B) and LAPL(S) in AMC1 FCL.115; FCL.120 should be used for the BPL and SPL, respectively.

**FCL.235 Skill test**

- (a) Through the completion of a skill test, applicants for a PPL shall demonstrate the ability to perform as PIC on the appropriate aircraft category the relevant procedures and manoeuvres with the competency appropriate to the privileges granted.
- (b) Applicants for the skill test shall have received flight instruction on the same class or type of aircraft to be used for the skill test.
- (c) Pass marks
  - (1) The skill test shall be divided into different sections, representing all the different phases of flight appropriate to the category of aircraft flown.
  - (2) Failure in any item of a section will cause the applicant to fail the entire section. If the applicant fails only 1 section, he/she shall repeat only that section. Failure in more than 1 section will cause the applicant to fail the entire test.
  - (3) When the test needs to be repeated in accordance with (2), failure in any section, including those that have been passed on a previous attempt, will cause the applicant to fail the entire test.
  - (4) Failure to achieve a pass in all sections of the test in 2 attempts will require further training.

**AMC1 FCL.125; FCL.235**

**CONTENTS OF THE SKILL TEST FOR THE ISSUE OF A LAPL(S) AND OF AN SPL**

- (a) An applicant should be responsible for the flight planning and should ensure that all equipment and documentation for the execution of the flight are on board.
- (b) The applicant should indicate to the FE the checks and duties carried out.

Checks should be completed in accordance with the flight manual or the authorised checklist for the sailplane on which the test is being taken.

**FLIGHT TEST TOLERANCE**

- (c) The applicant should demonstrate the ability to:
  - (1) operate the sailplane within its limitations;
  - (2) complete all manoeuvres with smoothness and accuracy;
  - (3) exercise good judgment and airmanship;
  - (4) apply aeronautical knowledge;
  - (5) maintain control of the sailplane at all times in such a manner that the successful outcome of a procedure or manoeuvre is never seriously in doubt.

**CONTENT OF THE SKILL TEST**

- (d) The skill test contents and sections set out in this AMC should be used for the skill test for the issue of a LAPL(S) and of an SPL:

**SECTION 1 PRE-FLIGHT OPERATIONS AND DEPARTURE**

Use of checklist, airmanship (control of sailplane by external visual reference), look-out. Apply in all sections.

- |   |  |
|---|--|
| a | Pre-flight sailplane (daily) inspection, documentation, NOTAM and weather briefing |
| b | Verifying in-limits mass and balance and performance calculation                   |
| c | Sailplane servicing compliance   |
| d | Pre-take-off checks  |

**SECTION 2 LAUNCH METHOD**

**Note: at least for one of the three launch methods all the mentioned items are fully exercised during the skill test**

**SECTION 2 (A) WINCH OR CAR LAUNCH**

- a Signals before and during launch, including messages to winch driver
- b Adequate profile of winch launch
- c Simulated launch failure
- d Situational awareness

**SECTION 2 (B) AEROTOW LAUNCH**

- a Signals before and during launch, including signals to or communications with tow plane pilot for any problems
- b Initial roll and take-off climb
- c Launch abandonment (simulation only or 'talk-through')
- d Correct positioning during straight flight and turns
- e Out of position and recovery
- f Correct release from tow
- g Look-out and airmanship through whole launch phase

**SECTION 2 (C) SELF-LAUNCH  
(powered sailplanes only)**

- a ATC compliance (if applicable)
- b Aerodrome departure procedures
- c Initial roll and take-off climb
- d Look-out and airmanship during the whole take-off
- e Simulated engine failure after take-off
- f Engine shut down and stowage

**SECTION 3 GENERAL AIRWORK**

- a Maintain straight flight: attitude and speed control
- b Coordinated medium (30 ° bank) turns, look-out procedures and collision avoidance
- c Turning on to selected headings visually and with use of compass
- d Flight at high angle of attack (critically low air speed)
- e Clean stall and recovery
- f Spin avoidance and recovery
- g Steep (45 ° bank) turns, look-out procedures and collision avoidance
- h Local area navigation and awareness

**SECTION 4 CIRCUIT, APPROACH AND LANDING**

- a Aerodrome circuit joining procedure
- b Collision avoidance: look-out procedures
- c Pre-landing checks
- d Circuit, approach control and landing

e	Precision landing (simulation of out-landing and short field)
f	Crosswind landing if suitable conditions available

## **AMC2 FCL.125; FCL.235**

### **CONTENTS OF THE SKILL TEST FOR THE ISSUE OF A LAPL(B) AND A BPL**

- (a) The take-off site should be chosen by the applicant depending on the actual meteorological conditions, the area which has to be over flown and the possible options for suitable landing sites. The applicant should be responsible for the flight planning and should ensure that all equipment and documentation for the execution of the flight are on board.
- (b) An applicant should indicate to the FE the checks and duties carried out. Checks should be completed in accordance with the flight manual or the authorised checklist for the balloon on which the test is being taken. During pre-flight preparation for the test the applicant should be required to perform crew and passenger briefings and demonstrate crowd control. The load calculation should be performed by the applicant in compliance with the operations manual or flight manual for the balloon used.

### **FLIGHT TEST TOLERANCE**

- (c) The applicant should demonstrate the ability to:
  - (1) operate the balloon within its limitations;
  - (2) complete all manoeuvres with smoothness and accuracy
  - (3) exercise good judgment and airmanship;
  - (4) apply aeronautical knowledge;
  - (5) maintain control of the balloon at all times in such a manner that the successful outcome of a procedure or manoeuvre is never seriously in doubt.

### **CONTENT OF THE SKILL TEST**

- (d) The skill test contents and sections set out in this paragraph should be used for the skill test for the issue of a LAPL(B) (hot-air balloon) and a BPL (hot-air balloon):

**SECTION 1 PRE-FLIGHT OPERATIONS, INFLATION AND TAKE-OFF**

Use of checklist, airmanship, control of balloon by external visual reference, look-out procedures, etc. apply in all sections.

- a Pre-flight documentation, flight planning, NOTAM and weather briefing
- b Balloon inspection and servicing
- c Load calculation
- d Crowd control, crew and passenger briefings
- e Assembly and layout
- f Inflation and pre-take-off procedures
- g Take-off
- h ATC compliance(if applicable)

**SECTION 2 GENERAL AIRWORK**

- a Climb to level flight
- b Level flight
- c Descent to level flight
- d Operating at low level
- e ATC compliance (if applicable)

**SECTION 3 EN-ROUTE PROCEDURES**

- a Dead reckoning and map reading
- b Marking positions and time
- c Orientation and airspace structure
- d Maintenance of altitude
- e Fuel management
- f Communication with retrieve crew
- g ATC compliance

**SECTION 4 APPROACH AND LANDING PROCEDURES**

- a Approach from low level, missed approach and fly on
- b Approach from high level, missed approach and fly on
- c Pre-landing checks
- d Passenger pre-landing briefing
- e Selection of landing field
- f Landing, dragging and deflation
- g ATC compliance (if applicable)
- h Actions after flight

**SECTION 5 ABNORMAL AND EMERGENCY PROCEDURES**

- a Simulated fire on the ground and in the air
- b Simulated pilot light and burner failures

c	Other abnormal and emergency procedures as outlined in the appropriate flight manual.
d	Oral questions

- (e) The skill test contents and sections set out in this paragraph should be used for the skill test for the issue of a LAPL(B) (gas balloon) and a BPL (gas balloon):

**SECTION 1 PRE-FLIGHT OPERATIONS, INFLATION AND TAKE-OFF**

Use of checklist, airmanship, control of balloon by external visual reference, look-out procedures, etc. apply in all sections.

a	Pre-flight documentation, flight planning, NOTAM and weather briefing
b	Balloon inspection and servicing
c	Load calculation
d	Crowd control, crew and passenger briefings
e	Assembly and layout
f	Inflation and pre-take-off procedures
g	Take-off
h	ATC compliance (if applicable)

**SECTION 2 GENERAL AIRWORK**

a	Climb to level flight
b	Level flight
c	Descent to level flight
d	Operating at low level
e	ATC compliance (if applicable)

**SECTION 3 EN-ROUTE PROCEDURES**

a	Dead reckoning and map reading
b	Marking positions and time
c	Orientation and airspace structure
d	Maintenance of altitude
e	Ballast management
f	Communication with retrieve crew
g	ATC compliance

**SECTION 4 APPROACH AND LANDING PROCEDURES**

a	Approach from low level, missed approach and fly on
b	Approach from high level, missed approach and fly on
c	Pre-landing checks
d	Passenger pre-landing briefing
e	Selection of landing field



f	Landing, dragging and deflation
g	ATC compliance (if applicable)
h	Actions after flight
<b>SECTION 5 ABNORMAL AND EMERGENCY PROCEDURES</b>	
a	Simulated closed appendix during take-off and climb
b	Simulated parachute or valve failure
c	Other abnormal and emergency procedures as outlined in the appropriate flight manual
d	Oral questions

### **AMC1 FCL.215; FCL.235**

#### **THEORETICAL KNOWLEDGE EXAMINATION AND SKILL TEST FOR THE PPL**

- (a) Theoretical knowledge examination
- (1) The examinations should comprise a total of 120 multiple-choice questions covering all the subjects.
  - (2) Communication practical classroom testing may be conducted.
  - (3) The period of 18 months mentioned in FCL.025(b)(2) should be counted from the end of the calendar month when the applicant first attempted an examination.
- (b) Skill test
- Further training may be required following any failed skill test or part thereof. There should be no limit to the number of skill tests that may be attempted.
- (c) Conduct of the test
- (1) If the applicant chooses to terminate a skill test for reasons considered inadequate by the FE, the applicant should retake the entire skill test. If the test is terminated for reasons considered adequate by the FE, only those sections not completed should be tested in a further flight.
  - (2) Any manoeuvre or procedure of the test may be repeated once by the applicant. The FE may stop the test at any stage if it is considered that the applicant's demonstration of flying skill requires a complete retest.
  - (3) An applicant should be required to fly the aircraft from a position where the PIC functions can be performed and to carry out the test as if there is no

other crew member. Responsibility for the flight should be allocated in accordance with national regulations.

### **AMC1 FCL.235 Skill test**

#### **CONTENTS OF THE SKILL TEST FOR THE ISSUE OF A PPL(A)**

- (a) The route to be flown for the navigation test should be chosen by the FE. The route may end at the aerodrome of departure or at another aerodrome. The applicant should be responsible for the flight planning and should ensure that all equipment and documentation for the execution of the flight are on board. The navigation section of the test should have a duration that allows the pilot to demonstrate his/her ability to complete a route with at least three identified waypoints and may, as agreed between the applicant and FE, be flown as a separate test.
- (b) An applicant should indicate to the FE the checks and duties carried out, including the identification of radio facilities. Checks should be completed in accordance with the authorised checklist for the aeroplane on which the test is being taken. During pre-flight preparation for the test the applicant should be required to determine power settings and speeds. Performance data for take-off, approach and landing should be calculated by the applicant in compliance with the operations manual or flight manual for the aeroplane used.

#### **FLIGHT TEST TOLERANCE**

- (c) The applicant should demonstrate the ability to:
  - (1) operate the aeroplane within its limitations;
  - (2) complete all manoeuvres with smoothness and accuracy;
  - (3) exercise good judgment and airmanship;
  - (4) apply aeronautical knowledge;
  - (5) maintain control of the aeroplane at all times in such a manner that the successful outcome of a procedure or manoeuvre is never seriously in doubt.
- (d) The following limits are for general guidance. The FE should make allowance for turbulent conditions and the handling qualities and performance of the aeroplane used:
  - (1) height:

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- (i) normal flight  $\pm 150$  ft
  - (ii) with simulated engine failure  $\pm 200$  ft (if ME aeroplane is used)
- (2) heading or tracking of radio aids:
  - (i) normal flight  $\pm 10^\circ$
  - (ii) with simulated engine failure  $\pm 15^\circ$  (if ME aeroplane is used)
- (3) speed:
  - (i) take-off and approach  $+15/-5$  knots
  - (ii) all other flight regimes  $\pm 15$  knots

**CONTENT OF THE SKILL TEST**

- (e) The skill test contents and sections set out in this AMC should be used for the skill test for the issue of a PPL(A) on SE and ME aeroplanes or on TMGs.

**SECTION 1 PRE-FLIGHT OPERATIONS AND DEPARTURE**

Use of checklist, airmanship, control of aeroplane by external visual reference, anti/de-icing procedures, etc. apply in all sections.

- a Pre-flight documentation, NOTAM and weather briefing
- b Mass and balance and performance calculation
- c Aeroplane inspection and servicing
- d Engine starting and after starting procedures
- e Taxiing and aerodrome procedures, pre-take-off procedures
- f Take-off and after take-off checks
- g Aerodrome departure procedures
- h ATC compliance and R/T procedures

**SECTION 2 GENERAL AIRWORK**

- a ATC compliance and R/T procedures
- b Straight and level flight, with speed changes
- c Climbing:
  - i. best rate of climb;
  - ii. climbing turns;
  - iii. levelling off.
- d Medium ( $30^\circ$  bank) turns
- e Steep ( $45^\circ$  bank) turns (including recognition and recovery from a spiral dive)

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f	Flight at critically low air speed with and without flaps
g	Stalling: i. clean stall and recover with power; ii. approach to stall descending turn with bank angle 20°, approach configuration; iii. approach to stall in landing configuration.
h	Descending: i. with and without power; ii. descending turns (steep gliding turns); iii. levelling off.
<b>SECTION 3 EN-ROUTE PROCEDURES</b>	
a	Flight plan, dead reckoning and map reading
b	Maintenance of altitude, heading and speed
c	Orientation, timing and revision of ETAs and log keeping
d	Diversion to alternate aerodrome (planning and implementation)
e	Use of radio navigation aids
f	Basic instrument flying check (180° turn in simulated IMC)
g	Flight management (checks, fuel systems and carburettor icing, etc.)
h	ATC compliance and R/T procedures
<b>SECTION 4 APPROACH AND LANDING PROCEDURES</b>	
a	Aerodrome arrival procedures
b	* Precision landing (short field landing), crosswind, if suitable conditions available
c	* Flapless landing
d	* Approach to landing with idle power (SE only)
e	Touch and go
f	Go-around from low height
g	ATC compliance and R/T procedures
h	Actions after flight
<b>SECTION 5 ABNORMAL AND EMERGENCY PROCEDURES</b>	
This section may be combined with sections 1 through 4	
a	Simulated engine failure after take-off (SE only)
b	* Simulated forced landing (SE only)
c	Simulated precautionary landing (SE only)
d	Simulated emergencies
e	Oral questions
<b>SECTION 6 SIMULATED ASYMMETRIC FLIGHT AND RELEVANT CLASS OR TYPE ITEMS</b>	

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This section may be combined with sections 1 through 5	
a	Simulated engine failure during take-off (at a safe altitude unless carried out in an FFS)
b	Asymmetric approach and go-around
c	Asymmetric approach and full stop landing
d	Engine shutdown and restart
e	ATC compliance, R/T procedures or airmanship
f	As determined by the FE: any relevant items of the class or type rating skill test to include, if applicable: <ul style="list-style-type: none"><li>i. aeroplane systems including handling of auto pilot;</li><li>ii. operation of pressurisation system;</li><li>iii. use of de-icing and anti-icing system.</li></ul>
g	Oral questions

\* These items may be combined, at the discretion of the FE.

### **AMC2 FCL.235 Skill test**

#### **CONTENTS OF THE SKILL TEST FOR THE ISSUE OF A PPL(H)**

- (a) The area and route to be flown should be chosen by the FE and all low level and hover work should be at an adequate aerodrome or site. Routes used for section 3 may end at the aerodrome of departure or at another aerodrome. The applicant should be responsible for the flight planning and should ensure that all equipment and documentation for the execution of the flight are on board. The navigation section of the test, as set out in this AMC should consist of at least three legs, each leg of a minimum duration of 10 minutes. The skill test may be conducted in two flights.
- (b) An applicant should indicate to the FE the checks and duties carried out, including the identification of radio facilities. Checks should be completed in accordance with the authorised checklist or pilot operating handbook for the helicopter on which the test is being taken. During pre-flight preparation for the test the applicant is required to determine power settings and speeds. Performance data for take-off, approach and landing should be calculated by the applicant in compliance with the operations manual or flight manual for the helicopter used.

#### **FLIGHT TEST TOLERANCE**

- (c) The applicant should demonstrate the ability to:
  - (1) operate the helicopter within its limitations;

- (2) complete all manoeuvres with smoothness and accuracy;
  - (3) exercise good judgement and airmanship;
  - (4) apply aeronautical knowledge;
  - (5) maintain control of the helicopter at all times in such a manner that the successful outcome of a procedure or manoeuvre is never seriously in doubt.
- (d) The following limits are for general guidance. The FE should make allowance for turbulent conditions and the handling qualities and performance of the helicopter used.
- (1) height:
    - (i) normal forward flight  $\pm 150$  ft
    - (ii) with simulated major emergency  $\pm 200$  ft
    - (iii) hovering IGE flight  $\pm 2$  ft
  - (2) heading or tracking of radio aids:
    - (i) normal flight  $\pm 10^\circ$
    - (ii) with simulated major emergency  $\pm 15^\circ$
  - (3) speed:
    - (i) take-off approach  $- 10$  knots/ $+15$  knots
    - (ii) all other flight regimes  $\pm 15$  knots
  - (4) ground drift:
    - (i) take-off hover IGE  $\pm 3$  ft
    - (ii) landing no sideways or backwards Movement

## **CONTENT OF THE SKILL TEST**

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- (e) The skill test contents and sections set out in this AMC should be used for the skill test for the issue of a PPL(H) on SE or ME helicopters.

**SECTION 1 PRE-FLIGHT OR POST-FLIGHT CHECKS AND PROCEDURES**

Use of checklist, airmanship, control of helicopter by external visual reference, anti-icing procedures, etc. apply in all sections

- |   |   |
|---|---|
| a | Helicopter knowledge, (for example technical log, fuel, mass and balance, performance), flight planning, NOTAM and weather briefing |
| b | Pre-flight inspection or action, location of parts and purpose  |
| c | Cockpit inspection and starting procedure   |
| d | Communication and navigation equipment checks, selecting and setting frequencies  |
| e | Pre-take-off procedure, R/T procedure and ATC compliance  |
| f | Parking, shutdown and post-flight procedure   |

**SECTION 2 HOVER MANOEUVRES, ADVANCED HANDLING AND CONFINED AREAS**

- |   |  |
|---|--|
| a | Take-off and landing (lift-off and touch down)                                       |
| b | Taxi and hover taxi  |
| c | Stationary hover with head, cross or tail wind                                       |
| d | Stationary hover turns, 360° left and right (spot turns)                             |
| e | Forward, sideways and backwards hover manoeuvring                                    |
| f | Simulated engine failure from the hover  |
| g | Quick stops into and downwind  |
| h | Sloping ground or unprepared sites landings and take-offs                            |
| i | Take-offs (various profiles)   |
| j | Crosswind and downwind take-off (if practicable)                                     |
| k | Take-off at maximum take-off mass (actual or simulated)                              |
| l | Approaches (various profiles)  |
| m | Limited power take-off and landing   |
| n | Autorotations, (FE to select two items from: basic, range, low speed and 360° turns) |
| o | Autorotative landing   |
| p | Practice forced landing with power recovery  |
| q | Power checks, reconnaissance technique, approach and departure technique             |

**SECTION 3 NAVIGATION - EN ROUTE PROCEDURES**

- |   |   |
|---|---|
| a | Navigation and orientation at various altitudes or heights and map reading                |
| b | Altitude or height, speed, heading control, observation of airspace and altimeter setting |

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c	Monitoring of flight progress, flight log, fuel usage, endurance, ETA, assessment of track error and re-establishment of correct track and instrument monitoring
d	Observation of weather conditions and diversion planning
e	Use of navigation aids (where available)
f	ATC liaison with due observance of regulations, etc.
<b>SECTION 4 FLIGHT PROCEDURES AND MANOEUVRES</b>	
a	Level flight, control of heading, altitude or height and speed
b	Climbing and descending turns to specified headings
c	Level turns with up to 30° bank, 180° to 360° left and right
d	Level turns 180° left and right by sole reference to instruments
<b>SECTION 5 ABNORMAL AND EMERGENCY PROCEDURES (SIMULATED WHERE APPROPRIATE)</b>	
Note (1) Where the test is conducted on an ME helicopter, a simulated engine failure drill, including an SE approach and landing should be included in the test.	
Note (2) The FE should select four items from the following:	
a	Engine malfunctions, including governor failure, carburettor or engine icing and oil system, as appropriate
b	Fuel system malfunction
c	Electrical system malfunction
d	Hydraulic system malfunction, including approach and landing without hydraulics, as applicable
e	Main rotor or anti-torque system malfunction (FFS or discussion only)
f	Fire drills, including smoke control and removal, as applicable
g	Other abnormal and emergency procedures as outlined in an appropriate flight manual and with reference to <a href="#">Appendix 9 C</a> to MCAR-Part-FCL, sections 3 and 4, including for ME helicopters: <ul style="list-style-type: none"> <li>(a) Simulated engine failure at take-off: <ul style="list-style-type: none"> <li>(1) rejected take-off at or before TDP or safe forced landing at or before DPATO;</li> <li>(2) shortly after TDP or DPATO.</li> </ul> </li> <li>(b) Landing with simulated engine failure: <ul style="list-style-type: none"> <li>(1) landing or go-around following engine failure before LDP or DPBL;</li> <li>(2) following engine failure after LDP or safe forced landing after DPBL.</li> </ul> </li> </ul>



### **AMC3 FCL.235 Skill test**

#### **CONTENT OF THE SKILL TEST FOR THE ISSUE OF THE PPL(AS)**

- (a) The area and route to be flown is chosen by the FE. Routes used for section 3 may end at the aerodrome of departure or at another aerodrome and one destination should be a controlled aerodrome. The skill test may be conducted in two flights. The total duration of the flight(s) should be at least 60 minutes.
- (b) The applicant should demonstrate the ability to:
  - (1) operate the airship within its limitations;
  - (2) complete all manoeuvres with smoothness and accuracy;
  - (3) exercise good judgement and airmanship;
  - (4) apply aeronautical knowledge;
  - (5) maintain control of the airship at all times in such a manner that the successful outcome of a procedure or manoeuvre is never seriously in doubt.

#### **FLIGHT TEST TOLERANCES**

- (c) The following limits should apply, corrected to make allowance for turbulent conditions and the handling qualities and performance of the airship used.
  - (1) height:
    - (i) normal flight  $\pm 200$  ft
    - (ii) simulated major emergency  $\pm 300$  ft
  - (2) tracking on radio aids:  $\pm 15^\circ$
  - (3) heading:
    - (i) normal flight  $\pm 15^\circ$
    - (ii) simulated major emergency  $\pm 20^\circ$

#### **CONTENT OF THE TEST**

- (d) The skill test contents and sections set out in this AMC should be used for the skill test for the issue of a PPL(As).

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- (e) Items in sections 5 and 6 may be performed in an FNPT (As) or a FS (As).

**SECTION 1 PRE-FLIGHT OPERATIONS AND DEPARTURE**

Use of airship checklists, airmanship, control of airship by external visual reference, anti-icing procedures, and principles of threat and error management, etc. apply in all sections

- |   |  |
|---|--|
| a | Pre-flight, including:<br>flight planning, documentation, mass and balance, NOTAM and weather briefing |
| b | Airship inspection and servicing   |
| c | Off-mast procedure, ground manoeuvring and take-off  |
| d | Performance considerations and trim  |
| e | Aerodrome and traffic pattern operations   |
| f | Departure procedure, altimeter setting, collision avoidance (look-out)                                 |
| g | ATC compliance and R/T procedures  |

**SECTION 2 GENERAL AIRWORK**

- |   |  |
|---|--|
| a | Control of the airship by external visual reference, including straight and level, climb, descent and look-out   |
| b | Flight close to pressure height  |
| c | Turns  |
| d | Steep descents and climbs  |
| e | Flight by reference solely to instruments, including:<br>i. Level flight, control of heading, altitude and air speed;<br>ii. Climbing and descending turns;<br>iii. Recoveries from unusual attitudes. |
| f | ATC compliance and R/T procedures  |

**SECTION 3 EN-ROUTE PROCEDURES**

- |   |  |
|---|--|
| a | Flight plan, dead reckoning and map reading  |
| b | Maintenance of altitude, heading and speed and collision avoidance (look-out procedures)             |
| c | Orientation, timing and revision of ETAs and log keeping   |
| d | Observation of weather conditions and diversion to alternate aerodrome (planning and implementation) |
| e | Use of radio navigation aids   |
| f | Flight management (checks, fuel systems, etc.)   |
| g | ATC compliance and R/T procedures  |

**SECTION 4 APPROACH AND LANDING PROCEDURES**

- |   |  |
|---|--|
| a | Aerodrome arrival procedures, altimeter setting, checks and look-out |
| b | ATC compliance and R/T procedures                                    |

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c	Go-around action
d	Normal landing
e	Short field landing
f	Post-flight actions
<b>SECTION 5 ABNORMAL AND EMERGENCY PROCEDURES</b>	
This section may be combined with sections 1 through 4	
a	Simulated engine failure after take-off (at a safe altitude) and fire drill
b	Equipment malfunctions
c	Forced landing (simulated)
d	ATC compliance and R/T procedures
e	Oral questions
<b>SECTION 6 RELEVANT TYPE ITEMS</b>	
This section may be combined with sections 1 through 5	
a	Simulated engine failure during take-off (at a safe altitude unless carried out in a FFS)
b	Approach and go-around with failed engine(s)
c	Approach and full stop landing with failed engine(s)
d	Malfunctions in the envelope pressure system
e	ATC compliance, R/T procedures and airmanship
f	As determined by the FE: any relevant items of the type rating skill test to include, if applicable: i. Airship systems; ii. Operation of envelope pressure system.
g	Oral questions

## **SECTION 2 – SPECIFIC REQUIREMENTS FOR THE PPL AEROPLANES – PPL(A)**

### **FCL.205.A PPL(A) – Privileges**

- (a) The privileges of the holders of a PPL(A) are to act without remuneration as PIC or co-pilots of aeroplanes or TMGs engaged in non-commercial operations and to exercise all privileges of holders of an LAPL(A).
- (b) Notwithstanding the paragraph above, the holder of a PPL(A) with instructor or examiner privileges may receive remuneration for:
  - (1) the provision of flight instruction for the LAPL(A) or PPL(A);
  - (2) the conduct of skill tests and proficiency checks for the licences specified in point (1);
  - (3) the training, testing and checking for the ratings or certificates associated with the instructor's or examiner's licence, as applicable.

### **FCL.210.A PPL(A) – Experience requirements and crediting**

- (a) Applicants for a PPL(A) shall have completed at least 45 hours of flight instruction in aeroplanes or TMGs, of which 5 hours may have been completed in an FSTD, including at least the following:
  - (1) 25 hours of dual flight instruction;
  - (2) 10 hours of supervised solo flight time, including at least 5 hours of solo cross-country flight time with at least one cross-country flight of at least 270 km (150 NM), during which full-stop landings at two aerodromes different from the aerodrome of departure shall be made.

Applicants may complete the flight time of a night rating training course in accordance with point FCL.810(a)(1)(ii) as part of the 45 hours of flight instruction, provided that, before commencing night rating training, they have completed basic instrument flight training.

- (b) Specific requirements for applicants that have undergone LAPL(A) training. Applicants for a PPL(A) shall receive credits for previous LAPL(A) training they have undergone and shall be issued with a PPL(A), provided that the LAPL(A) training and the PPL(A) training that they completed in total complies with the

experience requirements in point (a). However, in such a case all of the following shall apply:

- (1) if applicants already hold an LAPL(A), all of the following shall apply, provided that applicants have completed at least 45 hours of total flight time in aeroplanes or TMGs:
  - (i) the requirement in the introductory sentence of point (a) is reduced to 40 hours of flight instruction;
  - (ii) the requirement in point (a)(1) is reduced to 21 hours of dual flight instruction;
- (2) applicants shall have completed at least all of the following with an instructor that is qualified to instruct for a PPL(A):
  - (i) 5 hours of dual flight instruction;
  - (ii) solo flight time as specified in point (a)(2).
- (c) Specific requirements for applicants who hold an SPL issued in accordance with MCAR-Part-SFCL, including privileges to fly TMGs. Applicants for a PPL(A) who hold an SPL with the privileges to fly TMGs shall have completed:
  - (1) at least 24 hours of flight time on TMGs after endorsement of the TMG privileges; and
  - (2) at least 15 hours of flight instruction in aeroplanes in a training course at a DTO or at an ATO, including at least the requirements of point (a)(2).
- (d) Crediting. Applicants holding a pilot licence for another category of aircraft, with the exception of balloons, shall be credited with 10 % of their total flight time as PIC on such aircraft up to a maximum of 10 hours. The amount of credit given shall in any case not include the requirements in (a)(2).

## **SECTION 3 – SPECIFIC REQUIREMENTS FOR THE PPL HELICOPTERS – PPL(H)**

### **FCL.205.H PPL(H) – Privileges**

- (a) The privileges of the holder of a PPL(H) are to act without remuneration as PIC or co-pilot of helicopters engaged in non-commercial operations and to exercise all privileges of holders of an LAPL(H).
- (b) Notwithstanding the paragraph above, the holder of a PPL(H) with instructor or examiner privileges may receive remuneration for:
  - (1) the provision of flight instruction for the LAPL(H) or the PPL(H);
  - (2) the conduct of skill tests and proficiency checks for the licences specified in point (1);
  - (3) the training, testing and checking for the ratings or certificates associated with the instructor's or examiner's licence, as applicable.

### **FCL.210.H PPL(H) – Experience requirements and crediting**

- (a) Applicants for a PPL(H) shall have completed at least 45 hours of flight instruction on helicopters, of which 5 hours may have been completed in an FSTD, including at least:
  - (1) 25 hours of dual flight instruction; and
  - (2) 10 hours of supervised solo flight time, including at least 5 hours of solo cross-country flight time with at least 1 cross-country flight of at least 185 km (100 NM), with full stop landings at 2 aerodromes different from the aerodrome of departure.
  - (3) 35 of the 45 hours of flight instruction have to be completed on the same type of helicopter as the one used for the skill test.
- (b) Specific requirements for applicants that have undergone LAPL(H) training. Applicants for a PPL(H) shall receive credits for previous LAPL(H) training they have undergone and shall be issued with a PPL(H), provided that the LAPL(H) training and the PPL(H) training that they completed in total complies with the experience requirements in point (a).

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- (c) Applicants holding a pilot licence for another category of aircraft, with the exception of balloons, shall be credited with 10 % of their total flight time as PIC on such aircraft up to a maximum of 6 hours. The amount of credit given shall in any case not include the requirements in (a)(2).

## **SECTION 4 – SPECIFIC REQUIREMENTS FOR THE PPL AIRSHIPS – PPL(AS)**

### **FCL.205.As PPL(As) – Privileges**

- (a) The privileges of the holder of a PPL(As) are to act without remuneration as PIC or co-pilot on airships engaged in non-commercial operations.
- (b) Notwithstanding the paragraph above, the holder of a PPL(As) with instructor or examiner privileges may receive remuneration for:
  - (1) the provision of flight instruction for the PPL(As);
  - (2) the conduct of skill tests and proficiency checks for the licence specified in point (1);
  - (3) the training, testing and checking for the ratings or certificates associated with the instructor's or examiner's licence, as applicable.

### **FCL.210.As PPL(As) – Experience requirements and crediting**

- (a) Applicants for a PPL(As) shall have completed at least 35 hours of flight instruction in airships, 5 of which may have been completed in an FSTD, including at least:
  - (1) 25 hours of dual flight instruction, including:
    - (i) 3 hours of cross-country flight training, including 1 cross-country flight of at least 65 km (35 NM);
    - (ii) 3 hours of instrument instruction;
  - (2) 8 take-offs and landings at an aerodrome, including masting and unmasting procedures;
  - (3) 8 hours of supervised solo flight time.
- (b) Applicants who hold a BPL issued in accordance with MCAR-Part-BFCL and are qualified to fly hot-air airships shall be credited with 10 % of their total flight time as PIC on such airships and up to a maximum of 5 hours.



**AMC1 FCL.210.As PPL(As) – Experience requirements and crediting**

**FLIGHT INSTRUCTION FOR THE PPL(AS)**

(a) Entry to training

Before being accepted for training an applicant should be informed that the appropriate medical certificate must be obtained before solo flying is permitted.

(b) Flight instruction

(1) The PPL(As) flight instruction syllabus should take into account the principles of threat and error management and cover:

- (i) pre-flight operations, including mass and balance determination, airship inspection and servicing;
- (ii) ground manoeuvring, masting and unmasting procedures;
- (iii) aerodrome and traffic pattern operations, collision avoidance precautions and procedures;
- (iv) control of the airship by external visual reference;
- (v) take-offs and landings;
- (vi) flight by reference solely to instruments, including the completion of a level 180 ° turn;
- (vii) cross-country flying using visual reference, dead reckoning and radio navigation aids;
- (viii) emergency operations, including simulated airship equipment malfunctions;
- (ix) operations to, from and transiting controlled aerodromes, compliance with air traffic services procedures, communication procedures and phraseology.

(2) Before allowing the applicant for a PPL(As) to undertake his/her first solo flight, the FI should ensure that the applicant can use R/T communication.

(c) Syllabus of flight instruction

- (1) The numbering of exercises should be used primarily as an exercise reference list and as a broad instructional sequencing guide; therefore the demonstrations and practices need not necessarily be given in the order listed. The actual order and content will depend upon the following interrelated factors:
  - (i) the applicant's progress and ability;
  - (ii) the weather conditions affecting the flight;
  - (iii) the flight time available;
  - (iv) instructional technique considerations;
  - (v) the local operating environment;
  - (vi) applicability of the exercises to the airship.
- (2) Each of the exercises involves the need for the applicant to be aware of the needs of good airmanship and look-out, which should be emphasised at all times.
  - (i) Exercise 1a: Familiarisation with the airship:
    - (A) characteristics of the airship;
    - (B) cockpit layout;
    - (C) systems;
    - (D) checklists, drills and controls.
  - (ii) Exercise 1b: Emergency drills:
    - (A) action if fire on the ground and in the air;
    - (B) engine cabin and electrical system fire;
    - (C) systems failure;
    - (D) escape drills, location and use of emergency equipment and exits.
  - (iii) Exercise 2: Preparation for and action after flight:

- (A) flight authorisation and airship acceptance;
  - (B) serviceability documents;
  - (C) equipment required, maps, etc.;
  - (D) mass and balance;
  - (E) external checks;
  - (F) ground crew briefing;
  - (G) internal checks;
  - (H) harness, seat or rudder panel adjustments;
  - (I) starting and warm-up checks;
  - (J) power checks;
  - (K) running down system checks and switching off the engine;
  - (L) parking, security and masting;
  - (M) completion of authorisation sheet and serviceability documents.
- (iv) Exercise 3: Air experience: flight exercise.
- (v) Exercise 4: Effects of controls:
- (A) primary effects;
  - (B) further effects;
  - (C) effects of:
    - (a) air speed;
    - (b) power;
    - (c) trimming controls;
    - (d) other controls, as applicable.
  - (D) operation of:

- (a) mixture control;
  - (b) carburettor heat;
  - (c) cabin heating or ventilation.
- (vi) Exercise 5: Ground manoeuvring:
  - (A) pre-taxi checks;
  - (B) starting, control of speed and stopping;
  - (C) engine handling;
  - (D) masting procedures;
  - (E) control of direction and turning;
  - (F) effects of wind;
  - (G) effects of ground surface;
  - (H) marshalling signals;
  - (I) instrument checks;
  - (J) air traffic control procedures;
  - (K) emergencies.
- (vii) Exercise 6a: Take-off procedures:
  - (A) pre-take-off checks;
  - (B) take-off with different static heaviness;
  - (C) drills during and after take-off;
  - (D) noise abatement procedures.
- (viii) Exercise 6b: Emergencies:
  - (A) abandoned take-off;
  - (B) engine failure after take-off;

- (C) malfunctions of thrust vector control;
  - (D) aerodynamic control failures;
  - (E) electrical and system failures.
- (ix) Exercise 7: Climbing:
- (A) entry, maintaining the normal and max rate climb and levelling off;
  - (B) levelling off at selected altitudes;
  - (C) maximum angle of climb;
  - (D) maximum rate of climb.
- (x) Exercise 8: Straight and level:
- (A) attaining and maintaining straight and level flight;
  - (B) flight at or close to pressure height;
  - (C) control in pitch, including use of trim;
  - (D) at selected air speeds (use of power);
  - (E) during speed changes;
  - (F) use of instruments for precision.
- (xi) Exercise 9: Descending:
- (A) entry, maintaining and levelling off;
  - (B) levelling off at selected altitudes;
  - (C) maximum rate of descent;
  - (D) maximum angle of descent;
  - (E) use of instruments for precision flight.
- (xii) Exercise 10: Turning:
- (A) entry and maintaining level turns;

- (B) resuming straight flight;
- (C) faults in the turn;
- (D) climbing turns;
- (E) descending turns;
- (F) turns onto selected headings, use of gyro heading indicator and compass;
- (G) use of instruments for precision.
- (xiii) Exercise 11: Hovering: hovering manoeuvres (as applicable);
- (xiv) Exercise 12a: Approach and landing:
  - (A) effect of wind on approach and touchdown speeds;
  - (B) landing with different static heaviness;
  - (C) missed approach and go-around procedures;
  - (D) noise abatement procedures.
- (xv) Exercise 12b: Emergencies:
  - (A) aborted approach or go-around;
  - (B) malfunction of thrust vector control;
  - (C) envelope emergencies;
  - (D) fire emergencies;
  - (E) aerodynamic control failures;
  - (F) electrical and system failures.
- (xvi) Exercise 13: Precautionary landing:
  - (A) occasions necessitating;
  - (B) in-flight conditions;
  - (C) landing area selection;

- (D) circuit and approach;
- (E) actions after landing;
- (xvii) Exercise 14a: Navigation:
  - (A) flight planning:
    - (a) weather forecast and actuals;
    - (b) map selection and preparation:
      - (1) choice of route;
      - (2) airspace structure;
      - (3) sensitive areas;
      - (4) safety altitudes.
    - (c) calculations:
      - (1) magnetic heading(s) and time(s) en-route;
      - (2) fuel consumption;
      - (3) mass and balance;
      - (4) performance.
    - (d) flight information:
      - (1) NOTAMs etc.;
      - (2) radio frequencies;
      - (3) selection of alternate aerodromes.
    - (e) airship documentation;
    - (f) notification of the flight:
      - (1) pre-flight administrative procedures;
      - (2) flight plan form.

- (B) departure:
  - (a) organisation of cockpit workload;
  - (b) departure procedures:
    - (1) altimeter settings;
    - (2) ATC liaison in controlled or regulated airspace;
    - (3) setting heading procedure;
    - (4) noting of ETAs.
  - (c) maintenance of altitude and heading;
  - (d) revisions of ETA and heading;
  - (e) log keeping;
  - (f) use of radio;
  - (g) use of nav aids;
  - (h) minimum weather conditions for continuation of flight;
  - (i) in-flight decisions;
  - (j) transiting controlled or regulated airspace;
  - (k) diversion procedures;
  - (l) uncertainty of position procedure;
  - (m) lost procedure.
- (C) arrival, aerodrome joining procedure:
  - (a) ATC liaison in controlled or regulated airspace;
  - (b) altimeter setting;
  - (c) entering the traffic pattern;
  - (d) circuit procedures;



- (e) parking or on masting;
  - (f) security of airship;
  - (g) refuelling;
  - (h) closing of flight plan, if appropriate;
  - (i) post-flight administrative procedures.
- (xviii) Exercise 14b: Navigation problems at lower levels and in reduced visibility:
  - (A) actions before descending;
  - (B) hazards (for example obstacles, and terrain);
  - (C) difficulties of map reading;
  - (D) effects of winds, turbulence and precipitation;
  - (E) vertical situational awareness;
  - (F) avoidance of noise sensitive areas;
  - (G) joining the circuit;
  - (H) bad weather circuit and landing.
- (xix) Exercise 14c: Radio navigation:
  - (A) use of GNSS
    - (a) selection of waypoints;
    - (b) to or from indications and orientation;
    - (c) error messages.
  - (B) use of VHF omni range (if applicable):
    - (a) availability, AIP and frequencies;
    - (b) selection and identification;
    - (c) OBS;

- (d) to or from indications and orientation;
- (e) CDI;
- (f) determination of radial;
- (g) intercepting and maintaining a radial;
- (h) VOR passage;
- (i) obtaining a fix from two VORs.
- (C) use of ADF equipment: NDBs (if applicable):
  - (a) availability, AIP and frequencies;
  - (b) selection and identification;
  - (c) orientation relative to the beacon;
  - (d) homing.
- (D) use of VHF/DF:
  - (a) availability, AIP and frequencies;
  - (b) R/T procedures and ATC liaison;
  - (c) obtaining a QDM and homing.
- (E) use of en-route or terminal radar:
  - (a) availability and AIP;
  - (b) procedures and ATC liaison;
  - (c) pilot's responsibilities;
  - (d) secondary surveillance radar:
    - (1) transponders;
    - (2) code selection;
    - (3) interrogation and reply.

- (F) use of DME (if applicable);
  - (a) station selection and identification;
  - (b) modes of operation: distance, groundspeed and time to run.
- (xx) Exercise 15: Basic instrument flight:
  - (A) physiological sensations;
  - (B) instrument appreciation: attitude instrument flight;
  - (C) instrument limitations;
  - (D) basic manoeuvres:
    - (a) straight and level;
    - (b) climbing and descending;
    - (c) turns, climbing and descending, onto selected headings;
    - (d) recoveries from climbing and descending turns.
- (d) BITD
  - (1) A BITD may be used for flight training for:
    - (i) flight by reference solely to instruments;
    - (ii) navigation using radio navigation aids;
    - (iii) basic instrument flight.
  - (2) The use of the BITD should be subject to the following:
    - (i) the training should be complemented by exercises on an airship;
    - (ii) the record of the parameters of the flight must be available; and an FI(As) should conduct the instruction.

## **SUBPART D – COMMERCIAL PILOT LICENCE – CPL**

### **SECTION 1 – COMMON REQUIREMENTS**

#### **FCL.300 CPL – Minimum age**

An applicant for a CPL shall be at least 18 years of age.

#### **FCL.305 CPL – Privileges and conditions**

- (a) Privileges. The privileges of the holder of a CPL are, within the appropriate aircraft category, to:
  - (1) exercise all the privileges of the holder of an LAPL and a PPL;
  - (2) act as PIC or co-pilot of any aircraft engaged in operations other than commercial air transport;
  - (3) act as PIC in commercial air transport of any single-pilot aircraft subject to the restrictions specified in FCL.060 and in this Subpart;
  - (4) act as co-pilot in commercial air transport subject to the restrictions specified in FCL.060.
- (b) Conditions. An applicant for the issue of a CPL shall have fulfilled the requirements for the class or type rating of the aircraft used in the skill test.

#### **FCL.310 CPL – Theoretical knowledge examinations**

Applicants for the issue of a CPL shall demonstrate a level of knowledge appropriate to the privileges granted in the following subjects:

- (a) air law;
- (b) aircraft general knowledge — airframe/systems/power plant;
- (c) aircraft general knowledge — instrumentation;
- (d) mass and balance;
- (e) performance;
- (f) flight planning and monitoring;

- (g) human performance;
- (h) meteorology;
- (i) general navigation;
- (j) radio navigation;
- (k) operational procedures;
- (l) principles of flight; and
- (m) communications.

**AMC1 FCL.310; FCL.515(b); FCL.615(b); FCL.835(d) Theoretical knowledge examinations**

**LEARNING OBJECTIVES FOR ATPL, CPL, IR, CB-IR(A) and BIR**

- (a) Aeroplanes and helicopters

**GENERAL**

In the tables of this AMC, the applicable LOs for each ATPL, CPL, IR, CB-IR(A) are marked with an 'X', and for the BIR exam and BIR BK with the number 1, 2 or 3 (corresponding to the modules as mentioned in FCL.835 'Basic instrument rating (BIR)').

The LOs define the subject knowledge and applied knowledge, skills and attitudes that a student pilot should have assimilated during the theoretical knowledge course.

The LOs are intended to be used by an approved training organisation (ATO) when developing the MCAR-Part-FCL theoretical knowledge elements of the appropriate course. It should be noted, however, that the LOs do not provide a ready-made ground training syllabus for individual ATOs, and should not be seen by organisations as a substitute for a thorough course design. Adherence to the LOs should become part of the ATO's compliance monitoring scheme as required by ORA.GEN.200(a)(6).

ATOs are required to produce a training plan for each of their courses based on the instructional systems design (ISD) methodology as specified in AMC2 ORA.ATO.230 of MCAR-Part-ORA.

Additional guidance on the meaning and taxonomy of the verbs used in the LOs can be found in GM1 FCL.310; FCL.515(b); FCL.615(b); FCL.835(d).

### **TRAINING AIMS**

After completion of the training, a student pilot should:

- be able to understand and apply the subject knowledge in order to be able to identify and manage threats and errors effectively;
- meet at least the Area 100 KSA minimum standard.

### **INTERPRETATION**

The abbreviations used are ICAO abbreviations listed in ICAO Doc 8400 'ICAO Abbreviations and Codes', or those listed in GM1 FCL.010.

Where a LO refers to a definition, e.g. 'Define the following terms' or 'Define and understand' or 'Explain the definitions in ...', candidates are also expected to be able to recognise a given definition.

Below is a table showing the short references to applicable legislation and standards:

#### **SECTION 1 PRE-FLIGHT OPERATIONS AND DEPARTURE**

Use of airship checklists, airmanship, control of airship by external visual reference, anti-icing procedures, and principles of threat and error management, etc. apply in all sections

- |   |  |
|---|--|
| a | Pre-flight, including:<br>flight planning, documentation, mass and balance, NOTAM and weather briefing |
| b | Airship inspection and servicing   |
| c | Off-mast procedure, ground manoeuvring and take-off  |
| d | Performance considerations and trim  |
| e | Aerodrome and traffic pattern operations   |
| f | Departure procedure, altimeter setting, collision avoidance (look-out)                                 |
| g | ATC compliance and R/T procedures  |

#### **SECTION 2 GENERAL AIRWORK**

- |   |  |
|---|--|
| a | Control of the airship by external visual reference, including straight and level, climb, descent and look-out |
| b | Flight close to pressure height  |
| c | Turns  |

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d	Steep descents and climbs
e	Flight by reference solely to instruments, including: <ul style="list-style-type: none"><li>i. Level flight, control of heading, altitude and air speed;</li><li>ii. Climbing and descending turns;</li><li>iii. Recoveries from unusual attitudes.</li></ul>
f	ATC compliance and R/T procedures
<b>SECTION 3 EN-ROUTE PROCEDURES</b>	
a	Flight plan, dead reckoning and map reading
b	Maintenance of altitude, heading and speed and collision avoidance (look-out procedures)
c	Orientation, timing and revision of ETAs and log keeping
d	Observation of weather conditions and diversion to alternate aerodrome (planning and implementation)
e	Use of radio navigation aids
f	Flight management (checks, fuel systems, etc.)
g	ATC compliance and R/T procedures
<b>SECTION 4 APPROACH AND LANDING PROCEDURES</b>	
a	Aerodrome arrival procedures, altimeter setting, checks and look-out
b	ATC compliance and R/T procedures
c	Go-around action
d	Normal landing
e	Short field landing
f	Post-flight actions
<b>SECTION 5 ABNORMAL AND EMERGENCY PROCEDURES</b>	
This section may be combined with sections 1 through 4	
a	Simulated engine failure after take-off (at a safe altitude) and fire drill
b	Equipment malfunctions
c	Forced landing (simulated)
d	ATC compliance and R/T procedures
e	Oral questions
<b>SECTION 6 RELEVANT TYPE ITEMS</b>	
This section may be combined with sections 1 through 5	
a	Simulated engine failure during take-off (at a safe altitude unless carried out in a FFS)
b	Approach and go-around with failed engine(s)
c	Approach and full stop landing with failed engine(s)
d	Malfunctions in the envelope pressure system
e	ATC compliance, R/T procedures and airmanship

f	As determined by the FE: any relevant items of the type rating skill test to include, if applicable: i. Airship systems; ii. Operation of envelope pressure system.
g	Oral questions

‘Applicable operational requirements’ refers to, for the ATPL(A), CPL(A), ATPL(H)/IR, ATPL(H)/VFR, CPL(H), IR and CBIR, MCAR-Part-o, MCAR-Part-ARO, MCAR-Part-ORO; MCAR-Part-CAT;MCAR-Part-SPA.

The General Student Pilot Route Manual (GSPRM) contains planning data plus aerodrome and approach charts that may be used in theoretical knowledge training courses. The guidelines on its content can be found in this AMC, before the LO table for Subject 033 ‘Flight planning and monitoring’.

Excerpts from any aircraft manuals including but not limited to CAP 696, 697 and 698 for aeroplanes, and CAP 758 for helicopters may be used in training. Where questions refer to excerpts from aircraft manuals, the associated aircraft data will be provided in the examinations.

Some numerical data (e.g. speeds, altitudes/levels and masses) used in questions for theoretical knowledge examinations may not be representative for helicopter operations, but the data is satisfactory for the calculations required.

Note: In all subject areas, the term ‘mass’ is used to describe a quantity of matter, and ‘weight’ when describing the force. However, the term ‘weight’ is normally used in aviation to colloquially describe mass. The pilot should always note the units to determine whether the term ‘weight’ is being used to describe a force (e.g. unit newton) or quantity of matter (e.g. unit kilogram).

## **DETAILED THEORETICAL KNOWLEDGE SYLLABUS AND LOs FOR ATPL, CPL, IR, CB-IR(A) and BIR**

### **GENERAL**

The detailed theoretical knowledge syllabus outlines the topics that should be taught and examined in order to meet the theoretical knowledge requirements appropriate to ATPL, MPL, CPL, IR, CB-IR(A) and BIR.

For each topic in the detailed theoretical knowledge syllabus, one or more LOs are set out in the appendices as shown below:

— Appendix 010 AIR LAW



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- Appendix 021 AIRCRAFT GENERAL KNOWLEDGE – AIRFRAME, SYSTEMS AND POWER PLANT
- Appendix 022 AIRCRAFT GENERAL KNOWLEDGE – INSTRUMENTATION
- Appendix 031 FLIGHT PERFORMANCE AND PLANNING – MASS AND BALANCE
- Appendix 032 FLIGHT PERFORMANCE AND PLANNING – PERFORMANCE – AEROPLANES
- Appendix 033 FLIGHT PERFORMANCE AND PLANNING – FLIGHT PLANNING AND MONITORING
- Appendix 034 FLIGHT PERFORMANCE AND PLANNING – PERFORMANCE – HELICOPTERS
- Appendix 040 HUMAN PERFORMANCE AND LIMITATIONS
- Appendix 050 METEOROLOGY
- Appendix 061 NAVIGATION – GENERAL NAVIGATION
- Appendix 062 NAVIGATION – RADIO NAVIGATION
- Appendix 070 OPERATIONAL PROCEDURES
- Appendix 081 PRINCIPLES OF FLIGHT – AEROPLANES
- Appendix 082 PRINCIPLES OF FLIGHT – HELICOPTERS
- Appendix 090 RADIO COMMUNICATIONS
- Appendix AREA 100 KNOWLEDGE, SKILLS AND ATTITUDES (KSA)

(b) Airships

**SYLLABUS OF THEORETICAL KNOWLEDGE FOR CPL AND IR**

The applicable items for each licence or rating are marked with 'x'. An 'x' on the main title of a subject means that all the subdivisions are applicable.'

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		CPL	IR
1.	<b>AIR LAW AND ATC PROCEDURES</b>	X	
	INTERNATIONAL LAW: CONVENTIONS, AGREEMENTS AND ORGANISATIONS		
	AIRWORTHINESS OF AIRCRAFT		
	AIRCRAFT NATIONALITY AND REGISTRATION MARKS		
	PERSONNEL LICENSING		X
	RULES OF THE AIR		X
	PROCEDURES FOR AIR NAVIGATION SERVICES: AIRCRAFT OPERATIONS		X
	AIR TRAFFIC SERVICES AND AIR TRAFFIC MANAGEMENT		X
	AERONAUTICAL INFORMATION SERVICE		X
	AERODROMES		X
	FACILITATION		
	SEARCH AND RESCUE		
	SECURITY		
	AIRCRAFT ACCIDENT AND INCIDENT INVESTIGATION		
2.	<b>AIRSHIP GENERAL KNOWLEDGE: ENVELOPE, AIRFRAME AND SYSTEMS, ELECTRICS, POWERPLANT AND EMERGENCY EQUIPMENT</b>	X	

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		<b>CPL</b>	<b>IR</b>
	DESIGN, MATERIALS, LOADS AND STRESSES		
	ENVELOPE AND AIR-BAGS		
	FRAMEWORK		
	GONDOLA		
	FLIGHT CONTROLS		
	LANDING GEAR		
	HYDRAULICS AND PNEUMATICS		
	HEATING AND AIR CONDITIONING		
	FUEL SYSTEM		
	PISTON ENGINES		
	TURBINE ENGINES (BASICS)		
	ELECTRICS		
	FIRE PROTECTION AND DETECTION SYSTEMS		
	MAINTENANCE		
<b>3.</b>	<b>AIRSHIP GENERAL KNOWLEDGE: INSTRUMENTATION</b>	X	
	SENSORS AND INSTRUMENTS		
	MEASUREMENT OF AIR DATA AND GAS PARAMETERS		
	MAGNETISM: DIRECT READING COMPASS AND FLUX VALVE		
	GYROSCOPIC INSTRUMENTS		
	COMMUNICATION SYSTEMS		
	ALERTING SYSTEMS		

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		CPL	IR
	INTEGRATED INSTRUMENTS: ELECTRONIC DISPLAYS		
	FLIGHT MANAGEMENT SYSTEM (GENERAL BASICS)		
	DIGITAL CIRCUITS AND COMPUTERS		
<b>4.</b>	<b>FLIGHT PERFORMANCE AND PLANNING</b>	X	
<b>4.1.</b>	<b>MASS AND BALANCE: AIRSHIPS</b>	X	
	PURPOSE OF MASS AND BALANCE CONSIDERATIONS		
	LOADING		
	FUNDAMENTALS OF CG CALCULATIONS		
	MASS AND BALANCE DETAILS OF AIRCRAFT		
	DETERMINATION OF CG POSITION		
	PASSENGER, CARGO AND BALLAST HANDLING		
<b>4.2.</b>	<b>FLIGHT PLANNING AND FLIGHT MONITORING</b>		
	FLIGHT PLANNING FOR VFR FLIGHTS	X	
	FLIGHT PLANNING FOR IFR FLIGHTS		x
	FUEL PLANNING	X	x
	PRE-FLIGHT PREPARATION	X	x
	ATS FLIGHT PLAN	X	x

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		CPL	IR
	FLIGHT MONITORING AND IN-FLIGHT RE-PLANNING	X	x
<b>4.3.</b>	<b>PERFORMANCE: AIR-SHIPS</b>	X	
	AIRWORTHINESS RE-QUIREMENTS		
	BASICS OF AIRSHIP PERFORMANCE		
	DEFINITIONS AND TERMS		
	STAGES OF FLIGHT		
	USE OF FLIGHT MANUAL		
<b>5.</b>	<b>HUMAN PERFORMANCE</b>	X	
	HUMAN FACTORS: BASIC CONCEPTS		
	BASIC AVIATION PHYSIOLOGY AND HEALTH MAINTENANCE		
	BASIC AVIATION PSYCHOLOGY		
<b>6.</b>	<b>METEOROLOGY</b>	X	
	THE ATMOSPHERE		
	WIND		
	THERMODYNAMICS		
	CLOUDS AND FOG		
	PRECIPITATION		
	AIR MASSES AND FRONTS		
	PRESSURE SYSTEMS		
	CLIMATOLOGY		
	FLIGHT HAZARDS		
	METEOROLOGICAL INFORMATION		
<b>7.</b>	<b>NAVIGATION</b>		

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		CPL	IR
<b>7.1.</b>	<b>GENERAL NAVIGATION</b>	X	
	BASICS OF NAVIGATION		
	MAGNETISM AND COMPASSES		
	CHARTS		
	DR NAVIGATION		
	IN-FLIGHT NAVIGATION		
<b>7.2.</b>	<b>RADIO NAVIGATION</b>		
	BASIC RADIO PROPAGATION THEORY	X	x
	RADIO AIDS	X	x
	RADAR	X	x
	INTENTIONALLY LEFT BLANK		
	AREA NAVIGATION SYSTEMS AND RNAV/FMS		x
	GNSS	X	x
<b>8.</b>	<b>OPERATIONAL PROCEDURES AIRSHIP</b>	X	
	GENERAL REQUIREMENTS		
	SPECIAL OPERATIONAL PROCEDURES AND HAZARDS (GENERAL ASPECTS)		
	EMERGENCY PROCEDURES		
<b>9.</b>	<b>PRINCIPLES OF FLIGHT</b>	X	
<b>9.1.</b>	<b>PRINCIPLES OF FLIGHT: AIRSHIPS</b>	X	
	BASICS OF AEROSTATICS		

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		<b>CPL</b>	<b>IR</b>
	BASICS OF SUBSONIC AERODYNAMICS		
	AERODYNAMICS OF AIRSHIPS		
	STABILITY		
	CONTROLLABILITY		
	LIMITATIONS		
	PROPELLERS		
	BASICS OF AIRSHIP FLIGHT MECHANICS		
<b>10.</b>	<b>COMMUNICATIONS</b>		
<b>10.1.</b>	<b>VFR COMMUNICATIONS</b>	X	
	DEFINITIONS	X	
	GENERAL OPERATING PROCEDURES	X	
	RELEVANT WEATHER INFORMATION TERMS (VFR)	X	
	ACTION REQUIRED TO BE TAKEN IN CASE OF COMMUNICATION FAILURE	X	
	DISTRESS AND URGENCY PROCEDURES	X	
	GENERAL PRINCIPLES OF VHF PROPAGATION AND ALLOCATION OF FREQUENCIES	X	
<b>10.2.</b>	<b>IFR COMMUNICATIONS</b>		
	DEFINITIONS		X
	GENERAL OPERATING PROCEDURES		X
	ACTION REQUIRED TO BE TAKEN IN CASE		X

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		CPL	IR
	OF COMMUNICATION FAILURE		
	DISTRESS AND URGENCY PROCEDURES		X
	RELEVANT WEATHER INFORMATION TERMS (IFR)		X
	GENERAL PRINCIPLES OF VHF PROPAGATION AND ALLOCATION OF FREQUENCIES		X
	MORSE CODE		X



## Appendix to AMC1 FCL.310; FCL.515(b); FCL.615(b) Theoretical knowledge examinations

### SUBJECT 010 – AIR LAW

Note that the term ‘mass’ is used to describe a quantity of matter, and ‘weight’ when describing the force. However, the term ‘weight’ is normally used in aviation to colloquially describe mass. The professional pilot should always note the units to determine whether the term ‘weight’ is being used to describe a force (e.g. unit newton) or quantity of matter (e.g. unit kilogram).

- (1) The subjects ‘Air law’ and ‘ATC procedures’ are primarily based on ICAO documentation and European Union regulations.
- (2) National law should not be taken into account for theoretical-examination purposes; it should remain relevant though during practical training and operational flying.

Syllabus reference	BK	Syllabus details and associated Learning Objectives	Aeroplane		Helicopter			IR	CB-IR(A)	BIR Exam	BIR BK	Remarks
			ATPL	CPL	ATPL /IR	ATPL	CPL					
<b>010 00 00 00</b>		<b>AIR LAW</b>										
<b>010 01 00 00</b>		<b>INTERNATIONAL LAW: CONVENTIONS, AGREEMENTS AND ORGANISATIONS</b>										
<b>010 01 01 00</b>		<b>The Convention on International Civil Aviation (Chicago) — ICAO Doc 7300/9</b> <b>Convention on the High Seas (Geneva, 29 April 1958)</b>										
<b>010 01 01 01</b>		<b><i>The establishment of the Convention on International Civil Aviation, Chicago, 7 December 1944</i></b>										
(01)	X	Explain the circumstances that led to the establishment of the Convention	X	X	X	X	X					

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Syllabus reference	BK	Syllabus details and associated Learning Objectives	Aeroplane		Helicopter			IR	CB-IR(A)	BIR Exam	BIR BK	Remarks
			ATPL	CPL	ATPL /IR	ATPL	CPL					
		on International Civil Aviation, Chicago, 7 December 1944.										
<b>010 01 01 02</b>		<b>Part I — Air navigation</b>										
(01)	X	Recall the general contents of relevant parts of the following chapters: — general principles and application of the Convention; — flight over territory of Contracting States; — nationality of aircraft; — international standards and recommended practices (SARPs), especially notification of differences and validity of endorsed certificates and licences.	X	X	X	X	X					
(02)	X	General principles Describe the application of the following terms in civil aviation: — sovereignty; — territory and high seas according to the UN Convention on the High Seas.	X	X	X	X	X					
(03)		Explain the following terms and how they apply to international air traffic: — right of non-scheduled flight (including the two technical freedoms of the air); — scheduled air services; — cabotage; — landing at customs airports;	X	X	X	X	X					

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Syllabus reference	BK	Syllabus details and associated Learning Objectives	Aeroplane		Helicopter			IR	CB-IR(A)	BIR Exam	BIR BK	Remarks
			ATPL	CPL	ATPL /IR	ATPL	CPL					
		<ul style="list-style-type: none"> <li>Rules of the Air;</li> <li>search of aircraft.</li> </ul>										
(04)	X	Explain the duties of Contracting States in relation to: <ul style="list-style-type: none"> <li>documents carried on board the aircraft:               <ul style="list-style-type: none"> <li>certificate of registration;</li> <li>certificates of airworthiness;</li> <li>licences of personnel;</li> <li>recognition of certificates and licences;</li> </ul> </li> <li>cargo restrictions;</li> <li>photographic apparatus.</li> </ul>	X	X	X	X	X					
<b>010 01 01 03</b>		<b>Part II — The International Civil Aviation Organization (ICAO)</b>										
(01)	X	Describe the objectives of ICAO.	X	X	X	X	X					
(02)	X	Recognise the organisation and duties of the ICAO Assembly, Council and Air Navigation Commission (ANC).	X	X	X	X	X					
(03)	X	Describe the annexes to the Convention.	X	X	X	X	X					
<b>010 01 02 00</b>		<b>Other conventions and agreements</b>										
<b>010 01 02 01</b>		<b>The International Air Services Transit Agreement (ICAO Doc 7500)</b>										
(01)		Explain the two technical freedoms of the air.	X	X	X	X	X					

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Syllabus reference	BK	Syllabus details and associated Learning Objectives	Aeroplane		Helicopter			IR	CB-IR(A)	BIR Exam	BIR BK	Remarks
			ATPL	CPL	ATPL /IR	ATPL	CPL					
<b>010 01 02 02</b>		<b>The International Air Transport Agreement (ICAO Doc 9626)</b>										
(01)		Explain the three commercial freedoms of the air.	X	X	X	X	X					
<b>010 01 02 03</b>		<b>Suppression of Unlawful Acts Against the Safety of Civil Aviation — The Tokyo Convention of 1963</b>										
(01)		Describe the measures and actions to be taken by the pilot-in-command (PIC) of an aircraft in order to suppress unlawful acts against the safety of the aircraft.	X	X	X	X	X					
<b>010 01 02 04</b>		<b>Intentionally left blank</b>										
<b>010 01 02 05</b>		<b>Private international law</b>										
(01)		Explain the legal significance of the issue of a passenger ticket or of baggage/cargo documents (that the issue is a form of contract).	X	X	X	X	X					
(02)		Describe the consequences for an airline or the PIC when a document of carriage is not issued (that the contract is unaffected).	X	X	X	X	X					
(03)	X	Explain the consequences for an airline operator of the Consumer Protection Act on passenger rights in the event of delay, cancellation or denial of boarding.	X	X	X	X	X					

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Syllabus reference	BK	Syllabus details and associated Learning Objectives	Aeroplane		Helicopter			IR	CB-IR(A)	BIR Exam	BIR BK	Remarks
			ATPL	CPL	ATPL /IR	ATPL	CPL					
(04)		Explain the liability limit in relation to destruction, loss, damage or delay of baggage.	X	X	X	X	X					
<b>010 01 03 00</b>		<b>World organisations</b>										
<b>010 01 03 01</b>		<b>The International Air Transport Association (IATA)</b>										
(01)		Describe the objectives of IATA.	X		X	X						
<b>010 01 04 00</b>		<b>European organisations</b>										
<b>010 01 04 01</b>		<b>Civil Aviation Regulations and associated MCAR's</b>										
(01)	X	Describe the objectives of EASA.	X	X	X	X	X					
(02)		Describe the role of EASA in European civil aviation.	X	X	X	X	X					
(03)		State that the structure of the regulatory material related to EASA involves: — hard law (regulations, delegated acts, implementing acts, and implementing rules); — soft law (certification specifications, acceptable means of compliance, and guidance material).	X	X	X	X	X					
(04)		State the meaning of the terminology associated with the structure of the regulatory material related to EASA, specifically: regulations, delegated acts, implementing acts, and implementing rules, as applicable until 11	X	X	X	X	X					

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Syllabus reference	BK	Syllabus details and associated Learning Objectives	Aeroplane		Helicopter			IR	CB-IR(A)	BIR Exam	BIR BK	Remarks
			ATPL	CPL	ATPL /IR	ATPL	CPL					
		September 2023; and certification specifications, acceptable means of compliance, and guidance material.										
<b>010 01 04 02</b>		<b>EUROCONTROL</b>										
(01)	X	Describe the Single European Sky (SES) regulations.	X	X	X	X	X					
<b>010 02 00 00</b>		<b>AIRWORTHINESS OF AIRCRAFT, AIRCRAFT NATIONALITY AND REGISTRATION MARKS</b>										
<b>010 02 01 00</b>		<b>Intentionally left blank</b>										
<b>010 02 02 00</b>		<b>Certificate of Airworthiness (CofA)</b>										
<b>010 02 02 01</b>		<b>Certificate of Airworthiness (CofA) — Details</b>										
(01)		State the issuing authority of a CofA.	X	X	X	X	X					
(02)		State the necessity to hold a CofA.	X	X	X	X	X					
(03)	X	Explain the prerequisites for the issue of a CofA according to the civil aviation Regulation.	X	X	X	X	X					
(04)		State who shall determine an aircraft's continuing airworthiness.	X	X	X	X	X					
(05)		Describe how a CofA can be renewed or may remain valid.	X	X	X	X	X					
<b>010 02 03 00</b>		<b>ICAO Annex 7 — Aircraft Nationality and Registration Marks</b>										
<b>010 02 03 01</b>		<b>ICAO Annex 7 — Definitions</b>										
(01)	X	Recall the definition of the following terms:	X	X	X	X	X					

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Syllabus reference	BK	Syllabus details and associated Learning Objectives	Aeroplane		Helicopter			IR	CB-IR(A)	BIR Exam	BIR BK	Remarks
			ATPL	CPL	ATPL /IR	ATPL	CPL					
		— aircraft; — heavier-than-air aircraft; — State of Registry.										
<b>010 02 04 00</b>		<b>Nationality marks, common marks and registration marks</b>										
<b>010 02 04 01</b>		<b>Nationality marks, common marks and registration marks — assignment and location</b>										
(01)		State the location of nationality marks, common marks and registration marks.	X		X							
(02)		Explain who is responsible for assigning nationality marks, common marks and registration marks.	X	X	X	X	X					
<b>010 03 00 00</b>		<b>Intentionally left blank</b>										
<b>010 04 00 00</b>		<b>PERSONNEL LICENSING</b>										
<b>010 04 01 00</b>		<b>ICAO Annex 1</b>										
<b>010 04 01 01</b>		<b>Differences between ICAO Annex 1 and MCAR-Part-FCL (herein after: Aircrew Regulation)</b>										
(01)	X	Describe the relationship and differences between ICAO Annex 1 and the Aircrew Regulation.	X	X	X	X	X	X				
<b>010 04 02 00</b>		<b>Aircrew Regulation — Annex I (Part-FCL)</b> <b>Source: Aircrew Regulation</b>										
<b>010 04 02 01</b>		<b>Definitions</b>										
(01)		Define the following:	X	X	X	X	X	X	X		1	

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Syllabus reference	BK	Syllabus details and associated Learning Objectives	Aeroplane		Helicopter			IR	CB-IR(A)	BIR Exam	BIR BK	Remarks
			ATPL	CPL	ATPL /IR	ATPL	CPL					
		— Category, class and type of aircraft, cross-country, dual instruction time, flight time, student pilot-in-command (SPIC), instrument time, instrument flight time, instrument ground time, night, private pilot, proficiency check, renewal, revalidation, skill test, solo flight time.										
(02)		Define the following: — multi-crew cooperation (MCC), multi-pilot aircraft, rating.	X	X	X	X	X					
<b>010 04 02 02</b>		<b>Content and structure</b>										
(01)	X	Explain the structure of MCAR-Part-FCL.	X	X	X	X	X	X	X		1	
(02)		Explain the requirements to act as a flight crew member of a civil aircraft registered in a State, and know the general principles of the licensing system (light aircraft pilot licence (LAPL), private pilot licence (PPL), commercial pilot licence (CPL), multi-crew pilot licence (MPL), airline transport pilot licence (ATPL)).	X	X	X	X	X	X				
(03)	X	List the two factors that are relevant to the exercise of the privileges of a licence.	X	X	X	X	X	X				



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Syllabus reference	BK	Syllabus details and associated Learning Objectives	Aeroplane		Helicopter			IR	CB-IR(A)	BIR Exam	BIR BK	Remarks
			ATPL	CPL	ATPL /IR	ATPL	CPL					
(04)	X	State the circumstances in which a language proficiency endorsement is required.	X	X	X	X	X	X				
(05)	X	List the restrictions for licence holders with an age of 60 years or more.	X	X	X	X	X					
(06)	X	Explain the term 'competent authority'.	X	X	X	X	X	X				
(07)		Describe the obligation to carry and present documents (e.g. a flight crew licence) under MCAR-Part-FCL.	X	X	X	X	X	X				
<b>010 04 02 03</b>		<b>Commercial pilot licence (CPL)</b>										
(01)	X	State the requirements for the issue of a CPL.	X	X	X	X	X					
(02)		State the privileges of a CPL.	X	X	X	X	X					
<b>010 04 02 04</b>		<b>Airline transport pilot licence (ATPL) and multi-crew pilot licence (MPL)</b>										
(01)	X	State the requirements for the issue of an ATPL.	X		X	X						
(02)		State the privileges of an ATPL.	X		X	X						
(03)	X	State the requirements for the issue of an MPL.	X									
(04)		State the privileges of an MPL.	X									
<b>010 04 02 05</b>		<b>Ratings</b>										
(01)		State the requirements for class ratings, their validity and privileges.	X	X								

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Syllabus reference	BK	Syllabus details and associated Learning Objectives	Aeroplane		Helicopter			IR	CB-IR(A)	BIR Exam	BIR BK	Remarks
			ATPL	CPL	ATPL /IR	ATPL	CPL					
(02)		State the requirements for type ratings, their validity and privileges.	X	X	X	X	X					
(03)		State the requirements for instrument ratings, their validity and privileges (instrument rating (IR), competency-based instrument rating (CB-IR) and basic instrument rating (BIR).	X		X			X	X		1	
(04)		State the requirements for other ratings, their validity and privileges according to MCAR-Part-FCL.	X	X	X	X	X					
<b>010 04 03 00</b>		<b>Aircrew Regulation — Annex IV (Part-MED)</b>										
<b>010 04 03 01</b>		<b>Aircrew Regulation — Annex IV (Part-MED) — Details</b>										
(01)	X	Describe the relevant content of Part-MED — Medical requirements (administrative parts and requirements related to licensing only).	X	X	X	X	X	X				
(02)		State the requirements for the issue of a medical certificate.	X	X	X	X	X	X				
(03)		Name the class of medical certificate required when exercising the privileges of a CPL, MPL or ATPL.	X	X	X	X	X					
(04)		State the actions to be taken in case of a decrease in medical fitness.	X	X	X	X	X	X				
<b>010 05 00 00</b>		<b>RULES OF THE AIR ACCORDING TO ICAO ANNEX 2 AND MCAR-Part-ROA</b>										

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Syllabus reference	BK	Syllabus details and associated Learning Objectives	Aeroplane		Helicopter			IR	CB-IR(A)	BIR Exam	BIR BK	Remarks
			ATPL	CPL	ATPL /IR	ATPL	CPL					
<b>010 05 01 00</b>		<b>Overview of ICAO Annex 2 and MCAR-Part-ROA and its references and subsequent amendments</b>										
<b>010 05 01 01</b>		<b>ICAO Annex 2 and MCAR-Part-ROA— Relationship and content</b>										
(01)		Explain the scope and purpose of ICAO Annex 2.	X	X	X	X	X	X				
(02)		Explain the scope and main content of SERA.	X	X	X	X	X	X				
<b>010 05 02 00</b>		<b>Rules of the Air</b>										
<b>010 05 02 01</b>		<b>Applicability of the Rules of the Air</b>										
(01)		Explain the principle of territorial application of the various Rules of the Air, e.g. ICAO, SERA, national rules.	X	X	X	X	X					
(02)		Explain the necessity to comply with the Rules of the Air.	X	X	X	X	X					
(03)		State the responsibilities of the PIC.	X	X	X	X	X					
(04)		Identify under what circumstances departure from the Rules of the Air may be allowed.	X	X	X	X	X				1, 2, 3	
(05)		Explain the duties of the PIC concerning pre-flight actions in case of an instrument flight rule (IFR) flight.	X		X			X	X	3	1	
(06)		State that the PIC of an aircraft has final authority as to the disposition of the aircraft while in command.	X	X	X	X	X					
(07)		Explain when the use of psychoactive substances, taking into consideration	X	X	X	X	X	X				

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Syllabus reference	BK	Syllabus details and associated Learning Objectives	Aeroplane		Helicopter			IR	CB-IR(A)	BIR Exam	BIR BK	Remarks
			ATPL	CPL	ATPL /IR	ATPL	CPL					
		their effects, by flight crew members is prohibited.										
<b>010 05 03 00</b>		<b>General rules</b>										
<b>010 05 03 01</b>		<b>General rules — Collision avoidance — SERA</b>										
(01)		Describe the rules for the avoidance of collisions.	X	X	X	X	X					
(02)		Describe the lights, including their angles, to be displayed by aircraft.	X	X	X	X	X					
(03)		Interpret marshalling signals.	X	X	X	X	X					
(04)		State the basic requirements for minimum height (HGT) for the flight over congested areas of cities, towns or settlements, or over an open-air assembly of persons.	X	X	X	X	X					
(05)		Define when the cruising levels shall be expressed in terms of flight levels (FLs).	X	X	X	X	X					
(06)		Define under what circumstances cruising levels shall be expressed in terms of altitude (ALT).	X	X	X	X	X					
(07)		Explain the limitation for proximity to other aircraft and the right-of-way rules, including holding at runway (RWY) holding positions and lighted stop bars.	X	X	X	X	X					
(08)		Describe the meaning of light signals displayed to aircraft and by aircraft.	X	X	X	X	X					

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Syllabus reference	BK	Syllabus details and associated Learning Objectives	Aeroplane		Helicopter			IR	CB-IR(A)	BIR Exam	BIR BK	Remarks
			ATPL	CPL	ATPL /IR	ATPL	CPL					
(09)		Describe the requirements when carrying out simulated instrument flights.	X		X			X	X	3	1	
(10)		Explain the basic rules for an aircraft operating on and in the vicinity of an aerodrome (AD).	X	X	X	X	X					
(11)		Explain the requirements for the submission of an air traffic service (ATS) flight plan.	X	X	X	X	X			3	1	
(12)		Explain the actions to be taken in case of flight plan change or delay.	X	X	X	X	X	X		3	1	
(13)		State the actions to be taken in case of inadvertent changes to track, true airspeed (TAS) and time estimate affecting the current flight plan.	X	X	X	X	X	X				
(14)		Explain the procedures for closing a flight plan.	X	X	X	X	X			3	1, 2	
(15)		State for which flights an air traffic control (ATC) clearance shall be obtained.	X	X	X	X	X			3	1, 2	
(16)		State how a pilot may request ATC clearance.	X	X	X	X	X			3	1, 2	
(17)		State the action to be taken if an ATC clearance is not satisfactory to a PIC.	X	X	X	X	X					
(18)		Describe the required actions to be carried out if the continuation of a controlled visual flight rule (VFR) flight in visual meteorological conditions (VMC) is not practicable any more.	X		X	X		X	X	3	2	

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Syllabus reference	BK	Syllabus details and associated Learning Objectives	Aeroplane		Helicopter			IR	CB-IR(A)	BIR Exam	BIR BK	Remarks
			ATPL	CPL	ATPL /IR	ATPL	CPL					
(19)		Describe the provisions for transmitting a position report to the appropriate ATS unit including time of transmission and normal content of the message.	X	X	X	X	X	X	X	3		
(20)		Describe the necessary action when an aircraft experiences a communication (COM) failure.	X	X	X	X	X	X	X	3		
(21)		State what information an aircraft being subjected to unlawful interference shall give to the appropriate ATS unit.	X	X	X	X	X	X				
<b>010 05 04 00</b>		<b>Visual flight rules (VFR)</b>										
<b>010 05 04 01</b>		<b>Visual flight rules (VFR) — SERA</b>										
(01)		Describe the VFR as contained in MCAR-Part-ROA and the Civil Aviation Regulations.	X	X	X	X	X					
<b>010 05 05 00</b>		<b>Instrument flight rules (IFR)</b>										
<b>010 05 05 01</b>		<b>Instrument flight rules (IFR) — SERA</b>										
(01)		Describe the IFR as contained in MCAR-Part-ROA and the Civil Aviation Regulations	X		X			X	X	3		
<b>010 05 06 00</b>		<b>Interception of civil aircraft</b>										
<b>010 05 06 01</b>		<b>Interception of civil aircraft — SERA</b>										
(01)		List the circumstances in which interception of a civil aircraft may occur.	X	X	X	X	X					

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Syllabus reference	BK	Syllabus details and associated Learning Objectives	Aeroplane		Helicopter			IR	CB-IR(A)	BIR Exam	BIR BK	Remarks
			ATPL	CPL	ATPL /IR	ATPL	CPL					
(02)		State what primary action should be carried out by an intercepted aircraft.	X	X	X	X	X					
(03)		State which frequency should primarily be tried in order to contact an intercepting aircraft.	X	X	X	X	X					
(04)		State on which mode and code a transponder on board the intercepted aircraft should be operated.	X	X	X	X	X					
(05)		Recall the interception signals and phrases.	X	X	X	X	X					
<b>010 06 00 00</b>		<b>AIRCRAFT OPERATIONS</b>										
<b>010 06 01 00</b>		<b><i>Intentionally left blank</i></b>										
<b>010 06 02 00</b>		<b>Definitions and abbreviations (PANS-OPS Flight Procedures, ICAO Doc 8168, Volume I)</b>										
<b>010 06 02 01</b>		<b><i>Definitions and abbreviations — ICAO Doc 8168, Volume I</i></b>										
(01)	X	Recall all definitions included in ICAO Doc 8168, Volume I, Part I, Section 1, Chapter 1.	X		X			X				
(02)	X	Interpret all abbreviations and acronyms as shown in ICAO Doc 8168, Volume I, Part I, Section 1, Chapter 2.	X		X			X				
<b>010 06 03 00</b>		<b>Departure procedures — (ICAO Doc 8168, Volume I)</b>										
<b>010 06 03 01</b>		<b><i>General criteria (assuming all engines operating)</i></b>										
(01)	X	State the factors dictating the design of instrument departure procedures.	X		X			X	X		2	

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Syllabus reference	BK	Syllabus details and associated Learning Objectives	Aeroplane		Helicopter			IR	CB-IR(A)	BIR Exam	BIR BK	Remarks
			ATPL	CPL	ATPL /IR	ATPL	CPL					
(02)		Explain in which situations the criteria for omnidirectional departures are applied.	X		X			X	X	2		
<b>010 06 03 02</b>		<b>Standard instrument departures (SIDs)</b>										
(01)		Explain the terms 'straight departure' and 'turning departure'.	X		X			X	X	2		
<b>010 06 03 03</b>		<b>Omnidirectional departures</b>										
(01)		Explain what is the meaning of an 'omnidirectional departure'.	X		X			X	X	2		
<b>010 06 03 04</b>		<b>Intentionally left blank</b>										
<b>010 06 03 05</b>		<b>Intentionally left blank</b>										
<b>010 06 04 00</b>		<b>Approach procedures — ICAO Doc 8168, Volume I</b>										
<b>010 06 04 01</b>		<b>General criteria</b>										
(01)		State the general criteria (except 'Speeds for procedure calculations') of the approach procedure design: — instrument approach areas; — accuracy of fixes; — fixes formed by intersections; — intersection fix-tolerance factors; — other fix-tolerance factors; — descent gradient.	X		X			X			2	
(02)		Name the five possible segments of an instrument approach procedure.	X		X			X	X	2		
(03)		State the reasons for establishing aircraft categories for the approach.	X		X			X	X	2		



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Syllabus reference	BK	Syllabus details and associated Learning Objectives	Aeroplane		Helicopter			IR	CB-IR(A)	BIR Exam	BIR BK	Remarks
			ATPL	CPL	ATPL /IR	ATPL	CPL					
(04)		State the maximum angle between the final approach track and the extended RWY centre line to still consider a non-precision approach as being a 'straight-in approach'.	X		X			X	X	2		
(05)		State the minimum obstacle clearance (MOC) provided by the minimum sector altitudes (MSAs) established for an aerodrome.	X		X			X	X	2		
(06)	X	State that a pilot shall apply wind corrections when carrying out an instrument approach procedure.	X		X			X	X		2	
(07)		State the most significant factor influencing the conduct of instrument approach procedures.	X		X			X	X	2		
(08)		Explain why a pilot should not descend below obstacle clearance altitude/height (OCA/H), which are established for: — precision approach procedures; — non-precision approach procedures; — visual (circling) procedures; — APV approach procedures.	X		X			X	X	2		
(09)		Describe in general terms the relevant factors for the calculation of operational minima.	X		X			X	X	2		
(10)		State the following acronyms in plain language:	X		X			X	X	2		

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Syllabus reference	BK	Syllabus details and associated Learning Objectives	Aeroplane		Helicopter			IR	CB-IR(A)	BIR Exam	BIR BK	Remarks
			ATPL	CPL	ATPL /IR	ATPL	CPL					
		DA, DH, OCA, OCH, MDA, MDH, MOC, DA/H, OCA/H, MDA/H.										
(11)		Explain the relationship between the terms: DA, DH, OCA, OCH, MDA, MDH, MOC, DA/H, OCA/H, and MDA/H.	X		X			X	X	2		
<b>010 06 04 02</b>		<b>Approach procedure design</b>										
(01)		Describe how the vertical cross section for each of the five approach segments is broken down into the various areas.	X		X			X	X	2		
(02)		State within which area of the cross section the minimum obstacle clearance (MOC) is provided for the whole width of the area.	X		X			X	X	2		
(03)		Define the terms 'IAF', 'IF', 'FAF', 'FAP', 'MAPt' and 'TP'.	X		X			X	X	2		
(04)	X	State the accuracy of facilities providing track (VHF omnidirectional radio range (VOR), instrument landing system (ILS), non-directional beacon (NDB)).	X		X			X	X		2	
(05)		State the optimum descent gradient (preferred for a precision approach) in degrees and per cent.	X		X			X	X	2		
<b>010 06 04 03</b>		<b>Arrival and approach segments</b>										
(01)		Name the five standard segments of an instrument approach procedure,	X		X			X	X	2		

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Syllabus reference	BK	Syllabus details and associated Learning Objectives	Aeroplane		Helicopter			IR	CB-IR(A)	BIR Exam	BIR BK	Remarks
			ATPL	CPL	ATPL /IR	ATPL	CPL					
		and state the beginning and end for each of them.										
(02)		Describe where an arrival route normally ends.	X		X			X	X	2		
(03)		State the main task of the initial approach segment.	X		X			X	X	2		
(04)		Describe the maximum angle of interception between the initial approach segment and the intermediate approach segment (provided at the intermediate fix) for a precision approach and a non-precision approach.	X		X			X	X	2		
(05)		Describe the main task of the intermediate approach segment.	X		X			X	X	2		
(06)		State the main task of the final approach segment.	X		X			X	X	2		
(07)		Name the two possible aims of a final approach.	X		X			X	X	2		
(08)		Explain the term 'final approach point' in case of an ILS approach.	X		X			X	X	2		
(09)		State what happens if an ILS glide path (GP) becomes inoperative during the approach.	X		X			X	X	2		
<b>010 06 04 04</b>		<b>Missed approach</b>										
(01)		Name the three phases of a missed approach procedure and describe their geometric limits.	X		X			X	X	2		
(02)		State the main task of a missed approach procedure.	X		X			X	X	2		

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Syllabus reference	BK	Syllabus details and associated Learning Objectives	Aeroplane		Helicopter			IR	CB-IR(A)	BIR Exam	BIR BK	Remarks
			ATPL	CPL	ATPL /IR	ATPL	CPL					
(03)		Define the term 'missed approach point (MAPt)'.	X		X			X	X	2		
(04)		Describe how an MAPt may be established in an approach procedure.	X		X			X	X	2		
(05)		State the pilot's action if, upon reaching the MAPt, the required visual reference is not established.	X		X			X	X	2		
(06)		Describe what a pilot is expected to do in the event a missed approach is initiated prior to arriving at the MAPt.	X		X			X	X	2		
(07)		State whether the pilot is obliged to cross the MAPt at the height (HGT)/altitude (ALT) required by the procedure or whether they are allowed to cross the MAPt at a HGT/ALT greater than that required by the procedure.	X		X			X	X	2		
<b>010 06 04 05</b>		<b>Visual manoeuvring (circling) in the vicinity of the aerodrome (AD)</b>										
(01)		Describe what is meant by 'visual manoeuvring (circling)'.	X		X			X	X	2		
(02)		Describe how a prominent obstacle in the visual manoeuvring (circling) area outside the final approach and missed approach area has to be considered for the visual circling.	X		X			X	X	2		
(03)		State for which category of aircraft the obstacle clearance altitude/height (OCA/H) within an established visual manoeuvring (circling) area is determined.	X		X			X	X	2		

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Syllabus reference	BK	Syllabus details and associated Learning Objectives	Aeroplane		Helicopter			IR	CB-IR(A)	BIR Exam	BIR BK	Remarks
			ATPL	CPL	ATPL /IR	ATPL	CPL					
(04)		Describe how the minimum descent altitude/height (MDA/H) is specified for visual manoeuvring (circling) if the OCA/H is known.	X		X			X	X	2		
(05)		State the conditions to be fulfilled before descending below MDA/H in a visual manoeuvring (circling) approach.	X		X			X	X	2		
(06)		Explain why there can be no single procedure designed that will cater for conducting a circling approach in every situation.	X		X			X	X	2		
(07)		State how the pilot is expected to act after initial visual contact during a visual manoeuvring (circling).	X		X			X	X	2		
(08)		Describe what the pilot is expected to do if visual reference is lost while circling to land from an instrument approach.	X		X			X	X	2		
<b>010 06 04 06</b>		<b><i>Intentionally left blank</i></b> <i>Note: VOR and VOR/DME are covered under 062 02 03 00 and 062 02 04 00.</i>										
<b>010 06 05 00</b>		<b>Holding procedures — ICAO Doc 8168, Volume I</b>										
<b>010 06 05 01</b>		<b>Entry and holding</b>										
(01)		Explain why deviations from the in-flight procedures of a holding established in accordance with ICAO Doc 8168 are dangerous.	X		X			X	X	2		

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Syllabus reference	BK	Syllabus details and associated Learning Objectives	Aeroplane		Helicopter			IR	CB-IR(A)	BIR Exam	BIR BK	Remarks
			ATPL	CPL	ATPL /IR	ATPL	CPL					
(02)		State that if for any reason a pilot is unable to conform to the procedures for normal conditions laid down for any particular holding pattern, this pilot should advise ATC as early as possible.	X		X			X	X	2		
(03)		Describe the shape and terminology associated with the holding pattern.	X		X			X	X	2		
(04)		State the bank angle and rate of turn to be used whilst flying in a holding pattern.	X		X			X	X	2		
(05)		Explain why a pilot in a holding pattern should attempt to maintain tracks and how this can be achieved.	X		X			X	X	2		
(06)		Describe where outbound timing begins in a holding pattern.	X		X			X	X	2		
(07)		State where the outbound leg in a holding terminates if the outbound leg is based on DME.	X		X			X	X	2		
(08)		Describe the three heading entry sectors for entries into a holding pattern.	X		X			X	X	2		
(09)		Describe the terms 'parallel entry', 'offset entry' and 'direct entry'.	X		X			X	X	2		
(10)		Determine the correct entry procedure for a given holding pattern.	X		X			X	X	2		
(11)		State the still-air time for flying the outbound entry heading with or without DME.	X		X			X	X	2		

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Syllabus reference	BK	Syllabus details and associated Learning Objectives	Aeroplane		Helicopter			IR	CB-IR(A)	BIR Exam	BIR BK	Remarks
			ATPL	CPL	ATPL /IR	ATPL	CPL					
(12)		Describe what the pilot is expected to do when clearance is received specifying the time of departure from the holding point.	X		X			X	X	2		
<b>010 06 05 02</b>		<b>Obstacle clearance</b>										
(01)	X	Describe the layout of the basic holding area, entry area and buffer area of a holding pattern.	X		X			X	X		2	
(02)	X	State which obstacle clearance is provided by a minimum permissible holding level referring to the holding area, the buffer area (general only) and over high terrain or in mountainous areas.	X		X			X	X		2	
<b>010 06 06 00</b>		<b>Altimeter-setting procedures — ICAO Doc 8168</b>										
<b>010 06 06 01</b>		<b>Basic requirements and procedures</b>										
(01)		Describe the two main objectives of altimeter settings.	X	X	X	X	X	X	X	2	3	
(02)		Define the terms 'QNH' and 'QFE'.	X	X	X	X	X	X	X		3	
(03)		Describe the different terms for ALT or flight levels (FLs) respectively, which are the references during climb or descent to change the altimeter settings from QNH to 1013.2 hPa and vice versa.	X	X	X	X	X	X	X	2	3	
(04)		Define the term 'flight level (FL)'.	X	X	X	X	X	X	X	2	3	
(05)		State where FL zero shall be located.	X	X	X	X	X	X	X		3	

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Syllabus reference	BK	Syllabus details and associated Learning Objectives	Aeroplane		Helicopter			IR	CB-IR(A)	BIR Exam	BIR BK	Remarks
			ATPL	CPL	ATPL /IR	ATPL	CPL					
(06)		State the interval by which consecutive FLs shall be separated.	X	X	X	X	X	X	X	2	3	
(07)		Describe how FLs are defined.	X	X	X	X	X	X	X		3	
(08)		Define the term 'transition altitude (TA)'.	X	X	X	X	X	X	X	2	3	
(09)		State how TAs shall normally be specified.	X	X	X	X	X	X	X	2	3	
(10)		Explain how the HGT of the TA is calculated and expressed in practice.	X	X	X	X	X	X	X	2	3	
(11)		State where TAs shall be published.	X	X	X	X	X	X	X	2	3	
(12)		Define the term 'transition level (TRL)'.	X	X	X	X	X	X	X	2	3	
(13)		State when the TRL is normally passed on to the aircraft.	X	X	X	X	X	X	X	2	3	
(14)		State how the vertical position of the aircraft shall be expressed at or below the TA and TRL.	X	X	X	X	X	X	X	2	3	
(15)		Define the term 'transition layer'.	X	X	X	X	X	X	X	2	3	
(16)		Describe when the vertical position of an aircraft passing through the transition layer shall be expressed in terms of FLs and when in terms of ALT.	X	X	X	X	X	X	X	2	3	
(17)		State when the QNH altimeter setting shall be made available to departing aircraft.	X	X	X	X	X	X	X	2	3	
(18)		Explain when the vertical separation of an aircraft during en-route flight	X	X	X	X	X	X	X	2	3	



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Syllabus reference	BK	Syllabus details and associated Learning Objectives	Aeroplane		Helicopter			IR	CB-IR(A)	BIR Exam	BIR BK	Remarks
			ATPL	CPL	ATPL /IR	ATPL	CPL					
		shall be assessed in terms of ALT and when in terms of FLs.										
(19)		Explain when, in air-ground communications during an en-route flight, the vertical position of an aircraft shall be expressed in terms of ALT and when in terms of FLs.	X	X	X	X	X	X	X	2	3	
(20)		Describe why QNH altimeter-setting reports should be provided from sufficient locations.	X	X	X	X	X	X	X	2	3	
(21)		State how a QNH altimeter setting shall be made available to aircraft approaching a controlled aerodrome (AD) for landing.	X	X	X	X	X	X	X	2	3	
(22)		State under which circumstances the vertical position of an aircraft above the TRL may be referenced in ALT.	X	X	X	X	X	X	X	2	3	
<b>010 06 06 02</b>		<b>Procedures for operators and pilots</b>										
(01)		State on which setting at least one altimeter shall be set prior to take-off.	X	X	X	X	X	X	X	2	3	
(02)		State where during the climb the altimeter setting shall be changed from QNH to 1013.2 hPa.	X	X	X	X	X	X	X	2	3	
(03)		Describe when a pilot of an aircraft intending to land at an AD shall obtain the TRL.	X	X	X	X	X	X	X			
(04)		Describe when a pilot of an aircraft intending to land at an AD shall obtain the actual QNH altimeter setting.	X	X	X	X	X	X	X			

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Syllabus reference	BK	Syllabus details and associated Learning Objectives	Aeroplane		Helicopter			IR	CB-IR(A)	BIR Exam	BIR BK	Remarks
			ATPL	CPL	ATPL /IR	ATPL	CPL					
(05)		State where the altimeter settings shall be changed from 1013.2 hPa to QNH during descent for landing.	X	X	X	X	X	X	X			
<b>010 06 07 00</b>		<b>Parallel or near-parallel instrument RWYs — ICAO Doc 8168, Volume III</b>										
<b>010 06 07 01</b>		<b>Simultaneous operation on parallel or near-parallel instrument RWYs</b>										
(01)	X	Describe the difference between independent and dependent parallel approaches.	X	X	X	X	X	X	X		2	
(02)		Describe the following different operations: — simultaneous instrument departures; — segregated parallel approaches/departures; — semi-mixed and mixed operations.	X	X	X	X	X	X	X	2		
(03)		Describe the terms 'normal operating zone (NOZ)' and 'no transgression zone (NTZ)'.	X	X	X	X	X	X				
(04)		State the aircraft avionics requirements for conducting parallel instrument approaches.	X	X	X	X	X	X				
(05)		State where guidance material may be located for simultaneous operations on parallel or near-parallel instrument runways.	X	X	X	X	X	X				

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Syllabus reference	BK	Syllabus details and associated Learning Objectives	Aeroplane		Helicopter			IR	CB-IR(A)	BIR Exam	BIR BK	Remarks
			ATPL	CPL	ATPL /IR	ATPL	CPL					
(06)		State the radar requirements for simultaneous, independent, and parallel instrument approaches, and how weather conditions effect these.	X	X	X	X	X	X				
(07)		State the maximum angle of interception for an ILS localiser course (CRS) or microwave landing system (MLS) final approach track in case of simultaneous, independent, and parallel instrument approaches.	X	X	X	X	X	X				
(08)		Describe the special conditions for tracks on missed approach procedures and departures in case of simultaneous or parallel operations.	X	X	X	X	X	X				
<b>010 06 08 00</b>		<b>Secondary surveillance radar (transponder) operating procedures — ICAO Doc 8168</b>										
<b>010 06 08 01</b>		<b>Operation of transponders</b>										
(01)		State when and where the pilot shall operate the transponder.	X	X	X	X	X	X	X		3	
(02)		State the modes and codes that the pilot shall operate in the absence of any ATC directions or regional air navigation agreements.	X	X	X	X	X	X	X		3	
(03)		State when the pilot shall operate Mode C.	X	X	X	X	X	X				
(04)		State when the pilot shall 'SQUAWK IDENT'.	X	X	X	X	X	X	X		3	

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Syllabus reference	BK	Syllabus details and associated Learning Objectives	Aeroplane		Helicopter			IR	CB-IR(A)	BIR Exam	BIR BK	Remarks
			ATPL	CPL	ATPL /IR	ATPL	CPL					
(05)		State the transponder code to indicate: — a state of emergency; — a COM failure; — unlawful interference.	X	X	X	X	X	X	X		3	
(06)		Describe the consequences of a transponder failure in flight.	X	X	X	X	X	X	X		3	
(07)		State the primary action of the pilot in the case of an unserviceable transponder before departure when no repair or replacement at the given AD is possible.	X	X	X	X	X	X	X		3	
(08)		State when the pilot shall operate Mode S.							X		3	
<b>010 06 08 02</b>		<b>Operation of airborne collision avoidance system (ACAS) equipment</b>										
(01)		Describe the main reason for using ACAS.	X	X	X	X	X	X	X	2	3	
(02)		State whether the 'use of ACAS indications' described in ICAO Doc 8168 is absolutely mandatory.	X	X	X	X	X	X				
(03)		Explain the pilots' reaction required to allow ACAS to fulfil its role of assisting pilots in the avoidance of potential collisions.	X	X	X	X	X	X				
(04)		Explain why pilots shall not manoeuvre their aircraft in response to traffic advisories (TAs) only.	X	X	X	X	X	X				

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Syllabus reference	BK	Syllabus details and associated Learning Objectives	Aeroplane		Helicopter			IR	CB-IR(A)	BIR Exam	BIR BK	Remarks
			ATPL	CPL	ATPL /IR	ATPL	CPL					
(05)		Explain the significance of TAs in view of possible resolution advisories (RAs).	X	X	X	X	X	X				
(06)		State why a pilot should follow RAs immediately.	X	X	X	X	X	X				
(07)		List the reasons which may force a pilot to disregard an RA.	X	X	X	X	X	X				
(08)		Explain the importance of instructing ATC immediately that an RA has been followed.	X	X	X	X	X	X				
(09)		Explain the duties of a pilot with regard to ATC when an RA situation is resolved.	X	X	X	X	X	X				
<b>010 06 09 00</b>		<b>MCAR-Part-CAT ON AIR OPERATIONS</b>										
<b>010 06 09 01</b>		<b>Regulation structure</b>										
(01)		Describe the subject matter and scope of that Regulation.	X	X	X	X	X	X	X			
(02)	X	State that MCAR-Part-CAT, MCAR-Part-NCO and MCAR-Part-NCC covers all types of commercial and non-commercial operations.	X	X	X	X	X	X	X			
<b>010 06 09 02</b>		<b>Definitions (Annex I)</b>										
(01)		Recall the definitions in the Regulation not already given in ICAO PAN-OPS.	X	X	X	X	X	X	X			
<b>010 06 09 03</b>		<b>Part-SPA (Annex V), Part-NCC (Annex VI) and Part-NCO (Annex VII)</b>										
(01)		Describe the scope of these Parts.	X	X	X	X	X					

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Syllabus reference	BK	Syllabus details and associated Learning Objectives	Aeroplane		Helicopter			IR	CB-IR(A)	BIR Exam	BIR BK	Remarks
			ATPL	CPL	ATPL /IR	ATPL	CPL					
(02)	X	Explain the main content of these Parts, except the operational procedures.	X	X	X	X	X					
<b>010 07 00 00</b>		<b>AIR TRAFFIC SERVICES (ATS) AND AIR TRAFFIC MANAGEMENT (ATM)</b>										
<b>010 07 01 00</b>		<b>ICAO Annex 11 — Air Traffic Services</b>										
<b>010 07 01 01</b>		<b>Definitions</b>										
(01)	X	Recall the definitions given in ICAO Annex 11.	X	X	X	X	X	X				
<b>010 07 01 02</b>		<b>General</b>										
(01)	X	State the objectives of ATS.	X	X	X	X	X	X				
(02)	X	Describe the three basic types of ATS.	X	X	X	X	X	X				
(03)	X	Describe the three basic types of ATC services.	X	X	X	X	X	X				
(04)		State on which frequencies a pilot can expect ATC to contact them in case of an emergency.	X	X	X	X	X	X				
(05)		Describe the procedure for the transfer of an aircraft from one ATC unit to another.	X	X	X	X	X					
<b>010 07 01 03</b>		<b>Airspace</b>										
(01)		Describe the purpose for establishing flight information regions (FIRs) including upper flight information regions (UIRs).	X	X	X	X	X	X				

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Syllabus reference	BK	Syllabus details and associated Learning Objectives	Aeroplane		Helicopter			IR	CB-IR(A)	BIR Exam	BIR BK	Remarks
			ATPL	CPL	ATPL /IR	ATPL	CPL					
(02)		Describe the various rules and services that apply to the various classes of airspace.	X	X	X	X	X	X	X	3		
(03)		Explain which airspace shall be included in an FIR or UIR.	X	X	X	X	X	X				
(04)		State the designation for those portions of the airspace where flight information service (FIS) and alerting service shall be provided.	X	X	X	X	X	X				
(05)		State the designations for those portions of the airspace where ATC services shall be provided.	X	X	X	X	X	X				
(06)		Identify whether or not control areas (CTAs) and control zones (CTRs) designated within an FIR shall form part of that FIR.	X	X	X	X	X	X				
(07)		State the lower limit of a CTA as far as ICAO Standards are concerned.	X	X	X	X	X	X				
(08)		State whether or not the lower limit of a CTA has to be established uniformly.	X	X	X	X	X	X				
(09)		Explain why a UIR or upper CTA should be delineated to include the upper airspace within the lateral limits of a number of lower FIRs or CTAs.	X	X	X	X	X	X				
(10)		Describe in general the lateral limits of CTRs.	X	X	X	X	X	X				
(11)		State the minimum extension (in NM) of the lateral limits of a CTR.	X	X	X	X	X	X				

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Syllabus reference	BK	Syllabus details and associated Learning Objectives	Aeroplane		Helicopter			IR	CB-IR(A)	BIR Exam	BIR BK	Remarks
			ATPL	CPL	ATPL /IR	ATPL	CPL					
(12)		State the upper limits of a CTR located within the lateral limits of a CTA.	X	X	X	X	X	X				
<b>010 07 01 04</b>		<b>Air traffic control (ATC) services</b>										
(01)		Name all classes of airspace in which ATC services shall be provided.	X	X	X	X	X	X			2, 3	
(02)		Name the ATS units providing ATC services (area control service, approach control service, aerodrome control service).	X	X	X	X	X	X	X		3	
(03)		Describe which unit(s) may be assigned with the task to provide specified services on the apron.	X	X	X	X	X	X	X		3	
(04)		State the purpose of clearances issued by an ATC unit.	X	X	X	X	X	X	X		3	
(05)		List the various (five possible) parts of an ATC clearance.	X	X	X	X	X	X	X	3		
(06)		Explain why the movement of persons, vehicles and towed aircraft on the manoeuvring area of an AD shall be controlled by the aerodrome control tower (TWR) (as necessary).	X	X	X	X	X	X				
<b>010 07 01 05</b>		<b>Flight information service (FIS)</b>										
(01)	X	State for which aircraft FIS shall be provided.	X	X	X	X	X	X				
(02)	X	State whether or not FIS shall include the provision of pertinent significant meteorological information (SIGMET) and air meteorological information report (AIRMET) information.	X	X	X	X	X	X				



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Syllabus reference	BK	Syllabus details and associated Learning Objectives	Aeroplane		Helicopter			IR	CB-IR(A)	BIR Exam	BIR BK	Remarks
			ATPL	CPL	ATPL /IR	ATPL	CPL					
(03)	X	State which information FIS shall include in addition to SIGMET and AIR-MET information.	X	X	X	X	X	X				
(04)	X	Indicate which other information the FIS shall include in addition to the special information given in Annex 11.	X	X	X	X	X	X				
(05)	X	State the meaning of the acronym 'ATIS' in plain language.	X	X	X	X	X	X				
(06)		List the basic information concerning automatic terminal information service (ATIS) broadcasts (e.g. frequencies used, number of ADs included, updating, identification, acknowledgment of receipt, language and channels, ALT-setting).	X	X	X	X	X	X			2, 3	
(07)		State the content of an ATIS message.	X	X	X	X	X					
(08)		State the reasons and circumstances when an ATIS message shall be updated.	X	X	X	X	X	X				
<b>010 07 01 06</b>		<b>Alerting service</b>										
(01)		State who provides the alerting service.	X	X	X	X	X					
(02)		State who is responsible for initiating the appropriate emergency phase.	X	X	X	X	X					
(03)		State the aircraft to which alerting service shall be provided.	X	X	X	X	X					
(04)		State which unit shall be notified by the responsible ATS unit immediately	X	X	X	X	X					

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Syllabus reference	BK	Syllabus details and associated Learning Objectives	Aeroplane		Helicopter			IR	CB-IR(A)	BIR Exam	BIR BK	Remarks
			ATPL	CPL	ATPL /IR	ATPL	CPL					
		when an aircraft is considered to be in a state of emergency.										
(05)		Name the three stages of emergency and describe the basic conditions for each kind of emergency.	X	X	X	X	X				3	
(06)	X	State the meaning of the expressions 'INCERFA', 'ALERFA' and 'DETRESFA'.	X	X	X	X	X					
(07)	X	State the information to be provided to those aircraft that operate in the vicinity of an aircraft that is either in a state of emergency or unlawful interference.	X	X	X	X	X					
<b>010 07 01 07</b>		<b>Principles governing required navigation performance (RNP) and air traffic service (ATS) route designators</b>										
(01)		State the meaning of the acronym 'RNP'.	X	X	X	X	X					
(02)		State the factors that RNP is based on.	X	X	X	X	X					
(03)	X	Describe the reason for establishing a system of route designators and navigation specifications.	X	X	X	X	X					
(04)		State whether or not a prescribed RNP type is considered an integral part of the ATS route designator.	X	X	X	X	X					
(05)		Explain the composition of an ATS route designator.	X	X	X	X	X					

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Syllabus reference	BK	Syllabus details and associated Learning Objectives	Aeroplane		Helicopter			IR	CB-IR(A)	BIR Exam	BIR BK	Remarks
			ATPL	CPL	ATPL /IR	ATPL	CPL					
<b>010 07 02 00</b>		<b>ICAO Doc 4444 — Air Traffic Management</b>										
<b>010 07 02 01</b>		<b>Foreword (Scope and purpose)</b>										
(01)		State which ATS units provide clearances that do, and do not, include the prevention of collision with terrain.	X	X	X	X	X	X	X	3		
<b>010 07 02 02</b>		<b>Definitions</b>										
(01)	X	Recall all definitions given in ICAO Doc 4444 except the following: — accepting unit/controller, AD taxi circuit, aeronautical fixed service (AFS), aeronautical fixed station, air-taxiing, allocation, approach funnel, assignment, data convention, data processing, discrete code, D-value, flight status, ground effect, receiving unit/controller, sending unit/controller, transfer of control point, transferring unit/controller, unmanned free balloon.	X	X	X	X	X	X				
<b>010 07 02 03</b>		<b>ATS system capacity and air traffic flow management (ATFM)</b>										
(01)	X	Explain when and where ATFM services shall be implemented.	X	X	X	X	X	X	X		3	

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Syllabus reference	BK	Syllabus details and associated Learning Objectives	Aeroplane		Helicopter			IR	CB-IR(A)	BIR Exam	BIR BK	Remarks
			ATPL	CPL	ATPL /IR	ATPL	CPL					
<b>010 07 02 04</b>		<b>General provisions for air traffic services (ATS)</b>										
(01)	X	Describe who is responsible for the provision of flight information and alerting services within an FIR, within controlled airspace and at controlled ADs.	X	X	X	X	X	X				
<b>010 07 02 05</b>		<b>ATC clearances</b>										
(01)		State which information the issue of an ATC clearance is based on.	X	X	X	X	X	X	X		3	
(02)		Describe what a PIC should do if an ATC clearance is not suitable.	X	X	X	X	X	X	X	3		
(03)		State who bears the responsibility for adhering to the applicable rules and regulations whilst flying under the control of an ATC unit.	X	X	X	X	X	X	X		3	
(04)	X	State the two primary purposes of clearances issued by ATC units.	X	X	X	X	X	X				
(05)		State why clearances must be issued 'early enough' to aircraft.	X	X	X	X	X	X				
(06)		Explain what is meant by the expression 'clearance limit'.	X	X	X	X	X	X	X	3		
(07)		Explain the meaning of the phrases 'cleared via flight planned route', 'cleared via (designation) departure' and 'cleared via (designation) arrival' in an ATC clearance.	X	X	X	X	X	X	X	3		

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Syllabus reference	BK	Syllabus details and associated Learning Objectives	Aeroplane		Helicopter			IR	CB-IR(A)	BIR Exam	BIR BK	Remarks
			ATPL	CPL	ATPL /IR	ATPL	CPL					
(08)		List which items of an ATC clearance shall always be read back by the flight crew.	X	X	X	X	X	X	X	3		
<b>010 07 02 06</b>		<b>Horizontal speed control instructions</b>										
(01)		Explain the reason for speed control by ATC	X	X	X	X	X	X	X	3		
(02)	X	Define the maximum speed changes that ATC may impose.	X	X	X	X	X	X	X		3	
(03)		State within what distance from the THR the PIC should not expect any kind of speed control.	X	X	X	X	X	X	X	3		
<b>010 07 02 07</b>		<b>Change from IFR to VFR flight</b>										
(01)		Explain how the change from IFR to VFR can be initiated by the PIC.	X		X			X	X	3		
(02)		Describe the expected reaction of the appropriate ATC unit upon a request to change from IFR to VFR.	X		X			X	X	3		
<b>010 07 02 08</b>		<b>Wake turbulence</b>										
(01)		State the wake-turbulence categories of aircraft.	X	X	X	X	X	X		3	2	
(02)		State the wake-turbulence separation minima.	X	X	X	X	X	X		3	2	
(03)		Describe how a 'heavy' aircraft shall indicate this in the initial radiotelephony contact with ATS.	X	X	X	X	X	X				
<b>010 07 02 09</b>		<b>Altimeter-setting procedures</b>										
(01)		Define the following terms:	X	X	X	X	X	X	X		3	

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Syllabus reference	BK	Syllabus details and associated Learning Objectives	Aeroplane		Helicopter			IR	CB-IR(A)	BIR Exam	BIR BK	Remarks
			ATPL	CPL	ATPL /IR	ATPL	CPL					
		<ul style="list-style-type: none"> <li>— TRL;</li> <li>— transition layer; and</li> <li>— TA.</li> </ul>										
(02)		Describe how the vertical position of an aircraft in the vicinity of an AD shall be expressed at or below the TA, at or above the TRL, and while climbing or descending through the transition layer.	X	X	X	X	X	X	X		3	
(03)		Describe when the HGT of an aircraft using QFE during an NDB approach is referred to the landing THR instead of the AD elevation.	X	X	X	X	X	X	X	3		
(04)		State in which margin altimeter settings provided to aircraft shall be rounded up or down.	X	X	X	X	X	X	X	3		
(05)		Describe the expression 'lowest usable FL'.	X	X	X	X	X	X	X	3		
(06)		Determine how the vertical position of an aircraft on an en-route flight is expressed at or above the lowest usable FL and below the lowest usable FL.	X	X	X	X	X	X	X	3		
(07)		State who establishes the TRL to be used in the vicinity of an AD.	X	X	X	X	X	X	X	3		
(08)		Decide how and when a flight crew member shall be informed about the TRL.	X	X	X	X	X	X	X	3		

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Syllabus reference	BK	Syllabus details and associated Learning Objectives	Aeroplane		Helicopter			IR	CB-IR(A)	BIR Exam	BIR BK	Remarks
			ATPL	CPL	ATPL /IR	ATPL	CPL					
(09)		State whether or not the pilot can request TRL to be included in the approach clearance.	X	X	X	X	X	X	X	3		
<b>010 07 02 10</b>		<b>Position reporting</b>										
(01)		Describe when position reports shall be made by an aircraft flying on routes defined by designated significant points.	X	X	X	X	X	X	X	3		
(02)		List the six items that are normally included in a voice position report.	X	X	X	X	X	X	X	3		
(03)	X	State the requirements for using a simplified position report with FL, next position (and time-over) and ensuing significant points omitted.	X	X	X	X	X	X	X		3	
(04)		State the item of a position report which must be forwarded on to ATC with the initial call after changing to a new frequency.	X	X	X	X	X	X	X	3		
(05)		Indicate the item of a position report which may be omitted if secondary surveillance radar (SSR) Mode C is used.	X	X	X	X	X	X	X		3	
(06)		Explain in which circumstances the airspeed should be included in a position report.	X	X	X	X	X	X				
(07)		Explain the meaning of the acronym 'ADS'.	X	X	X	X	X	X				

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Syllabus reference	BK	Syllabus details and associated Learning Objectives	Aeroplane		Helicopter			IR	CB-IR(A)	BIR Exam	BIR BK	Remarks
			ATPL	CPL	ATPL /IR	ATPL	CPL					
(08)		Describe which expression shall precede the level figures in a position report if the level is reported in relation to 1013.2 hPa (standard pressure).	X	X	X	X	X	X				
<b>010 07 02 11</b>		<b>Reporting of operational and meteorological information</b>										
(01)		List the occasions when special air-reports shall be made.	X	X	X	X	X	X				
<b>010 07 02 12</b>		<b>Separation methods and minima</b>										
(01)		Explain the general provisions for the separation of controlled air traffic.	X		X			X	X			
(02)	X	Name the different kinds of separation used in aviation.	X		X			X	X		3	
(03)		State the difference between the type of separation provided within the various classes of airspace and the various types of flight.	X		X			X	X	3		
(04)		State who is responsible for the avoidance of collision with other aircraft when operating in VMC.	X		X			X	X	3		
(05)		Describe how vertical separation is obtained.	X		X			X	X	3		
(06)		State the required vertical separation minimum.	X		X			X	X	3		
(07)		Describe how the cruising levels of aircraft flying to the same destination and in the expected approach sequence are correlated with each other.	X		X			X	X	3		



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Syllabus reference	BK	Syllabus details and associated Learning Objectives	Aeroplane		Helicopter			IR	CB-IR(A)	BIR Exam	BIR BK	Remarks
			ATPL	CPL	ATPL /IR	ATPL	CPL					
(08)		Name the conditions that must be adhered to when two aircraft are cleared to maintain a specified vertical separation between them during climb or descent.	X		X			X	X	3		
(09)		State the two main methods for horizontal separation.	X		X			X	X	3		
(10)		Describe how lateral separation of aircraft at the same level may be obtained.	X		X			X	X	3		
(11)		Explain the term 'geographical separation'.	X		X			X	X	3		
(12)		Describe track separation between aircraft using the same navigation aid or method.	X		X			X	X	3		
(13)		Describe the three basic means for the establishment of longitudinal separation.	X		X			X	X	3		
(14)		State the minimum standard horizontal radar separation in NM.	X		X			X	X	3		
(15)		Describe the method of the Mach number technique.	X	X								
<b>010 07 02 13</b>		<b>Separation in the vicinity of aerodromes (ADs)</b>										
(01)		Describe the expression 'essential local traffic'.	X	X	X	X	X	X				
(02)		State which possible decision the PIC may choose to take if they are asked	X	X	X	X	X	X				

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Syllabus reference	BK	Syllabus details and associated Learning Objectives	Aeroplane		Helicopter			IR	CB-IR(A)	BIR Exam	BIR BK	Remarks
			ATPL	CPL	ATPL /IR	ATPL	CPL					
		to accept take-off in a direction which is not 'into the wind'.										
(03)		State the condition to enable ATC to initiate a visual approach for an IFR flight.	X	X	X	X	X	X	X	3	2	
(04)		State whether or not separation shall be provided by ATC between an aircraft executing a visual approach and other arriving or departing aircraft.	X	X	X	X	X	X	X	3	2	
(05)		State in which case, when the flight crew are not familiar with the instrument approach procedure being carried out, only the final approach track has to be given to them by ATC.	X	X	X	X	X	X	X	3	2	
(06)		Describe which FL should be assigned to an aircraft first arriving over a holding fix for landing.	X	X	X	X	X	X	X	3	2	
(07)		State which kinds of priority can be applied to aircraft for a landing.	X	X	X	X	X	X	X	3	2	
(08)		Describe the situation when a pilot of an aircraft in an approach sequence indicates their intention to hold for weather improvements.	X	X	X	X	X	X	X	3	2	
(09)		Explain the term 'expected approach time' and the procedures for its use.	X	X	X	X	X	X	X	3	2	
(10)		State the reasons which could probably lead to the decision to use another take-off or landing direction than the one into the wind.	X	X	X	X	X	X	X	3	2	

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			ATPL	CPL	ATPL /IR	ATPL	CPL					
(11)		State the possible consequences for a PIC if the 'RWY-in-use' is not considered suitable for the operation involved.	X	X	X	X	X	X	X			
<b>010 07 02 14</b>		<b>Miscellaneous separation procedures</b>										
(01)		State the minimum separation between departing and arriving aircraft.	X	X	X	X	X	X	X	3	2	
(02)		State the non-radar wake-turbulence longitudinal separation minima.	X	X	X	X	X	X	X	3	2	
(03)		Describe the consequences of a clearance to 'maintain own separation' while in VMC.	X	X	X	X	X	X	X	3	2	
(04)		Give a brief description of 'essential traffic' and 'essential traffic information'.	X	X	X	X	X	X	X	3	2	
(05)		Describe the circumstances under which a reduction in separation minima may be allowed.	X	X	X	X	X	X	X	3	2	
<b>010 07 02 15</b>		<b>Arriving and departing aircraft</b>										
(01)		List the elements of information which shall be transmitted to an aircraft as early as practicable if an approach for landing is intended.	X	X	X	X	X	X	X	3	2	
(02)		List the elements of information to be transmitted to an aircraft at the commencement of final approach.	X	X	X	X	X	X	X	3	2	

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Syllabus reference	BK	Syllabus details and associated Learning Objectives	Aeroplane		Helicopter			IR	CB-IR(A)	BIR Exam	BIR BK	Remarks
			ATPL	CPL	ATPL /IR	ATPL	CPL					
(03)		List the elements of information to be transmitted to an aircraft during final approach.	X	X	X	X	X	X	X	3	2	
(04)		State the prerequisites for operating on parallel or near-parallel RWYs including the different combinations of parallel arrivals or departures.	X	X	X	X	X	X				
(05)		State the sequence of priority between aircraft landing (or in the final stage of an approach to land) and aircraft intending to depart.	X	X	X	X	X	X	X	3	2	
(06)		State the significant changes in the meteorological conditions in the take-off or climb-out area that shall be transmitted without delay to a departing aircraft.	X	X	X	X	X	X	X	3	2	
(07)		State the significant changes that shall be transmitted as early as practicably possible to an arriving aircraft, particularly changes in the meteorological conditions.	X	X	X	X	X	X	X	3	2	
<b>010 07 02 16</b>		<b>Procedures for aerodrome (AD) control service</b>										
(01)		Name the operational failure or irregularity of AD equipment which shall be reported by the TWR immediately.	X	X	X	X	X	X	X	3	2	
(02)		Explain that, after a given period of time, the TWR shall report to the area	X	X	X	X	X	X	X	3	2	

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			ATPL	CPL	ATPL /IR	ATPL	CPL					
		control centre (ACC) or flight information centre (FIC) if an aircraft does not land as expected.										
(03)		Describe the procedures to be observed by the TWR whenever VFR operations are suspended.	X	X	X	X	X	X	X	3	2	
(04)		Explain the term 'RWY-in-use' and its selection.	X	X	X	X	X	X				
(05)		List the information the TWR should give to an aircraft prior to: — taxiing for take-off; — take-off; — entering the traffic circuit.	X	X	X	X	X	X				
(06)		Explain that a report of surface wind direction given to a pilot by the TWR is magnetic.	X	X	X	X	X	X				
(07)		Explain the exact meaning of the expression 'RWY vacated'.	X	X	X	X	X	X				
<b>010 07 02 17</b>		<b>Radar services</b>										
(01)		State the basic identification procedures used with radar.	X	X	X	X	X	X	X	3	2	
(02)		Define the term 'PSR'.	X	X	X	X	X	X	X	3	2	
(03)		Describe the circumstances under which an aircraft provided with radar service should be informed of its position.	X	X	X	X	X	X	X	3	2	

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Syllabus reference	BK	Syllabus details and associated Learning Objectives	Aeroplane		Helicopter			IR	CB-IR(A)	BIR Exam	BIR BK	Remarks
			ATPL	CPL	ATPL /IR	ATPL	CPL					
(04)		List the possible forms of position information passed on to the aircraft by radar services.	X	X	X	X	X	X	X	3	2	
(05)		Describe the term 'radar vectoring'.	X	X	X	X	X	X	X	3	2	
(06)		State the aims of radar vectoring as shown in ICAO Doc 4444.	X	X	X	X	X	X	X	3	2	
(07)		Describe how radar vectoring shall be achieved.	X	X	X	X	X	X	X	3	2	
(08)		Describe the information which shall be given to an aircraft when radar vectoring is terminated and the pilot is instructed to resume own navigation.	X	X	X	X	X	X	X	3	2	
(09)		Explain the procedures for the conduct of surveillance radar approaches (SRAs).	X	X	X	X	X	X	X	3	2	
(10)		Describe what kind of action (concerning the transponder) the pilot is expected to perform in case of emergency if they have previously been directed by ATC to operate the transponder on a specific code.	X	X	X	X	X	X	X	3	2	
<b>010 07 02 18</b>		<b>Air traffic advisory service</b>										
(01)		Describe the objective and basic principles of the air traffic advisory service.	X	X	X	X	X	X				
(02)		State to which aircraft air traffic advisory service may be provided.	X	X	X	X	X	X				

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Syllabus reference	BK	Syllabus details and associated Learning Objectives	Aeroplane		Helicopter			IR	CB-IR(A)	BIR Exam	BIR BK	Remarks
			ATPL	CPL	ATPL /IR	ATPL	CPL					
(03)		Explain the difference between advisory information and clearances, stating which ATS units are responsible for their issue.	X	X	X	X	X	X				
<b>010 07 02 19</b>		<b>Procedures related to emergencies, communication (COM) failure and contingencies</b>										
(01)		State the mode and code of SSR equipment a pilot might operate in a (general) state of emergency or (specifically) in case the aircraft is subject to unlawful interference.	X	X	X	X	X	X	X		3	
(02)		State the special rights an aircraft in a state of emergency can expect from ATC.	X	X	X	X	X	X	X		3	
(03)		Describe the expected action of aircraft after receiving a broadcast from ATS concerning the emergency descent of an aircraft.	X	X	X	X	X	X	X	3		
(04)		State how it can be ascertained, in case of a failure of two-way COM, whether the aircraft is able to receive transmissions from the ATS unit.	X	X	X	X	X	X	X	3		
(05)		State on which frequencies appropriate information, for an aircraft encountering two-way COM failure, shall be sent by ATS.	X	X	X	X	X	X	X	3		
(06)		State what is meant by the expressions 'strayed aircraft' and 'unidentified aircraft'.	X	X	X	X	X	X	X	3		

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Syllabus reference	BK	Syllabus details and associated Learning Objectives	Aeroplane		Helicopter			IR	CB-IR(A)	BIR Exam	BIR BK	Remarks
			ATPL	CPL	ATPL /IR	ATPL	CPL					
(07)		Explain the reasons for fuel-dumping and state the minimum level.	X	X	X	X	X	X				
(08)		Explain the possible request of ATC to an aircraft to change its radio-telephone (RTF) call sign.	X	X	X	X	X	X				
<b>010 07 02 20</b>		<b>Miscellaneous procedures</b>										
(01)		Explain the meaning of 'AIRPROX'.	X	X	X	X	X	X				
(02)		Describe the task of an air traffic incident report.	X	X	X	X	X	X				
<b>010 08 00 00</b>		<b>AERONAUTICAL INFORMATION SERVICE (AIS)</b>										
<b>010 08 01 00</b>		<b>Introduction</b>										
<b>010 08 01 01</b>		<b>Introduction to ICAO Annex 15 — Aeronautical Information Service (AIS)</b>										
(01)		State, in general terms, the objective of an AIS.	X	X	X	X	X	X				
<b>010 08 02 00</b>		<b>Definitions of ICAO Annex 15</b>										
<b>010 08 02 01</b>		<b>Definitions of ICAO Annex 15</b>										
(01)		Recall the following definitions: — aeronautical information circular (AIC), aeronautical information publication (AIP), AIP amendment, AIP supplement, aeronautical information regulation and control	X	X	X	X	X	X	X	2		



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Syllabus reference	BK	Syllabus details and associated Learning Objectives	Aeroplane		Helicopter			IR	CB-IR(A)	BIR Exam	BIR BK	Remarks
			ATPL	CPL	ATPL /IR	ATPL	CPL					
		(AIRAC), danger area, aeronautical information management, international airport, international NOTAM office (NOF), manoeuvring area, movement area, NOTAM, pre-flight information bulletin (PIB), prohibited area, restricted area, SNOWTAM, ASHTAM.										
<b>010 08 03 00</b>		<b>General</b>										
<b>010 08 03 01</b>		<b>General — AIS responsibilities and functions</b>										
(01)		State during which period of time an AIS shall be available with reference to an aircraft flying in the area of responsibility of an AIS, provided a 24-hour service is not available.	X	X	X	X	X	X				
(02)		List, in general, the kind of aeronautical information/data which an AIS service shall make available in a suitable form to flight crew.	X	X	X	X	X	X				
(03)		Summarise the duties of an AIS concerning aeronautical information data for the territory of a particular State.	X	X	X	X	X	X				
<b>010 08 04 00</b>		<b>Aeronautical information products and services</b>										
<b>010 08 04 01</b>		<b>Aeronautical information publication (AIP)</b>										

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Syllabus reference	BK	Syllabus details and associated Learning Objectives	Aeroplane		Helicopter			IR	CB-IR(A)	BIR Exam	BIR BK	Remarks
			ATPL	CPL	ATPL /IR	ATPL	CPL					
(01)		State the primary purpose of the AIP.	X	X	X	X	X	X				
(02)		Name the different parts of the AIP.	X	X	X	X	X	X				
(03)		State the main parts of the AIP where the following information can be found: <ul style="list-style-type: none"> <li>— differences from the ICAO Standards, Recommended Practices and Procedures;</li> <li>— location indicators, AIS, minimum flight ALT, meteorological information for aircraft in flight (VOLMET) service, SIGMET service;</li> <li>— general rules and procedures (especially general rules, VFR, IFR, ALT-setting procedure, interception of civil aircraft, unlawful interference, air traffic incidents);</li> <li>— ATS airspace (especially FIR, UIR, TMA);</li> <li>— ATS routes (especially lower ATS routes, upper ATS routes, area navigation routes);</li> <li>— AD data including aprons, taxiways (TWYs) and check locations/positions data;</li> </ul>	X	X	X	X	X	X	X	2		

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Syllabus reference	BK	Syllabus details and associated Learning Objectives	Aeroplane		Helicopter			IR	CB-IR(A)	BIR Exam	BIR BK	Remarks
			ATPL	CPL	ATPL /IR	ATPL	CPL					
		<ul style="list-style-type: none"> <li>— navigation warnings (especially prohibited, restricted and danger areas);</li> <li>— aircraft instruments, equipment and flight documents;</li> <li>— AD surface movement guidance and control system and markings;</li> <li>— RWY physical characteristics, declared distances, approach (APP) and RWY lighting;</li> <li>— AD radio navigation and landing aids;</li> <li>— charts related to an AD;</li> <li>— entry, transit and departure of aircraft, passengers, crew and cargo, and the significance of this information to flight crew.</li> </ul>										
(04)		State how permanent changes to the AIP shall be published.	X	X	X	X	X	X				
(05)		Explain what kind of information shall be published in the form of AIP Supplements.	X	X	X	X	X	X				
<b>010 08 04 02</b>		<b>Notices to airmen (NOTAMs)</b>										
(01)		Describe how information shall be published which in principle would belong to NOTAMs but includes extensive text or graphics.	X	X	X	X	X	X	X		2	
(02)		Summarise the essential information which leads to the issue of a NOTAM.	X	X	X	X	X	X	X	2		

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Syllabus reference	BK	Syllabus details and associated Learning Objectives	Aeroplane		Helicopter			IR	CB-IR(A)	BIR Exam	BIR BK	Remarks
			ATPL	CPL	ATPL /IR	ATPL	CPL					
(03)		State how NOTAMs shall be distributed.	X	X	X	X	X	X				
(04)		Explain how information regarding snow, ice and standing water on AD pavements shall be reported.	X	X	X	X	X	X	X			
(05)		Describe the means by which NOTAMs shall be distributed.	X	X	X	X	X	X				
(06)		Define and state which information an ASHTAM may contain.	X	X	X	X	X	X				
<b>010 08 04 03</b>		<b>Aeronautical information regulation and control (AIRAC)</b>										
(01)	X	List the circumstances under which the information concerned shall or should be distributed as an AIRAC.	X	X	X	X	X	X	X		2	
<b>010 08 04 04</b>		<b>Aeronautical information circulars (AICs)</b>										
(01)	X	Describe the type of information that may be published in AICs.	X	X	X	X	X	X				
(02)		Explain the organisation of AICs.	X	X	X	X	X	X				
<b>010 08 04 05</b>		<b>Pre-flight and post-flight information/data</b>										
(01)		Summarise, in addition to the elements of the integrated AIP and maps/charts, the additional current information relating to the AD of departure that shall be provided as pre-flight information.	X	X	X	X	X	X				

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Syllabus reference	BK	Syllabus details and associated Learning Objectives	Aeroplane		Helicopter			IR	CB-IR(A)	BIR Exam	BIR BK	Remarks
			ATPL	CPL	ATPL /IR	ATPL	CPL					
(02)		Describe how a recapitulation of current NOTAM and other information of urgent character shall be made available to flight crew.	X	X	X	X	X	X	X	2		
(03)		State which post-flight information from flight crew shall be submitted to AIS for distribution as required by the circumstances.	X	X	X	X	X	X				
<b>010 08 05 00</b>		<b>ATM service providers</b>										
<b>010 08 05 01</b>		<b>ATM</b>										
(01)		MCAR-Part-ATS: — general requirements for the provision of air navigation services; — specific requirements for the provision of air traffic services; — specific requirements for the provision of meteorological services; — specific requirements for the provision of aeronautical information services; — specific requirements for the provision of communication, navigation or surveillance services.	X		X	X						
<b>010 09 00 00</b>		<b>AERODROMES (ICAO Annex 14 and Civil Aviation Regulations) and associated MCAR's</b>										

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Syllabus reference	BK	Syllabus details and associated Learning Objectives	Aeroplane		Helicopter			IR	CB-IR(A)	BIR Exam	BIR BK	Remarks
			ATPL	CPL	ATPL /IR	ATPL	CPL					
<b>010 09 01 00</b>		<b>General</b>										
<b>010 09 01 01</b>		<b>General — AD reference code</b>										
(01)		Describe the intent of the AD reference code and state the functions of the two code elements.	X	X								
<b>010 09 02 00</b>		<b>Aerodrome (AD) data</b>										
<b>010 09 02 01</b>		<b>Aerodrome (AD) reference point</b>										
(01)		Describe where the AD reference point shall be located and where it shall normally remain.	X	X	X	X	X	X	X		2	
<b>010 09 02 02</b>		<b>Pavement strengths</b>										
(01)		Explain the terms: 'pavement classification number (PCN)' and 'aircraft classification number (ACN)', and describe their mutual dependence.	X	X	X	X	X	X				
(02)		Describe how the bearing strength for an aircraft with an apron mass equal to or less than 5 700 kg shall be reported.	X	X	X	X	X	X				
<b>010 09 02 03</b>		<b>Declared distances</b>										
(01)		State that ICAO Annex 14 provides guidance on the calculation of declared distances (TORA, TODA, ASDA, LDA).	X	X	X	X	X	X				
(02)		Recall the definitions for the four main declared distances.	X	X	X	X	X	X				
<b>010 09 02 04</b>		<b>Condition of the movement area and related facilities</b>										

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Syllabus reference	BK	Syllabus details and associated Learning Objectives	Aeroplane		Helicopter			IR	CB-IR(A)	BIR Exam	BIR BK	Remarks
			ATPL	CPL	ATPL /IR	ATPL	CPL					
(01)		State the purpose of informing AIS and ATS units about the condition of the movement area and related facilities.	X	X	X	X	X	X				
(02)		List the matters of operational significance or affecting aircraft performance which should be reported to AIS and ATS units to be transmitted to aircraft involved.	X	X	X	X	X	X				
(03)		Describe the different types of contaminant on RWYs.	X	X	X	X	X	X		2	1	
(04)		Explain the different types of frozen water on the RWY and their impact on aircraft braking performance.	X	X	X	X	X	X				
(05)		Describe the runway condition codes and the associated runway braking action.	X	X	X	X	X			2	1	
<b>010 09 03 00</b>		<b>Physical characteristics</b>										
<b>010 09 03 01</b>		<b>Runways (RWYs)</b>										
(01)		Describe where a THR should normally be located.	X	X	X	X	X	X				
(02)		Describe the general considerations concerning RWYs-associated with a stopway (SWY) or clearway (CWY).	X	X	X	X	X	X	X		2	
<b>010 09 03 02</b>		<b>Runway (RWY) strips</b>										
(01)		Explain the term 'runway strip'.	X	X	X	X	X	X	X		2	
<b>010 09 03 03</b>		<b>Runway-end safety area</b>										

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Syllabus reference	BK	Syllabus details and associated Learning Objectives	Aeroplane		Helicopter			IR	CB-IR(A)	BIR Exam	BIR BK	Remarks
			ATPL	CPL	ATPL /IR	ATPL	CPL					
(01)		Explain the term 'runway-end safety area'.	X	X	X	X	X	X	X		2	
<b>010 09 03 04</b>		<b>Clearway (CWY)</b>										
(01)		Explain the term 'clearway'.	X	X	X	X	X	X	X		2	
<b>010 09 03 05</b>		<b>Stopway (SWY)</b>										
(01)		Explain the term 'stopway'.	X	X	X	X	X	X	X		2	
<b>010 09 03 06</b>		<b>Intentionally left blank</b>										
<b>010 09 03 07</b>		<b>Taxiways (TWYs)</b>										
(01)		Describe the reasons and the requirements for rapid-exit TWYs.	X	X	X	X	X	X				
(02)		Explain TWY widening in curves.	X	X	X	X	X	X				
(03)		Explain when and where holding bays should be provided.	X	X	X	X	X	X				
(04)		Describe where RWY holding positions shall be established.	X	X	X	X	X	X	X		2	
(05)		Describe the term 'road holding position'.	X	X	X	X	X	X				
(06)		Describe where intermediate TWY holding positions should be established.	X	X	X	X	X	X				
<b>010 09 04 00</b>		<b>Visual aids for navigation</b>										
<b>010 09 04 01</b>		<b>Indicators and signalling devices</b>										
(01)		Describe the wind-direction indicators with which ADs shall be equipped.	X	X	X	X	X	X	X			
(02)		Describe a landing-direction indicator.	X	X	X	X	X	X				



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			ATPL	CPL	ATPL /IR	ATPL	CPL					
(03)		Explain the capabilities of a signalling lamp.	X	X	X	X	X	X	X			
(04)	X	State which characteristics a signal area should have.	X	X	X	X	X	X	X			
(05)	X	Interpret all indications and signals that may be used in a signal area.	X	X	X	X	X	X	X			
<b>010 09 04 02</b>		<b>Markings</b>										
(01)		Name the colours used for the various markings (RWY, TWY, aircraft stands, apron safety lines).	X	X	X	X	X	X	X	2		
(02)		State where a RWY designation marking shall be provided and describe the different layouts (excluding dimensions).	X	X	X	X	X	X	X			
(03)		Describe the application and general characteristics (excluding dimensions) of: — RWY-centre-line markings; — THR markings; — touchdown-zone (TDZ) markings; — RWY-side-stripe markings; — TWY-centre-line markings; — RWY holding position markings; — intermediate holding position markings; — aircraft-stand markings; — apron safety lines; — road holding position markings; — mandatory instruction markings;	X	X	X	X	X	X	X	2		

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Syllabus reference	BK	Syllabus details and associated Learning Objectives	Aeroplane		Helicopter			IR	CB-IR(A)	BIR Exam	BIR BK	Remarks
			ATPL	CPL	ATPL /IR	ATPL	CPL					
		— information markings.										
<b>010 09 04 03</b>		<b>Lights</b>										
(01)		Describe the mechanical safety considerations regarding elevated approach lights and elevated RWY, SWY and TWY lights.	X	X	X	X	X	X	X	2		
(02)		List the conditions for the installation of an aerodrome beacon (ABN) and describe its general characteristics.	X	X	X	X	X	X	X		2	
(03)		Describe the different kinds of operations for which a simple approach lighting system shall be used.	X	X	X	X	X	X	X	2		
(04)		Describe the basic installations of a simple approach lighting system including the dimensions and distances normally used.	X	X	X	X	X	X	X	2		
(05)		Describe the principle of a precision approach category I lighting system including information such as location and characteristics.	X	X	X	X	X	X	X	2		
(06)		Describe the principle of a precision approach category II and III lighting system including information such as location and characteristics, especially the inner 300 m of the system.	X					X	X			
(07)		Describe the wing bars of the precision approach path indicator (PAPI) and the abbreviated precision ap-	X	X	X	X	X	X	X		2	

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Syllabus reference	BK	Syllabus details and associated Learning Objectives	Aeroplane		Helicopter			IR	CB-IR(A)	BIR Exam	BIR BK	Remarks
			ATPL	CPL	ATPL /IR	ATPL	CPL					
		proach path indicator (APAPI). Interpret what the pilot will see during the approach using PAPI.										
(08)		Interpret what the pilot will see during an approach using a helicopter approach path indicator (HAPI).			X	X	X					
(09)		Explain the application and characteristics (as applicable, but limited to colour, intensity, direction and whether fixed or flashing) of: <ul style="list-style-type: none"> <li>— RWY-edge lights;</li> <li>— RWY-THR and wing-bar lights;</li> <li>— RWY-end lights;</li> <li>— RWY-centre-line lights;</li> <li>— RWY-lead-in lights;</li> <li>— RWY-TDZ lights;</li> <li>— SWY lights;</li> <li>— TWY-centre-line lights;</li> <li>— TWY-edge lights;</li> <li>— stop bars;</li> <li>— intermediate holding position lights;</li> <li>— RWY guard lights;</li> <li>— road holding position lights.</li> </ul>	X	X	X	X	X	X	X	2		
(10)		State the timescale within which aeronautical ground lights shall be made available to arriving aircraft.	X	X	X	X	X	X	X			
<b>010 09 04 04</b>		<b>Signs</b>										
(01)		Explain which signs are the only ones on the movement area utilising red.	X	X	X	X	X	X	X		2	

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			ATPL	CPL	ATPL /IR	ATPL	CPL					
(02)		List the provisions for illuminating signs.	X	X	X	X	X	X	X		2	
(03)		Name the kinds of signs which shall be included in mandatory instruction signs.	X	X	X	X	X	X	X		2	
(04)		Name the colours used for mandatory instruction signs.	X	X	X	X	X	X	X		2	
(05)		Describe by which sign a pattern 'A' RWY holding position (i.e. at an intersection of a TWY and a non-instrument, non-precision approach or take-off RWY) marking shall be supplemented.	X	X	X	X	X	X	X			
(06)		Describe by which sign a pattern 'B' RWY holding position (i.e. at an intersection of a TWY and a precision approach RWY) marking shall be supplemented.	X	X	X	X	X	X	X			
(07)		Describe the location of: — a RWY designation sign at a TWY/RWY intersection; — a 'NO ENTRY' sign; — a RWY holding position sign.	X	X	X	X	X	X	X		2	
(08)		State which sign indicates that a taxiing aircraft is about to infringe an obstacle limitation surface or interfere with the operation of radio navigation aids (e.g. ILS/MLS critical/sensitive area).	X	X	X	X	X	X	X		2	

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			ATPL	CPL	ATPL /IR	ATPL	CPL					
(09)		Describe the various possible inscriptions on RWY designation signs and on holding position signs.	X	X	X	X	X	X	X		2	
(10)		Describe the colours used in connection with information signs.	X	X	X	X	X	X	X			
(11)		Describe the possible inscriptions on information signs.	X	X	X	X	X	X	X			
(12)		Explain the application, location and characteristics of aircraft stand identification signs.	X	X	X	X	X	X	X			
(13)		Explain the application, location and characteristics of road holding position signs.	X	X	X	X	X	X	X			
<b>010 09 04 05</b>		<b>Markers</b>										
(01)		Explain why markers located near a RWY or TWY shall be HGT limited.	X	X	X	X	X	X	X			
(02)		Explain the application and characteristics (excluding dimensions) of: — unpaved RWY-edge markers; — TWY-edge markers; — TWY-centre-line markers; — unpaved TWY-edge markers; — boundary markers; — SWY-edge markers.	X	X	X	X	X	X	X			
<b>010 09 05 00</b>		<b>Visual aids for denoting obstacles</b>										
<b>010 09 05 01</b>		<b>Marking of objects</b>										
(01)		State how fixed or mobile objects shall be marked if colouring is not practicable.	X	X	X	X	X	X				

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			ATPL	CPL	ATPL /IR	ATPL	CPL					
(02)		Describe marking by colours (fixed or mobile objects).	X	X	X	X	X	X				
(03)		Explain the use of markers for the marking of objects, overhead wires, cables, etc.	X	X	X	X	X	X				
(04)		Explain the use of flags for the marking of objects.	X	X	X	X	X	X				
<b>010 09 05 02</b>		<b>Lighting of objects</b>										
(01)		Name the different types of lights to indicate the presence of objects which must be lighted.	X	X	X	X	X	X				
(02)		Describe (in general terms) the location of obstacle lights.	X	X	X	X	X	X				
(03)		Describe (in general and for normal circumstances) the colour and sequence of low-intensity obstacle lights, medium-intensity obstacle lights and high-intensity obstacle lights.	X	X	X	X	X	X				
(04)		State that information about lights to be displayed by aircraft is provided in both ICAO Annex 2 (Rules of the Air) and SERA.	X	X	X	X	X	X				
<b>010 09 06 00</b>		<b>Visual aids for denoting restricted use of areas</b>										
<b>010 09 06 01</b>		<b>Visual aids for denoting restricted use of areas on RWYs and TWYs</b>										
(01)		Describe the colours and meaning of 'closed markings' on RWYs and TWYs.	X	X	X	X	X	X				

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			ATPL	CPL	ATPL /IR	ATPL	CPL					
(02)		State how the pilot of an aircraft moving on the surface of a TWY, holding bay or apron shall be warned that the shoulders of these surfaces are 'non-load-bearing'.	X	X	X	X	X	X				
(03)		Describe the pre-THR marking (including colours) when the surface before the THR is not suitable for normal use by aircraft.	X	X	X	X	X	X				
<b>010 09 07 00</b>		<b>Aerodrome (AD) operational services, equipment and installations</b>										
<b>010 09 07 01</b>		<b>Rescue and firefighting (RFF)</b>										
(01)		State the principal objective of RFF services.	X	X	X	X	X	X				
(02)		Explain the basic information the AD category (for RFF) depends upon.	X	X	X	X	X	X				
(03)		Describe what is meant by the term 'response time', and state its normal and maximum limits.	X	X	X	X	X	X				
<b>010 09 07 02</b>		<b>Apron management service</b>										
(01)		State who has a right-of-way against vehicles operating on an apron.	X	X	X	X	X	X				
<b>010 09 07 03</b>		<b>Ground-servicing of aircraft</b>										
(01)		Describe the necessary actions during the ground-servicing of an aircraft with regard to the possible event of a fuel fire.	X	X	X	X	X	X				
<b>010 09 08 00</b>		<b>Supplementary Guidance Material</b>										

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			ATPL	CPL	ATPL /IR	ATPL	CPL					
<b>010 09 08 01</b>		<b>Declared distances</b>										
(01)		List the four types of 'declared distances' on a RWY and also the appropriate abbreviations.	X	X	X	X	X	X			1	
(02)		Explain the circumstances which lead to the situation that the four declared distances on a RWY are equal to the length of the RWY.	X	X	X	X	X	X				
(03)		Describe the influence of a CWY, SWY or displaced THR upon the four 'declared distances'.	X	X	X	X	X	X				
<b>010 09 08 02</b>		<b>Intentionally left blank</b>										
<b>010 09 08 03</b>		<b>Approach lighting systems</b>										
(01)		Name the two main groups of approach lighting systems.	X	X	X	X	X	X	X	2		
(02)		Describe the two different versions of a simple approach lighting system.	X	X	X	X	X	X	X	2		
(03)		Describe the two different basic versions of precision approach lighting systems for CAT I.	X	X	X	X	X	X	X	2		
(04)		Describe the diagram of the inner 300 m of the precision approach lighting system in the case of CAT II and III.	X									
(05)		Describe how the arrangement of an approach lighting system and the location of the appropriate THR are interrelated.	X	X	X	X	X	X	X	2		
<b>010 10 00 00</b>		<b>FACILITATION (ICAO Annex 9)</b>										
<b>010 10 01 00</b>		<b>Intentionally left blank</b>										



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Syllabus reference	BK	Syllabus details and associated Learning Objectives	Aeroplane		Helicopter			IR	CB-IR(A)	BIR Exam	BIR BK	Remarks
			ATPL	CPL	ATPL /IR	ATPL	CPL					
<b>010 10 02 00</b>		<b>Entry and departure of aircraft</b>										
<b>010 10 02 01</b>		<b>General declaration</b>										
(01)		Describe the purpose and use of aircraft documents as regards a 'general declaration'.	X	X	X	X	X					
<b>010 10 02 02</b>		<b>Entry and departure of crew</b>										
(01)		Explain entry requirements for crew.	X	X	X	X	X					
(02)		Explain the reasons for the use of crew member certificates (CMC) for crew members engaged in international air transport.	X	X	X	X	X					
(03)		Explain in which cases Contracting States should accept the CMC as an identity document instead of a passport or visa.	X	X	X	X	X					
<b>010 10 02 03</b>		<b>Entry and departure of passengers and baggage</b>										
(01)		Explain the entry requirements for passengers and their baggage.	X	X	X	X	X					
(02)		Explain the requirements and documentation for unaccompanied baggage.	X	X	X	X	X					
(03)		Identify the documentation required for the departure and entry of passengers and their baggage.	X	X	X	X	X					
(04)		Explain the arrangements in the event of a passenger being declared an inadmissible person.	X	X	X	X	X					

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Syllabus reference	BK	Syllabus details and associated Learning Objectives	Aeroplane		Helicopter			IR	CB-IR(A)	BIR Exam	BIR BK	Remarks
			ATPL	CPL	ATPL /IR	ATPL	CPL					
(05)		Describe the pilot's authority towards unruly passengers.	X	X	X	X	X					
<b>010 10 02 04</b>		<b>Entry and departure of cargo</b>										
(01)		Explain the entry requirements for cargo.	X	X	X	X	X					
<b>010 11 00 00</b>		<b>SEARCH AND RESCUE (SAR)</b>										
<b>010 11 01 00</b>		<b>Essential SAR definitions</b>										
<b>010 11 01 01</b>		<b>Essential SAR definitions — ICAO Annex 12</b>										
(01)		Recall the definitions of the following terms: alert phase, distress phase, emergency phase, operator, PIC, rescue coordination centre, State of Registry, uncertainty phase.	X	X	X	X	X					
<b>010 11 02 00</b>		<b>SAR — Organisation</b>										
<b>010 11 02 01</b>		<b>SAR — Organisation — Establishment and provision</b>										
(01)		Describe how ICAO Contracting States shall arrange for the establishment and prompt provision of SAR services.	X	X	X	X	X					
(02)		Explain the establishment of SAR by Contracting States.	X	X	X	X	X					
(03)		Describe the areas within which SAR services shall be established by Contracting States.	X	X	X	X	X					

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Syllabus reference	BK	Syllabus details and associated Learning Objectives	Aeroplane		Helicopter			IR	CB-IR(A)	BIR Exam	BIR BK	Remarks
			ATPL	CPL	ATPL /IR	ATPL	CPL					
(04)		State the period of time per day within which SAR services shall be available.	X	X	X	X	X					
(05)		Describe for which areas rescue coordination centres shall be established.	X	X	X	X	X					
<b>010 11 03 00</b>		<b>Operating procedures for non-SAR crews</b>										
<b>010 11 03 01</b>		<b>Operating procedures for non-SAR crews — PIC</b>										
(01)		Explain the SAR operating procedures for the PIC who arrives first at the scene of an accident.	X	X	X	X	X					
(02)		Explain the SAR operating procedures for the PIC intercepting a distress transmission.	X	X	X	X	X					
<b>010 11 04 00</b>		<b>Search and rescue signals</b>										
<b>010 11 04 01</b>		<b>Search and rescue signals — Survivors</b>										
(01)		Explain the 'ground-air visual signal code' for use by survivors.	X	X	X	X	X					
(02)		Recognise the SAR 'air-to-ground signals' for use by survivors.	X	X	X	X	X					
<b>010 12 00 00</b>		<b>SECURITY — Safeguarding International Civil Aviation against Acts of Unlawful Interference (ICAO Annex 17)</b>										
<b>010 12 01 00</b>		<b>Definitions of ICAO Annex 17</b>										
<b>010 12 01 01</b>		<b>Essential definitions of ICAO Annex 17</b>										

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Syllabus reference	BK	Syllabus details and associated Learning Objectives	Aeroplane		Helicopter			IR	CB-IR(A)	BIR Exam	BIR BK	Remarks
			ATPL	CPL	ATPL /IR	ATPL	CPL					
(01)		Recall the definitions of the following terms: — airside, aircraft security check, screening, security, security control, security-restricted area, unidentified baggage.	X	X	X	X	X					
<b>010 12 02 00</b>		<b>General principles</b>										
<b>010 12 02 01</b>		<b>General principles — Objectives of security</b>										
(01)		State the objectives of security.	X	X	X	X	X					
<b>010 12 03 00</b>		<b>Intentionally left blank</b>										
<b>010 12 04 00</b>		<b>Preventive security measures</b>										
<b>010 12 04 01</b>		<b>Preventive security measures</b>										
(01)		Describe the objects not allowed (for reasons of aviation security) on board an aircraft that is engaged in international civil aviation.	X	X	X	X	X					
(02)		State what each Contracting State is supposed to do if passengers subjected to security control have mixed after a security screening point.	X	X	X	X	X					
(03)		Explain what has to be done when passengers who are obliged to travel because of judicial or administrative proceedings are supposed to board an aircraft.	X	X	X	X	X					

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Syllabus reference	BK	Syllabus details and associated Learning Objectives	Aeroplane		Helicopter			IR	CB-IR(A)	BIR Exam	BIR BK	Remarks
			ATPL	CPL	ATPL /IR	ATPL	CPL					
(04)		Explain what has to be considered if law enforcement officers carry weapons on board.	X	X	X	X	X					
<b>010 12 05 00</b>		<b>Management of response to acts of unlawful interference</b>										
<b>010 12 05 01</b>		<b>Management of response to acts of unlawful interference</b>										
(01)		Describe the assistance each Contracting State shall provide to an aircraft subjected to an act of unlawful seizure.	X	X	X	X	X					
(02)		State the circumstances which could prevent a Contracting State from detaining an aircraft on the ground after being subjected to an act of unlawful seizure.	X	X	X	X	X					
<b>010 12 06 00</b>		<b>Operators' security programme</b>										
<b>010 12 06 01</b>		<b>Operators' security programme — Principles</b>										
(01)		Describe the principles of the written operator's security programme each Contracting State requires from operators.	X	X	X	X	X					
<b>010 12 07 00</b>		<b>Security procedures in other documents, i.e. ICAO Annexes 2, 6 and 14, ICAO Doc 4444, MCAR-Part-ORO and MCAR-Part-AERODROME Design</b>										

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Syllabus reference	BK	Syllabus details and associated Learning Objectives	Aeroplane		Helicopter			IR	CB-IR(A)	BIR Exam	BIR BK	Remarks
			ATPL	CPL	ATPL /IR	ATPL	CPL					
<b>010 12 07 01</b>		<b>ICAO Annex 2 — Rules of the Air, including Attachment B — Unlawful interference</b>										
(01)		Describe what the PIC should do, in a situation of unlawful interference, unless considerations aboard the aircraft dictate otherwise.	X	X	X	X	X					
(02)		Describe what the PIC, of an aircraft subjected to unlawful interference, should do if: — the aircraft must depart from its assigned track; — the aircraft must depart from its assigned cruising level; — the aircraft is unable to notify an ATS unit of the unlawful interference.	X	X	X	X	X					
(03)		Describe what the PIC should attempt to do with regard to broadcast warnings and the level at which to proceed, in a situation of unlawful interference, if no applicable regional procedures for in-flight contingencies have been established.	X	X	X	X	X					
<b>010 12 07 02</b>		<b>ICAO Annex 6 — Operation of Aircraft — Security</b>										
(01)		Describe the special considerations referring to flight crew compartment doors with regard to aviation security.	X	X	X	X	X					

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Syllabus reference	BK	Syllabus details and associated Learning Objectives	Aeroplane		Helicopter			IR	CB-IR(A)	BIR Exam	BIR BK	Remarks
			ATPL	CPL	ATPL /IR	ATPL	CPL					
<b>010 12 07 03</b>		<b>ICAO Annex 14 Volume I — Aero-dromes — Physical characteristics</b>										
(01)		Describe what minimum distance an isolated aircraft parking position (after the aircraft has been subjected to unlawful interference) should have from other parking positions, buildings or public areas.	X	X	X	X	X					
<b>010 12 07 04</b>		<b>ICAO Doc 4444 — Air Traffic Management</b>										
(01)		Describe the considerations that must take place with regard to a taxi clearance in case an aircraft is known or believed to have been subjected to unlawful interference.	X	X	X	X	X					
<b>010 13 00 00</b>		<b>AIRCRAFT ACCIDENT AND INCIDENT INVESTIGATION</b>										
<b>010 13 01 00</b>		<b>Essential definitions of ICAO Annex 13</b>										
<b>010 13 01 01</b>		<b>Definitions and descriptions</b>										
(01)		Recall the definitions of the following terms: — accident, aircraft, flight recorder, incident, investigation, maximum mass, operator, serious incident, serious injury, State of Design, State	X	X	X	X	X					

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Syllabus reference	BK	Syllabus details and associated Learning Objectives	Aeroplane		Helicopter			IR	CB-IR(A)	BIR Exam	BIR BK	Remarks
			ATPL	CPL	ATPL /IR	ATPL	CPL					
		of Manufacture, State of Occurrence, State of the Operator, State of Registry.										
(02)		Explain the difference between 'serious incident' and 'accident'.	X	X	X	X	X					
(03)		Determine whether a certain occurrence has to be defined as a serious incident or as an accident.	X	X	X	X	X					
(04)		Recognise the description of an accident or incident.	X	X	X	X	X					
<b>010 13 02 00</b>		<b>Accident and incident investigation in ICAO Annex 13</b>										
<b>010 13 02 01</b>		<b>Objectives and procedures</b>										
(01)		State the objective(s) of the investigation of an accident or incident according to ICAO Annex 13.	X	X	X	X	X					
(02)		Describe the general procedures for the investigation of an accident or incident according to ICAO Annex 13.	X	X	X	X	X					
<b>010 13 03 00</b>		<b>Accident and incident investigation in Civil Aviation regulations</b>										
<b>010 13 03 01</b>		<b>Occurrences</b>										
(01)		Identify an occurrence as being either an accident, incident or serious incident in accordance with the Civil Aviation Regulations and on the investigation and prevention of accidents and incidents in civil aviation.	X	X	X	X	X					



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Syllabus reference	BK	Syllabus details and associated Learning Objectives	Aeroplane		Helicopter			IR	CB-IR(A)	BIR Exam	BIR BK	Remarks
			ATPL	CPL	ATPL /IR	ATPL	CPL					
(02)		Describe the relationship the Civil Aviation Regulations on the investigation and prevention of accidents and incidents in civil aviation and MCAR-Occurrence reporting on Accident investigation and the Civil Aviation Regulations on the reporting, analysis and follow-up of occurrences in civil aviation.	X	X	X	X	X					
(03)		State the subject matter and scope of MCAR-Part-Occurrence Reporting.	X	X	X	X	X					
(04)		Identify occurrences that must be reported.	X	X	X	X	X					
(05)		Identify occurrences that should be voluntarily reported.	X	X	X	X	X					
(06)		Describe how information from occurrences is collected, stored and analysed.	X	X	X	X	X					

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**SUBJECT 021 – AIRCRAFT GENERAL KNOWLEDGE – AIRFRAME, SYSTEMS AND POWER PLANT**

Syllabus reference	BK	Syllabus details and associated Learning Objectives	Aeroplane		Helicopter			IR	CB-IR(A)	BIR Exam	BIR BK	Remarks
			ATPL	CPL	ATPL/IR	ATPL	CPL					
020 00 00 00		<b>AIRCRAFT GENERAL KNOWLEDGE</b>										
021 00 00 00		<b>AIRCRAFT GENERAL KNOWLEDGE — AIRFRAME, SYSTEMS AND POWER PLANT</b>										
021 01 00 00		<b>SYSTEM DESIGN, LOADS, STRESSES, MAINTENANCE</b>										
021 01 01 00		<b>System design</b>										
021 01 01 01		<b>Design concepts</b>										
(01)	X	Describe the following structural design philosophy: — safe life; — fail-safe (multiple load paths); — damage-tolerant.	X	X	X	X	X					
(02)		Explain the purpose of redundancy in aircraft design.	X	X	X	X	X					
021 01 01 02		<b>Level of certification</b>										
(01)	X	Explain why some systems are duplicated or triplicated.	X	X	X	X	X					
(02)	X	Explain that all aircraft are certified according to specifications determined by the Authority, and that these certification specifications cover aspects such as design, material quality and build quality.	X	X	X	X	X					

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Syllabus reference	BK	Syllabus details and associated Learning Objectives	Aeroplane		Helicopter			IR	CB-IR(A)	BIR Exam	BIR BK	Remarks
			ATPL	CPL	ATPL/IR	ATPL	CPL					
(03)	X	State that the certification specifications for aeroplanes issued by EASA are: — CS-23 for Normal, Utility, Aerobatic and Commuter Aeroplanes; — CS-25 for Large Aeroplanes.	X	X								
(04)	X	State that the certification specifications for rotorcraft issued by EASA are: — CS-27 for Small Rotorcraft; — CS-29 for Large Rotorcraft.			X	X	X					
<b>021 01 02 00</b>		<b>Loads and stresses</b>										
<b>021 01 02 01</b>		<b><i>Stress, strain and loads</i></b>										
(01)		Explain how stress and strain are always present in an aircraft structure both when parked and during manoeuvring. <i>Remark: Stress is the internal force per unit area inside a structural part as a result of external loads. Strain is the deformation caused by the action of stress on a material.</i>	X	X	X	X	X					
(02)		Describe the following types of loads that an aircraft may be subjected to, when they occur, and how a pilot may affect their magnitude: — static loads; — dynamic loads; — cyclic loads.	X	X	X	X	X					

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Syllabus reference	BK	Syllabus details and associated Learning Objectives	Aeroplane		Helicopter			IR	CB-IR(A)	BIR Exam	BIR BK	Remarks
			ATPL	CPL	ATPL/IR	ATPL	CPL					
(03)		Describe the areas typically prone to stress that should be given particular attention during a pre-flight inspection, and highlight the limited visual cues of any deformation that may be evident.	X	X	X	X	X					
<b>021 01 03 00</b>		<b>Fatigue and corrosion</b>										
<b>021 01 03 01</b>		<b><i>Describe and explain fatigue and corrosion</i></b>										
(01)		Describe the effects of corrosion and how it can be visually identified by a pilot during the pre-flight inspection.	X	X	X	X	X					
(02)		Describe the operating environments where the risk of corrosion is increased and how to minimise the effects of the environmental factors.	X	X	X	X	X					
(03)		Explain that aircraft have highly corrosive fluids on board as part of their systems and equipment.	X	X	X	X	X					
(04)		Explain fatigue, how it affects the useful life of an aircraft, and the effect of the following factors on the development of fatigue: — corrosion; — number of cycles; — type of flight manoeuvres; — stress level; — level and quality of maintenance.	X	X	X	X	X					
<b>021 01 04 00</b>		<b>Intentionally left blank</b>										
<b>021 01 05 00</b>		<b>Maintenance</b>										

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Syllabus reference	BK	Syllabus details and associated Learning Objectives	Aeroplane		Helicopter			IR	CB-IR(A)	BIR Exam	BIR BK	Remarks
			ATPL	CPL	ATPL/IR	ATPL	CPL					
<b>021 01 05 01</b>		<b><i>Maintenance methods: hard-time and on-condition monitoring</i></b>										
(01)		Explain the following terms: — hard-time or fixed-time maintenance; — on-condition maintenance; — condition monitoring.	X	X	X	X	X					
<b>021 02 00 00</b>		<b>AIRFRAME</b>										
<b>021 02 01 00</b>		<b>Attachment methods</b>										
<b>021 02 01 01</b>		<b><i>Attachment methods and detecting the development of faulty attachments</i></b>										
(01)		Describe the following attachment methods used for aircraft parts and components: — riveting; — welding; — bolting; — pinning; — adhesives (bonding); — screwing.	X	X	X	X	X					
(02)		Explain how the development of a faulty attachment between aircraft parts or components can be detected by a pilot during the pre-flight inspection.	X	X	X	X	X					
<b>021 02 02 00</b>		<b>Materials</b>										
<b>021 02 02 01</b>		<b><i>Composite and other materials</i></b>										

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Syllabus reference	BK	Syllabus details and associated Learning Objectives	Aeroplane		Helicopter			IR	CB-IR(A)	BIR Exam	BIR BK	Remarks
			ATPL	CPL	ATPL/IR	ATPL	CPL					
(01)	X	Explain the principle of a composite material, and give examples of typical non-metallic materials used on aircraft: — carbon; — glass; — Kevlar aramid; — resin or filler.	X	X	X	X	X					
(02)	X	State the advantages and disadvantages of composite materials compared with metal alloys by considering the following: — strength-to-weight ratio; — capability to tailor the strength to the direction of the load; — stiffness; — electrical conductivity (lightning); — resistance to fatigue and corrosion; — resistance to cost; — discovering damage during a pre-flight inspection.	X	X	X	X	X					
(03)		State that several types of materials are used on aircraft and that they are chosen based on type of structure or component and the required/desired material properties.	X	X	X	X	X					
<b>021 02 03 00</b>		<b>Aeroplane: wings, tail surfaces and control surfaces</b>										
<b>021 02 03 01</b>		<b>Design</b>										

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Syllabus reference	BK	Syllabus details and associated Learning Objectives	Aeroplane		Helicopter			IR	CB-IR(A)	BIR Exam	BIR BK	Remarks
			ATPL	CPL	ATPL/IR	ATPL	CPL					
(01)		Describe the following types of design and explain their advantages and disadvantages: — high-mounted wing; — low-mounted wing; — low- or mid-set tailplane; — T-tail.	X	X								
<b>021 02 03 02</b>		<b>Structural components</b>										
(01)		Describe the function of the following structural components: — spar and its components (web and girder or cap); — rib; — stringer; — skin; — torsion box.	X	X								
<b>021 02 03 03</b>		<b>Loads, stresses and aeroelastic vibrations (flutter)</b>										
(01)		Describe the vertical and horizontal loads on the ground and during normal flight.	X	X								
(02)		Describe the vertical and horizontal loads during asymmetric flight following an engine failure for a multi-engine aeroplane, and how a pilot may potentially overstress the structure during the failure scenario.	X	X								
(03)		Explain the principle of flutter and resonance for the wing and control surfaces.	X	X								

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Syllabus reference	BK	Syllabus details and associated Learning Objectives	Aeroplane		Helicopter			IR	CB-IR(A)	BIR Exam	BIR BK	Remarks
			ATPL	CPL	ATPL/IR	ATPL	CPL					
(04)		Explain the following countermeasures used to achieve stress relief and reduce resonance: — chord-wise and span-wise position of masses (e.g. engines, fuel, balance masses for wing and control balance masses); — torsional stiffness; — bending flexibility; — fuel-balancing procedures during flight (automatic or applied by the pilot).	X	X								
<b>021 02 04 00</b>		<b>Fuselage, landing gear, doors, floor, windscreen and windows</b>										
<b>021 02 04 01</b>		<b>Construction, functions, loads</b>										
(01)	X	Describe the following types of fuselage construction: — monocoque, — semi-monocoque.	X	X	X	X	X					
(01)		Describe the construction and the function of the following structural components of a fuselage: — frames; — bulkhead; — pressure bulkhead; — stiffeners, stringers, long- rons; — skin, doublers; — floor suspension (cross- beams); — floor panels;	X	X	X	X	X					



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Syllabus reference	BK	Syllabus details and associated Learning Objectives	Aeroplane		Helicopter			IR	CB-IR(A)	BIR Exam	BIR BK	Remarks
			ATPL	CPL	ATPL/IR	ATPL	CPL					
		— firewall.										
(03)		Describe the loads on the fuselage due to pressurisation.	X	X								
(04)		Describe the following loads on a main landing gear: — touch-down loads (vertical and horizontal); — taxi loads on bogie gear (turns).	X	X								
(05)		Describe the structural danger of a nose-wheel landing with respect to: — fuselage loads; — nose-wheel strut loads.	X	X								
(06)		Describe the structural danger of a tail strike with respect to: — fuselage and aft bulkhead damage (pressurisation).	X	X								
(07)		Describe the door and hatch construction for pressurised and unpressurised aeroplanes including: — door and frame (plug type); — hinge location; — locking mechanism.	X	X								
(08)	X	Explain the advantages and disadvantages of the following fuselage cross sections: — circular; — double bubble; — oval; — rectangular.	X	X								

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Syllabus reference	BK	Syllabus details and associated Learning Objectives	Aeroplane		Helicopter			IR	CB-IR(A)	BIR Exam	BIR BK	Remarks
			ATPL	CPL	ATPL/IR	ATPL	CPL					
(09)		Explain why flight-deck windows are constructed with different layers.	X	X								
(10)		Explain the function of window heating for structural purposes.	X	X								
(11)		Explain the implication of a direct-vision window (see CS 25.773(b)(3)).	X	X								
(12)		Explain the need for an eye-reference position.	X	X								
(13)		Explain the function of floor venting (blow-out panels).	X	X								
(14)		Describe the construction and fitting of sliding doors.			X	X	X					
<b>021 02 05 00</b>		<b>Helicopter: structural aspects of flight controls</b>										
<b>021 02 05 01</b>		<b>Design and construction</b>										
(01)		List the functions of flight controls.			X	X	X					
(02)		Explain why vertical and horizontal stabilisers may have different shapes and alignments.			X	X	X					
<b>021 02 05 02</b>		<b>Structural components and materials</b>										
(01)		Describe the fatigue life and methods of checking for serviceability of the components and materials of flight and control surfaces.			X	X	X					
<b>021 02 05 03</b>		<b>Loads, stresses and aeroelastic vibrations</b>										
(01)		Describe the dangers and stresses regarding safety and serviceability in			X	X	X					

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Syllabus reference	BK	Syllabus details and associated Learning Objectives	Aeroplane		Helicopter			IR	CB-IR(A)	BIR Exam	BIR BK	Remarks
			ATPL	CPL	ATPL/IR	ATPL	CPL					
		flight when the manufacturer's design envelope is exceeded.										
(02)		Explain that blade tracking is important both to minimise vibration and to help ensure uniformity of flow through the disc.			X	X	X					
(03)		Describe the early indications and vibrations which are likely to be experienced when the main-rotor blades and tail rotor are out of balance or tracking, including the possible early indications due to possible fatigue and overload.			X	X	X					
(04)		Explain how a vibration harmonic can be set up in other components which can lead to their early failure.			X	X	X					
(05)		State the three planes of vibration measurement, i.e. vertical, lateral, fore and aft.			X	X	X					
<b>021 02 06 00</b>		<b>Structural limitations</b>										
<b>021 02 06 01</b>		<b>Maximum structural masses</b>										
(01)		Define and explain the following maximum structural masses: — maximum ramp mass; — maximum take-off mass; — maximum zero fuel mass; — maximum landing mass. <i>Remark: These limitations may also be found in the relevant part of Subjects 031 'Mass and balance', 032</i>	X	X								

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Syllabus reference	BK	Syllabus details and associated Learning Objectives	Aeroplane		Helicopter			IR	CB-IR(A)	BIR Exam	BIR BK	Remarks
			ATPL	CPL	ATPL/IR	ATPL	CPL					
		<i>'Performance (aeroplane)' and 034 'Performance (helicopter)'.</i>										
(02)		Explain that airframe life is limited by fatigue, created by alternating stress and the number of load cycles.	X	X								
(03)		Explain the maximum structural masses: — maximum take-off mass.			X	X	X					
(04)		Explain that airframe life is limited by fatigue, created by load cycles.			X	X	X					
<b>021 03 00 00</b>		<b>HYDRAULICS</b>										
<b>021 03 01 00</b>		<b>Hydromechanics: basic principles</b>										
<b>021 03 01 01</b>		<b><i>Concepts and basic principles</i></b>										
(01)	X	Explain the concept and basic principles of hydromechanics including: — hydrostatic pressure; — Pascal's law; — the relationship between pressure, force and area; — transmission of power: multiplication of force, decrease of displacement.	X	X	X	X	X					
<b>021 03 02 00</b>		<b>Hydraulic systems</b>										
<b>021 03 02 01</b>		<b><i>Hydraulic fluids: types, characteristics, limitations</i></b>										
(01)	X	List and explain the desirable properties of a hydraulic fluid with regard to: — thermal stability; — corrosiveness;	X	X	X	X	X					

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Syllabus reference	BK	Syllabus details and associated Learning Objectives	Aeroplane		Helicopter			IR	CB-IR(A)	BIR Exam	BIR BK	Remarks
			ATPL	CPL	ATPL/IR	ATPL	CPL					
		<ul style="list-style-type: none"> <li>— flashpoint and flammability;</li> <li>— volatility;</li> <li>— viscosity.</li> </ul>										
(02)	X	State that hydraulic fluids are irritating to skin and eyes.	X	X	X	X	X					
(03)		List the two different types of hydraulic fluids: <ul style="list-style-type: none"> <li>— synthetic;</li> <li>— mineral.</li> </ul>	X	X	X	X	X					
(04)		State that different types of hydraulic fluids cannot be mixed.	X	X	X	X	X					
(05)	X	State that at the pressures being considered, hydraulic fluid is considered incompressible.	X	X	X	X	X					
<b>021 03 02 02</b>		<b>System components: design, operation, degraded modes of operation, indications and warnings</b>										
(01)		Explain the working principle of a hydraulic system.	X	X	X	X	X					
(02)		Describe the difference in the principle of operation between a constant pressure system and a system pressurised only on specific demand.	X	X	X	X	X					
(03)		State the differences in the principle of operation between a passive hydraulic system (without a pressure pump) and an active hydraulic system (with a pressure pump).	X	X	X	X	X					

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Syllabus reference	BK	Syllabus details and associated Learning Objectives	Aeroplane		Helicopter			IR	CB-IR(A)	BIR Exam	BIR BK	Remarks
			ATPL	CPL	ATPL/IR	ATPL	CPL					
(04)	X	List the main advantages and disadvantages of system actuation by hydraulic or purely mechanical means with respect to: — weight; — size; — force.	X	X	X	X	X					
(05)		List the main uses of hydraulic systems.	X	X	X	X	X					
(06)		State that hydraulic systems can be classified as either high pressure (typically 3000 psi or higher) or low pressure (typically up to 2000 psi).	X	X	X	X	X					
(07)		State that a high-pressure hydraulic system is typically operating at 3000 psi but on some aircraft a hydraulic pressure of 4000 to 5000 psi may also be used.	X	X	X	X	X					
(08)		Explain the working principle of a low-pressure (0–2000 psi) system.	X	X	X	X	X					
(09)		Explain the advantages and disadvantages of a high-pressure system over a low-pressure system.	X	X	X	X	X					
(10)		Describe the working principle and functions of pressure pumps including: — constant pressure pump (swash plate or cam plate);	X	X	X	X	X					

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Syllabus reference	BK	Syllabus details and associated Learning Objectives	Aeroplane		Helicopter			IR	CB-IR(A)	BIR Exam	BIR BK	Remarks
			ATPL	CPL	ATPL/IR	ATPL	CPL					
		— pressure pump whose output is dependent on pump revolutions per minute (rpm) (gear type).										
(11)		Explain the following different sources of hydraulic pressure, their typical application and potential operational limitations: — manual; — engine gearbox; — electrical; — air (pneumatic and ram-air turbine); — hydraulic (power transfer unit) or reversible motor pumps; — accessory.	X	X								
(12)		Explain the following different sources of hydraulic pressure, their typical application and potential operational limitations: — manual; — engine; — gearbox; — electrical.			X	X	X					
(13)		Describe the working principle and functions of the following hydraulic system components: — reservoir (pressurised and unpressurised); — accumulators; — case drain lines and fluid cooler return lines;	X	X	X	X	X					

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Syllabus reference	BK	Syllabus details and associated Learning Objectives	Aeroplane		Helicopter			IR	CB-IR(A)	BIR Exam	BIR BK	Remarks
			ATPL	CPL	ATPL/IR	ATPL	CPL					
		<ul style="list-style-type: none"> <li>— piston actuators (single- and double-acting);</li> <li>— hydraulic motors;</li> <li>— filters;</li> <li>— non-return (check) valves;</li> <li>— relief valves;</li> <li>— restrictor valves;</li> <li>— selector valves (linear and basic rotary selectors, two and four ports);</li> <li>— bypass valves;</li> <li>— shuttle valves;</li> <li>— fire shut-off valves;</li> <li>— priority valves;</li> <li>— fuse valves;</li> <li>— pressure and return pipes.</li> </ul>										
(14)		Explain the function of the demand pump installed on many transport aeroplanes.	X	X								
(15)		Explain how redundancy is obtained by giving examples.	X	X	X	X	X					
(16)		Interpret a typical hydraulic system schematic to the level of detail as found in an aircraft flight crew operating manual (FCOM).	X	X	X	X	X					
(17)		Explain the implication of a high system demand.	X	X	X	X	X					
(18)		List and describe the instruments and alerts for monitoring a hydraulic system.	X	X	X	X	X					



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Syllabus reference	BK	Syllabus details and associated Learning Objectives	Aeroplane		Helicopter			IR	CB-IR(A)	BIR Exam	BIR BK	Remarks
			ATPL	CPL	ATPL/IR	ATPL	CPL					
(19)		State the indications and explain the implications of the following malfunctions: — system leak or low level; — low pressure; — high temperature.	X	X	X	X	X					
<b>021 04 00 00</b>		<b>LANDING GEAR, WHEELS, TYRES, BRAKES</b>										
<b>021 04 01 00</b>		<b>Landing gear</b>										
<b>021 04 01 01</b>		<b>Types</b>										
(01)	X	Name, for an aeroplane, the following different landing-gear configurations: — nose wheel; — tail wheel.	X	X								
(02)	X	Name, for a helicopter, the following different landing-gear configurations: — nose wheel; — tail wheel; — skids.			X	X	X					
<b>021 04 01 02</b>		<b>System components, design, operation, indications and warnings, on-ground/in-flight protections, emergency extension systems</b>										
(01)		Explain the function of the following components of a landing gear: — oleo leg/shock strut; — axles; — bogies and bogie beam; — drag struts; — side stays/struts;	X	X								

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Syllabus reference	BK	Syllabus details and associated Learning Objectives	Aeroplane		Helicopter			IR	CB-IR(A)	BIR Exam	BIR BK	Remarks
			ATPL	CPL	ATPL/IR	ATPL	CPL					
		<ul style="list-style-type: none"> <li>— torsion links;</li> <li>— locks (over centre);</li> <li>— gear doors.</li> </ul>										
(02)		Explain the function of the following components of a landing gear: <ul style="list-style-type: none"> <li>— oleo leg/shock strut;</li> <li>— axles;</li> <li>— drag struts;</li> <li>— side stays/struts;</li> <li>— torsion links;</li> <li>— locks (over centre);</li> <li>— gear doors.</li> </ul>			X	X	X					
(03)		Name the different components of a landing gear, using a diagram.	X	X	X	X	X					
(04)		Describe the sequence of events during normal operation of the landing gear.	X	X	X	X	X					
(05)		State how landing-gear position indication and alerting is implemented.	X	X	X	X	X					
(06)		Describe the various protection devices to avoid inadvertent gear retraction on the ground and explain the implications of taking off with one or more protection devices in place: <ul style="list-style-type: none"> <li>— ground lock (pins);</li> <li>— protection devices in the gear retraction mechanism.</li> </ul>	X	X	X	X	X					
(07)		Explain the speed limitations for gear operation (VLO (maximum landing gear operating speed) and VLE	X	X	X	X	X					

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Syllabus reference	BK	Syllabus details and associated Learning Objectives	Aeroplane		Helicopter			IR	CB-IR(A)	BIR Exam	BIR BK	Remarks
			ATPL	CPL	ATPL/IR	ATPL	CPL					
		(maximum landing gear extended speed)).										
(08)		Describe the sequence for emergency gear extension: — unlocking; — operating; — down-locking.	X	X	X	X	X					
(09)		Describe some methods for emergency gear extension including: — gravity/free fall; — air or nitrogen pressure; — manually/mechanically.	X	X	X	X	X					
<b>021 04 02 00</b>		<b>Nose-wheel steering</b>										
<b>021 04 02 01</b>		<b>Design, operation</b>										
(01)		Explain the operating principle of nose-wheel steering.	X	X	X	X	X					
(02)		Explain, for a helicopter, the functioning of differential braking with free-castoring nose wheel.			X	X	X					
(03)		Describe, for an aeroplane, the functioning of the following systems: — differential braking with free-castoring nose wheel; — tiller or hand wheel steering; — rudder pedal nose-wheel steering.	X	X								
(04)		Explain the centring mechanism of the nose wheel.	X	X	X	X	X					
(05)		Define the term 'shimmy' and the possible consequences of shimmy	X	X								

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Syllabus reference	BK	Syllabus details and associated Learning Objectives	Aeroplane		Helicopter			IR	CB-IR(A)	BIR Exam	BIR BK	Remarks
			ATPL	CPL	ATPL/IR	ATPL	CPL					
		for the nose- and the main-wheel system and explain the purpose of a shimmy damper to reduce the severity of shimmy.										
(06)		Explain the purpose of main-wheel (body) steering.	X	X								
<b>021 04 03 00</b>		<b>Brakes</b>										
<b>021 04 03 01</b>		<b>Types and materials</b>										
(01)		Describe the basic operating principle of a disc brake.	X	X	X	X	X					
(02)		State the different materials used in a disc brake (steel, carbon).	X	X	X	X	X					
(03)		Describe the characteristics, advantages and disadvantages of steel and carbon brake discs with regard to: — weight; — temperature limits; — internal-friction coefficient; — wear.	X	X	X	X	X					
<b>021 04 03 02</b>		<b>System components, design, operation, indications and warnings</b>										
(01)		Explain the limitation of brake energy and describe the operational consequences.	X	X								
(02)		Explain how brakes are actuated: hydraulically, electrically.	X	X	X	X	X					
(03)		Explain the purpose of an in-flight wheel brake system.	X	X								

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Syllabus reference	BK	Syllabus details and associated Learning Objectives	Aeroplane		Helicopter			IR	CB-IR(A)	BIR Exam	BIR BK	Remarks
			ATPL	CPL	ATPL/IR	ATPL	CPL					
(04)		Describe the function of a brake accumulator.	X	X	X	X	X					
(05)		Describe the function of the parking brake.	X	X	X	X	X					
(06)		Explain the function of brake-wear indicators.	X	X								
(07)		Explain the reason for the brake-temperature indicator.	X	X								
<b>021 04 03 03</b>		<b>Anti-skid</b>										
(01)		Describe the operating principle of anti-skid where excessive brake pressure applied is automatically reduced for optimum breaking performance.	X	X								
(02)		Explain that the anti-skid computer compares wheel speed to aeroplane reference speed to provide the following: — slip ratio for maximum braking performance; — locked-wheel prevention (protection against deep skid on one wheel); — touchdown protection (protection against brake-pressure application during touchdown); — hydroplane protection.	X	X								
(03)		Give examples of the impact of an anti-skid system on performance, and explain the implications of anti-skid system failure.	X	X								

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Syllabus reference	BK	Syllabus details and associated Learning Objectives	Aeroplane		Helicopter			IR	CB-IR(A)	BIR Exam	BIR BK	Remarks
			ATPL	CPL	ATPL/IR	ATPL	CPL					
<b>021 04 03 04</b>		<b>Autobrake</b>										
(01)		Describe the operating principle of an autobrake system.	X	X								
(02)		Explain why the anti-skid system must be available when using autobrakes.	X	X								
(03)		Explain the difference between the three modes of operation of an autobrake system: — OFF (system off or reset); — Armed (the system is ready to operate under certain conditions); — Activated/Deactivated (application of pressure on brakes).	X	X								
(04)		Describe how an autobrake system setting will either apply maximum braking (RTO or MAX) or result in a given rate of deceleration, where the amount of braking applied may be affected by: — the use of reverse thrust; — slippery runway.	X	X								
<b>021 04 04 00</b>		<b>Wheels, rims and tyres</b>										
<b>021 04 04 01</b>		<b>Types, structural components and materials, operational limitations, thermal plugs</b>										
(01)	X	Describe the different types of tyres such as: — tubeless; — diagonal (cross ply);	X	X	X	X	X					

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Syllabus reference	BK	Syllabus details and associated Learning Objectives	Aeroplane		Helicopter			IR	CB-IR(A)	BIR Exam	BIR BK	Remarks
			ATPL	CPL	ATPL/IR	ATPL	CPL					
		— radial (circumferential bias).										
(02)	X	Define the following terms: — ply rating; — tyre tread; — tyre creep; — retread (cover).	X	X	X	X	X					
(03)		Explain the function of thermal/fusable plugs.	X	X								
(04)		Explain the implications of and how to identify tread separation and wear or damage with associated increased risk of tyre burst.	X	X								
(05)		Explain why the ground speed of tyres is limited.	X	X								
(06)		Describe the following tyre checks a pilot will perform during the pre-flight inspection and identify probable causes: — cuts and damages; — flat spots.	X	X								
<b>021 04 05 00</b>		<b>Helicopter equipment</b>										
<b>021 04 05 01</b>		<b>Flotation devices</b>										
(01)		Explain flotation devices, how they are operated, and their limitations.			X	X	X					
(02)		Explain why indicated airspeed (IAS) limitations before, during and after flotation-device deployment must be observed.			X	X	X					
<b>021 05 00 00</b>		<b>FLIGHT CONTROLS</b>										
<b>021 05 01 00</b>		<b>Aeroplane: primary flight controls</b>										

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Syllabus reference	BK	Syllabus details and associated Learning Objectives	Aeroplane		Helicopter			IR	CB-IR(A)	BIR Exam	BIR BK	Remarks
			ATPL	CPL	ATPL/IR	ATPL	CPL					
<b>021 05 01 01</b>		<b>Definition and control surfaces</b>										
(01)		Define a 'primary flight control'.	X	X								
(02)		List the following primary flight control surfaces: — elevator; — aileron, roll spoilers, flaperon; — rudder.	X	X								
(03)		List the various means of control surface actuation including: — manual; — fully powered (irreversible); — partially powered (reversible).	X	X								
<b>021 05 01 02</b>		<b>Manual controls</b>										
(01)		Explain the basic principle of a fully manual control system.	X	X								
<b>021 05 01 03</b>		<b>Fully powered controls (irreversible)</b>										
(01)		Explain the basic principle of a fully powered control system.	X	X								
(02)		Explain the concept of irreversibility in a flight control system.	X	X								
(03)		Explain the need for a 'feel system' in a fully powered control system.	X	X								
(04)		Explain the operating principle of a stabiliser trim system in a fully powered control system.	X	X								
(05)		Explain the operating principle of rudder and aileron trim in a fully powered control system.	X	X								



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Syllabus reference	BK	Syllabus details and associated Learning Objectives	Aeroplane		Helicopter			IR	CB-IR(A)	BIR Exam	BIR BK	Remarks
			ATPL	CPL	ATPL/IR	ATPL	CPL					
<b>021 05 01 04</b>		<b><i>Partially powered controls (reversible)</i></b>										
(01)		Explain the basic principle of a partially powered control system.	X	X								
(02)		Explain why a 'feel system' is not necessary in a partially powered control system.	X	X								
<b>021 05 01 05</b>		<b><i>System components, design, operation, indications and warnings, degraded modes of operation, jamming</i></b>										
(01)		List and describe the function of the following components of a flight control system: — actuators; — control valves; — cables; — electrical wiring; — control surface position sensors.	X	X								
(02)		Explain how redundancy is obtained in primary flight control systems of large transport aeroplanes.	X	X								
(03)		Explain the danger of control jamming and the means of retaining sufficient control capability.	X	X								
(04)		Explain the methods of locking the controls on the ground and describe 'gust or control lock' warnings.	X	X								

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Syllabus reference	BK	Syllabus details and associated Learning Objectives	Aeroplane		Helicopter			IR	CB-IR(A)	BIR Exam	BIR BK	Remarks
			ATPL	CPL	ATPL/IR	ATPL	CPL					
(05)		Explain the concept of a rudder deflection limitation (rudder limiter) system and the various means of implementation (rudder ratio changer, variable stops, blow-back).	X	X								
<b>021 05 02 00</b>		<b>Aeroplane: secondary flight controls</b>										
<b>021 05 02 01</b>		<b>System components, design, operation, degraded modes of operation, indications and warnings</b>										
(01)		Define a 'secondary flight control'.	X	X								
(02)		List the following secondary flight control surfaces: — lift-augmentation devices (flaps and slats); — speed brakes; — flight and ground spoilers; — trimming devices such as trim tabs, trimmable horizontal stabiliser.	X	X								
(03)		Describe secondary flight control actuation methods and sources of actuating power.	X	X								
(04)		Explain the function of a mechanical lock when using hydraulic motors driving a screw jack.	X	X								
(05)		Describe the requirement for limiting flight speeds for the various secondary flight control surfaces.	X	X								

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			ATPL	CPL	ATPL/IR	ATPL	CPL					
(06)		For lift-augmentation devices, explain the load-limiting (relief) protection devices and the functioning of an auto-retraction system.	X	X								
(07)		Explain how a flap/slat asymmetry protection device functions, and describe the implications of a flap/slat asymmetry situation.	X	X								
(08)		Describe the function of an auto-slat system.	X	X								
(09)		Explain the concept of control surface blow-back (aerodynamic forces overruling hydraulic forces).	X	X								
<b>021 05 03 00</b>		<b>Helicopter: flight controls</b>										
<b>021 05 03 01</b>		<b><i>Droop stops, control systems, trim systems, control stops</i></b>										
(01)		Explain the methods of locking the controls on the ground.			X	X	X					
(02)		Describe main-rotor droop stops and how rotor flapping is restricted.			X	X	X					
(03)		Explain the principle of phase lag and advance angle.			X	X	X					
(04)		Describe the following four axes of control operation, their operating principle and their associated cockpit controls: — collective control; — cyclic fore and aft (pitch axis); — cyclic lateral (roll axis); — yaw.			X	X	X					

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Syllabus reference	BK	Syllabus details and associated Learning Objectives	Aeroplane		Helicopter			IR	CB-IR(A)	BIR Exam	BIR BK	Remarks
			ATPL	CPL	ATPL/IR	ATPL	CPL					
(05)		Describe the swash plate or azimuth star control system including the following: <ul style="list-style-type: none"> <li>— swash plate inputs;</li> <li>— the function of the non-rotating swash plate;</li> <li>— the function of the rotating swash plate;</li> <li>— how swash plate tilt is achieved;</li> <li>— swash plate pitch axis;</li> <li>— swash plate roll axis;</li> <li>— balancing of pitch/roll/collective inputs to the swash plate to equalise torsional loads on the blades.</li> </ul>			X	X	X					
(06)		Describe the operation of the spider control system.			X	X	X					
(07)		State the need for artificial feel in a hydraulically actuated flight control system.			X	X	X					
(08)		Describe and explain the purpose of a trim system using the following terms: <ul style="list-style-type: none"> <li>— force-trim switch;</li> <li>— force gradient;</li> <li>— parallel trim actuator;</li> <li>— cyclic 4-way trim switch;</li> <li>— interaction of trim system with an SAS/SCAS/ASS stability system;</li> </ul>			X	X	X					

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Syllabus reference	BK	Syllabus details and associated Learning Objectives	Aeroplane		Helicopter			IR	CB-IR(A)	BIR Exam	BIR BK	Remarks
			ATPL	CPL	ATPL/IR	ATPL	CPL					
		— trim-motor indicators.										
(09)		Describe the different types of control runs.			X	X	X					
(10)		Explain the use of control stops.			X	X	X					
<b>021 05 04 00</b>		<b>Aeroplane: fly-by-wire (FBW) control systems</b>										
<b>021 05 04 01</b>		<b>Composition, explanation of operation, modes of operation</b>										
(01)		Explain that an FBW flight control system is composed of the following: — pilot's input command (control column/sidestick/rudder pedals); — electrical signalling paths, including: — pilot input to computer; — computer to flight control surfaces; — feedback from aircraft response to computer; — flight control computers; — actuators; — flight control surfaces.	X	X								
(02)		State the advantages of an FBW system in comparison with a conventional flight control system including: — weight; — pilot workload;	X	X								

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Syllabus reference	BK	Syllabus details and associated Learning Objectives	Aeroplane		Helicopter			IR	CB-IR(A)	BIR Exam	BIR BK	Remarks
			ATPL	CPL	ATPL/IR	ATPL	CPL					
		— flight-envelope protection.										
(03)		Explain why an FBW system is always irreversible.	X	X								
(04)		Explain the different modes of operation: — normal operation (e.g. normal law or normal mode); — downgraded operation (e.g. alternate law or secondary mode); — direct law.	X	X								
(05)		Describe the implications of mode degradation in relation to pilot workload and flight-envelope protection.	X	X								
(06)		— <i>Intentionally left blank</i>										
(07)		For aircraft using sidestick for manual control, describe the implications of: — dual control input made by the pilot; — the control takeover facility available to the pilot.	X	X								
(08)		<i>Intentionally left blank</i>										
(09)		Explain why several types of computers are needed and why they should be dissimilar.	X	X								
(10)		Explain why several control surfaces on every axis are needed on FBW aircraft.	X	X								

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Syllabus reference	BK	Syllabus details and associated Learning Objectives	Aeroplane		Helicopter			IR	CB-IR(A)	BIR Exam	BIR BK	Remarks
			ATPL	CPL	ATPL/IR	ATPL	CPL					
(11)		Explain why several sensors are needed on critical parameters.	X	X								
<b>021 05 05 00</b>		<b>Helicopter: fly-by-wire (FBW) control systems</b>										
		To be introduced at a later date.			X	X	X					
<b>021 06 00 00</b>		<b>PNEUMATICS — PRESSURISATION AND AIR-CONDITIONING SYSTEMS</b>										
<b>021 06 01 00</b>		<b>Pneumatic/bleed-air supply</b>										
<b>021 06 01 01</b>		<b>Piston-engine air supply</b>										
(01)		Describe the following means of supplying air for the pneumatic systems for piston-engine aircraft: — compressor; — vacuum pump.	X	X	X	X	X					
(02)		State that an air supply is required for the following systems: — instrumentation; — heating; — de-icing.	X	X	X	X	X					
<b>021 06 01 02</b>		<b>Gas turbine engine: bleed-air supply</b>										
(01)		State that the possible bleed-air sources for gas turbine engine aircraft are the following: — engine; — auxiliary power unit (APU); — ground supply.	X	X	X	X	X					

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Syllabus reference	BK	Syllabus details and associated Learning Objectives	Aeroplane		Helicopter			IR	CB-IR(A)	BIR Exam	BIR BK	Remarks
			ATPL	CPL	ATPL/IR	ATPL	CPL					
(02)		State that for an aeroplane a bleed-air supply can be used for the following systems or components: <ul style="list-style-type: none"> <li>— ice protection;</li> <li>— engine air starter;</li> <li>— pressurisation of a hydraulic reservoir;</li> <li>— air-driven hydraulic pumps;</li> <li>— pressurisation and air conditioning.</li> </ul>	X	X								
(03)		State that for a helicopter a bleed-air supply can be used for the following systems or components: <ul style="list-style-type: none"> <li>— anti-icing;</li> <li>— engine air starter;</li> <li>— pressurisation of a hydraulic reservoir.</li> </ul>			X	X	X					
(04)		State that the bleed-air supply system can comprise the following: <ul style="list-style-type: none"> <li>— pneumatic ducts;</li> <li>— isolation valve;</li> <li>— pressure-regulating valve;</li> <li>— engine bleed valve (HP/IP valves);</li> <li>— fan-air pre-cooler;</li> <li>— temperature and pressure sensors.</li> </ul>	X	X	X	X	X					
(05)		Interpret a basic pneumatic system schematic to the level of detail as found in an FCOM.	X	X	X	X	X					



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Syllabus reference	BK	Syllabus details and associated Learning Objectives	Aeroplane		Helicopter			IR	CB-IR(A)	BIR Exam	BIR BK	Remarks
			ATPL	CPL	ATPL/IR	ATPL	CPL					
(06)		Describe the cockpit indications for bleed-air systems.	X	X	X	X	X					
(07)		Explain how the bleed-air supply system is controlled and monitored.	X	X	X	X	X					
(08)		State the following bleed-air malfunctions: — over-temperature; — over-pressure; — low pressure; — overheat/duct leak; and describe the potential consequences.	X	X	X	X	X					
<b>021 06 02 00</b>		<b>Helicopter: air-conditioning systems</b>										
<b>021 06 02 01</b>		<b><i>Types, system components, design, operation, degraded modes of operation, indications and warnings</i></b>										
(01)		Describe the purpose of an air-conditioning system.			X	X	X					
(02)		Explain how an air-conditioning system is controlled.			X	X	X					
(03)		Describe the vapour cycle air-conditioning system including system components, design, operation, degraded modes of operation and system malfunction indications.			X	X	X					
(04)		Identify the following components from a diagram of an air-conditioning system and describe the operating principle and function:			X	X	X					

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Syllabus reference	BK	Syllabus details and associated Learning Objectives	Aeroplane		Helicopter			IR	CB-IR(A)	BIR Exam	BIR BK	Remarks
			ATPL	CPL	ATPL/IR	ATPL	CPL					
		<ul style="list-style-type: none"> <li>— air-cycle machine (pack, boot-strap system);</li> <li>— pack-cooling fan;</li> <li>— water separator;</li> <li>— mixing valves;</li> <li>— flow-control valves;</li> <li>— isolation valves;</li> <li>— recirculation fans;</li> <li>— filters for recirculation;</li> <li>— temperature sensors.</li> </ul>										
(05)		List and describe the controls, indications and warnings related to an air-conditioning system.			X	X	X					
<b>021 06 03 00</b>		<b>Aeroplane: pressurisation and air-conditioning system</b>										
<b>021 06 03 01</b>		<b>System components, design, operation, degraded modes of operation, indications and warnings</b>										
(01)		Explain that a pressurisation and an air-conditioning system of an aeroplane controls: <ul style="list-style-type: none"> <li>— ventilation;</li> <li>— temperature;</li> <li>— pressure.</li> </ul>	X	X								
(02)		Explain how humidity is controlled.	X	X								
(03)		Explain that the following components constitute a pressurisation system: <ul style="list-style-type: none"> <li>— pneumatic system as the power source;</li> <li>— outflow valve;</li> </ul>	X	X								

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Syllabus reference	BK	Syllabus details and associated Learning Objectives	Aeroplane		Helicopter			IR	CB-IR(A)	BIR Exam	BIR BK	Remarks
			ATPL	CPL	ATPL/IR	ATPL	CPL					
		<ul style="list-style-type: none"> <li>— outflow valve actuator;</li> <li>— pressure controller;</li> <li>— excessive differential pressure-relief valve;</li> <li>— negative differential pressure-relief valve.</li> </ul>										
(04)		<p>Explain that the following components constitute an air-conditioning system and describe their operating principles and function:</p> <ul style="list-style-type: none"> <li>— air-cycle machine (pack, bootstrap system);</li> <li>— pack-cooling fan;</li> <li>— water separator;</li> <li>— mixing valves;</li> <li>— flow-control valves (outflow valve);</li> <li>— isolation valves;</li> <li>— ram-air valve;</li> <li>— recirculation fans;</li> <li>— filters for recirculated air;</li> <li>— temperature sensors.</li> </ul> <p><i>Remark: The bootstrap system is the only air-conditioning system considered for MCAR-Part-FCL aeroplane examinations.</i></p>	X	X								
(05)		Describe the use of hot trim air.	X	X								
(06)		<p>Define the following terms:</p> <ul style="list-style-type: none"> <li>— cabin altitude;</li> <li>— cabin vertical speed;</li> <li>— differential pressure;</li> <li>— ground pressurisation.</li> </ul>	X	X								

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Syllabus reference	BK	Syllabus details and associated Learning Objectives	Aeroplane		Helicopter			IR	CB-IR(A)	BIR Exam	BIR BK	Remarks
			ATPL	CPL	ATPL/IR	ATPL	CPL					
(07)		Describe the operating principle of a pressurisation system.	X	X								
(08)		Describe the emergency operation by manual setting of the outflow valve position.	X	X								
(09)		Describe the working principle of an electronic cabin-pressure controller.	X	X								
(10)		State how the maximum operating altitude is determined.	X	X								
(11)		Explain: — why the maximum allowed value of cabin altitude is limited; — a typical value of maximum differential pressure for large transport aeroplanes; — the relation between cabin altitude, the maximum differential pressure and maximum aeroplane operating altitude.	X	X								
(12)		Explain the typical warning on a transport category aircraft when cabin altitude exceeds 10 000 ft.	X	X								
(13)		List and interpret typical indications of the pressurisation system.	X	X								
(14)		Describe the main operational differences between a bleed-air-driven air-conditioning system and an electrically driven air-conditioning system as found on aircraft without engine bleed-air system.	X	X								

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Syllabus reference	BK	Syllabus details and associated Learning Objectives	Aeroplane		Helicopter			IR	CB-IR(A)	BIR Exam	BIR BK	Remarks
			ATPL	CPL	ATPL/IR	ATPL	CPL					
<b>021 07 00 00</b>		<b>ANTI-ICING AND DE-ICING SYSTEMS</b>										
<b>021 07 01 00</b>		<b>Types, operation, indications</b>										
<b>021 07 01 01</b>		<b><i>Types, design, operation, indications and warnings, operational limitations</i></b>										
(01)		Explain the concepts of anti-icing and de-icing.	X	X	X	X	X					
(02)		Name the components of an aircraft which can be protected from ice accretion.	X	X	X	X	X					
(03)		State that on some aeroplanes the tail does not have an ice-protection system.	X	X								
(04)		State the different types of anti-icing/de-icing systems and describe their operating principle: — hot air; — electrical; — fluid.	X	X	X	X	X					
(05)		Describe the operating principle of the inflatable boot de-icing system.	X	X								
<b>021 07 02 00</b>		<b>Ice warning systems</b>										
<b>021 07 02 01</b>		<b><i>Types, operation, and indications</i></b>										
(01)		Describe the different operating principles of the following ice detectors: — mechanical systems using air pressure; — electromechanical systems using resonance frequencies.	X	X								

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Syllabus reference	BK	Syllabus details and associated Learning Objectives	Aeroplane		Helicopter			IR	CB-IR(A)	BIR Exam	BIR BK	Remarks
			ATPL	CPL	ATPL/IR	ATPL	CPL					
(02)		Describe the principle of operation of ice warning systems.	X	X								
<b>021 07 03 00</b>		<b>Helicopter blade heating systems</b>										
<b>021 07 03 01</b>		<b>Limitations</b>										
(01)		Explain the limitations on blade heating and the fact that on some helicopters the heating does not heat all the main-rotor blades at the same time.			X	X	X					
<b>021 08 00 00</b>		<b>FUEL SYSTEM</b>										
<b>021 08 01 00</b>		<b>Piston engine</b>										
<b>021 08 01 01</b>		<b>Fuel: types, characteristics, limitations</b>										
(01)		State the types of fuel used by a piston engine and their associated limitations: — diesel; — JET-A1 (for high-compression engines); — AVGAS; — MOGAS.	X	X	X	X	X					
(02)		State the main characteristics of these fuels and give typical values regarding their flash points, freezing points and density.	X	X	X	X	X					
<b>021 08 01 02</b>		<b>Design, operation, system components, indications</b>										
(01)		State the tasks of the fuel system.	X	X	X	X	X					

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Syllabus reference	BK	Syllabus details and associated Learning Objectives	Aeroplane		Helicopter			IR	CB-IR(A)	BIR Exam	BIR BK	Remarks
			ATPL	CPL	ATPL/IR	ATPL	CPL					
(02)		Name the following main components of a fuel system, and state their location and their function: — lines; — boost pump; — pressure valves; — filter, strainer; — tanks (wing, tip, fuselage); — vent system; — sump; — drain; — fuel-quantity sensor; — fuel-temperature sensor.	X	X	X	X	X					
(03)		Describe a gravity fuel feed system and a pressure feed fuel system.	X	X	X	X	X					
(04)		Describe the construction of the different types of fuel tanks and state their advantages and disadvantages: — drum tank; — bladder tank; — integral tank.	X	X	X	X	X					
(05)		Explain the function of cross-feed.	X	X	X	X	X					
(06)		Define the term 'unusable fuel'.	X	X	X	X	X					
(07)		List the following parameters that are monitored for the fuel system: — fuel quantity (low-level warning); — fuel temperature.	X	X	X	X	X					
<b>021 08 02 00</b>		<b>Turbine engine</b>										
<b>021 08 02 01</b>		<b>Fuel: types, characteristics, limitations</b>										

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Syllabus reference	BK	Syllabus details and associated Learning Objectives	Aeroplane		Helicopter			IR	CB-IR(A)	BIR Exam	BIR BK	Remarks
			ATPL	CPL	ATPL/IR	ATPL	CPL					
(01)		State the types of fuel used by a gas turbine engine: — JET-A; — JET-A1; — JET-B.	X	X	X	X	X					
(02)		State the main characteristics of these fuels and give typical values regarding their flash points, freezing points and density.	X	X	X	X	X					
(03)		State the existence of additives for freezing.	X	X	X	X	X					
<b>021 08 02 02</b>		<b>Design, operation, system components, indications</b>										
(01)		Explain the function of the fuel system: — lines; — centrifugal boost pump; — pressure valves; — fuel shut-off valve; — filter, strainer; — tanks (wing, tip, fuselage, tail); — bafflers/baffles; — sump; — vent system; — drain; — fuel-quantity sensor; — fuel-temperature sensor; — refuelling/defueling system; — fuel dump/jettison system.	X	X	X	X	X					



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Syllabus reference	BK	Syllabus details and associated Learning Objectives	Aeroplane		Helicopter			IR	CB-IR(A)	BIR Exam	BIR BK	Remarks
			ATPL	CPL	ATPL/IR	ATPL	CPL					
(02)		Name the main components of the fuel system and state their location and their function: — trim fuel tanks; — bafflers; — refuelling/defueling system; — fuel dump/jettison system. <i>Remark: For completion of list, please see 021 08 01 02 (02).</i>	X	X	X	X	X					
(03)		Interpret a typical fuel system schematic to the level of detail as found in an aircraft FCOM.	X	X	X	X	X					
(04)		Explain the limitations in the event of loss of booster pump fuel pressure.	X	X	X	X	X					
(05)		Describe the use and purpose of drip sticks (manual magnetic indicators) (may also be known as dip stick or drop stick).	X	X								
(06)		Explain the considerations for fitting a fuel dump/jettison system and, if fitted, its function.	X	X	X	X	X					
<b>021 09 00 00</b>		<b>ELECTRICS</b>										
		<i>Remark: For any reference to the direction of current flow, the conventional current flow shall be used, i.e. from positive to negative.</i>										
<b>021 09 01 00</b>		<b>General, definitions, basic applications: circuit breakers, logic circuits</b>										
<b>021 09 01 01</b>		<b>Static electricity</b>										

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Syllabus reference	BK	Syllabus details and associated Learning Objectives	Aeroplane		Helicopter			IR	CB-IR(A)	BIR Exam	BIR BK	Remarks
			ATPL	CPL	ATPL/IR	ATPL	CPL					
(01)		Explain static electricity and describe the flying conditions where aircraft are most susceptible to build-up of static electricity.	X	X	X	X	X					
(02)		Describe a static discharger and explain the following: — its purpose; — typical locations; — pilot's role of observing it during pre-flight inspection.	X	X	X	X	X					
(03)		Explain why an aircraft must first be grounded before refuelling/defueling.	X	X	X	X	X					
(04)		Explain the reason for electrical bonding.	X	X	X	X	X					
<b>021 09 01 02</b>		<b>Direct current (DC)</b>										
(01)		Explain the term 'direct current' (DC), and state that current can only flow in a closed circuit.	X	X	X	X	X					
(02)	X	Explain the basic principles of conductivity and give examples of conductors, semiconductors and insulators.	X	X	X	X	X					
(03)		Describe the difference in use of the following mechanical switches and explain the difference in observing their state (e.g. ON/OFF), and why some switches are guarded: — toggle switch; — rocker switch; — pushbutton switch; — rotary switch.	X	X	X	X	X					

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Syllabus reference	BK	Syllabus details and associated Learning Objectives	Aeroplane		Helicopter			IR	CB-IR(A)	BIR Exam	BIR BK	Remarks
			ATPL	CPL	ATPL/IR	ATPL	CPL					
		Explain the difference in observing their state (e.g. ON/OFF) and why some switches are guarded.										
(04)		Define voltage and current, and state their unit of measurement.	X	X	X	X	X					
(05)	X	Explain Ohm's law in qualitative terms.	X	X	X	X	X					
(06)	X	Explain the effect on total resistance when resistors are connected in series or in parallel.	X	X	X	X	X					
(07)	X	State that resistances can have a positive or a negative temperature coefficient (PTC/NTC) and state their use.	X	X	X	X	X					
(08)		Define electrical power and state the unit of measurement.	X	X	X	X	X					
<b>021 09 01 03</b>		<b>Alternating current (AC)</b>										
(01)	X	Explain the term 'alternating current' (AC), and compare its use to DC with regard to complexity.	X	X	X	X	X					
(02)		Define the term 'phase', and explain the basic principle of single-phase and three-phase AC.	X	X	X	X	X					
(03)		State that aircraft can use single-phase or three-phase AC.	X	X	X	X	X					
(04)		Define frequency and state the unit of measurement.	X	X	X	X	X					
(05)	X	Define 'phase shift' in qualitative terms.	X	X	X	X	X					
<b>021 09 01 04</b>		<b>Intentionally left blank</b>										

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Syllabus reference	BK	Syllabus details and associated Learning Objectives	Aeroplane		Helicopter			IR	CB-IR(A)	BIR Exam	BIR BK	Remarks
			ATPL	CPL	ATPL/IR	ATPL	CPL					
<b>021 09 01 05</b>		<b><i>Intentionally left blank</i></b>										
<b>021 09 01 06</b>		<b><i>Electromagnetism</i></b>										
(01)		State that an electrical current produces a magnetic field.	X	X	X	X	X					
(02)		Describe how the strength of the magnetic field changes with the magnitude of the current.	X	X	X	X	X					
(03)		Explain the purpose and the working principle of a solenoid.	X	X	X	X	X					
(04)		Explain the purpose and the working principle of a relay.	X	X	X	X	X					
(05)		Explain the principle of electromagnetic induction and how two electrical components or systems may affect each other through this principle.	X	X	X	X	X					
<b>021 09 01 07</b>		<b><i>Circuit protection</i></b>										
(01)		Explain the working principle of a fuse and a circuit breaker.	X	X	X	X	X					
(02)		Explain how a fuse is rated.	X	X	X	X	X					
(03)		Describe the principal difference between the following types of circuit breakers: — thermal circuit breaker sensing magnitude of current; — magnetic circuit breaker sensing direction of current.	X	X	X	X	X					
(04)		Describe how circuit breakers may be used to reset aircraft sys-	X	X	X	X	X					

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Syllabus reference	BK	Syllabus details and associated Learning Objectives	Aeroplane		Helicopter			IR	CB-IR(A)	BIR Exam	BIR BK	Remarks
			ATPL	CPL	ATPL/IR	ATPL	CPL					
		tems/computers in the event of system failure (when part of a described procedure).										
(05)		Explain a short circuit in practical terms using Ohm's Law, power and energy expressions highlighting the risk of fire due to power transfer and extreme energy dissipation.	X	X	X	X	X					
(06)		Explain the risk of fire resulting from excessive heat in a circuit subjected to overcurrent.	X	X	X	X	X					
(07)		Explain that overcurrent situations may be transient.	X	X	X	X	X					
(08)		Explain the hazards of multiple resets of a circuit breaker or the use of incorrect fuse rating when replacing blown fuses.	X	X	X	X	X					
<b>021 09 01 08</b>		<b>Semiconductors and logic circuits</b>										
(01)		Describe the effect of temperature on semiconductors with regard to function and longevity of the component.	X	X	X	X	X					
(02)		Describe the following five basic logic functions, as used in aircraft FCOM documentation, and recognise their schematic symbols according to the ANSI/MIL standard: — AND; — OR; — NOT; — NOR;	X	X	X	X	X					

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Syllabus reference	BK	Syllabus details and associated Learning Objectives	Aeroplane		Helicopter			IR	CB-IR(A)	BIR Exam	BIR BK	Remarks
			ATPL	CPL	ATPL/IR	ATPL	CPL					
		— NAND.										
(03)		Interpret a typical logic circuit schematic to the level of detail as found in an aircraft FCOM.	X	X	X	X	X					
<b>021 09 02 00</b>		<b>Batteries</b>										
<b>021 09 02 01</b>		<b>Types, characteristics and limitations</b>										
(01)		State the function of an aircraft battery.	X	X	X	X	X					
(02)		Name the types of rechargeable batteries used in aircraft: — lead-acid; — nickel-cadmium; — lithium-ion; — lithium-polymer.	X	X	X	X	X					
(03)		Compare the different battery types with respect to: — load behaviour; — charging characteristics; — risk of thermal runaway.	X	X	X	X	X					
(04)		Explain the term 'cell voltage' and describe how a battery may consist of several cells that combined provide the desirable voltage and capacity.	X	X	X	X	X					
(05)		Explain the difference between battery voltage and charging voltage.	X	X	X	X	X					
(06)		Define the term 'capacity of batteries' and state the unit of measurement used.	X	X	X	X	X					

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Syllabus reference	BK	Syllabus details and associated Learning Objectives	Aeroplane		Helicopter			IR	CB-IR(A)	BIR Exam	BIR BK	Remarks
			ATPL	CPL	ATPL/IR	ATPL	CPL					
(07)		State the effect of temperature on battery capacity and performance.	X	X	X	X	X					
(08)		State that in the case of loss of all generated power (battery power only) the remaining electrical power is time-limited.	X	X	X	X	X					
(09)		Explain how lithium-type batteries pose a threat to aircraft safety and what affects this risk: <ul style="list-style-type: none"> <li>— numbers of batteries on board an aircraft including those brought on board by passengers;</li> <li>— temperature, of both battery and environment;</li> <li>— physical condition of the battery;</li> <li>— battery charging.</li> </ul>	X	X	X	X	X					
(10)		Describe how to contain a battery thermal runaway highlighting the following: <ul style="list-style-type: none"> <li>— how one cell can affect the neighbouring cells;</li> <li>— challenges if it happens in an aircraft during flight.</li> </ul>	X	X	X	X	X					
<b>021 09 03 00</b>		<b>Generation</b>										
		Remark: For standardisation purposes, the following standard expressions are used: <ul style="list-style-type: none"> <li>— DC generator: produces DC output;</li> </ul>										

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Syllabus reference	BK	Syllabus details and associated Learning Objectives	Aeroplane		Helicopter			IR	CB-IR(A)	BIR Exam	BIR BK	Remarks
			ATPL	CPL	ATPL/IR	ATPL	CPL					
		<ul style="list-style-type: none"> <li>— DC alternator: produces AC, rectified by integrated rectifying unit, the output is DC;</li> <li>— DC alternator: producing a DC output by using a rectifier;</li> <li>— AC generator: produces AC output;</li> <li>— starter generator: integrated combination of a generator and a starter motor;</li> <li>— permanent magnet alternator/generator: self-exciting AC generator.</li> </ul>										
<b>021 09 03 01</b>		<b>DC generation</b>										
(01)		Describe the basic working principle of a simple DC generator or DC alternator.	X	X	X	X	X					
(02)		Explain the principle of voltage control and why it is required.	X	X	X	X	X					
(03)		Explain the purpose of reverse current protection from the battery/bus-bar to the alternator.	X	X	X	X	X					
(04)		Describe the basic operating principle of a starter generator and state its purpose.	X	X	X	X	X					
<b>021 09 03 02</b>		<b>AC generation</b>										
(01)		Describe the working principle of a brushless three-phase AC generator.	X	X	X	X	X					
(02)		State that the generator field current is used to control voltage.	X	X	X	X	X					



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			ATPL	CPL	ATPL/IR	ATPL	CPL					
(03)		State the relationship between output frequency and the rpm of a three-phase AC generator.	X	X	X	X	X					
(04)		Explain the term 'frequency wild generator'.	X	X	X	X	X					
(05)		List the following different power sources that can be used for an aeroplane to drive an AC generator: — engine; — APU; — RAT; — hydraulic.	X	X								
(06)		List the following different power sources that can be used for a helicopter to drive an AC generator: — engine; — APU; — gearbox.			X	X	X					
<b>021 09 03 03</b>		<b><i>Constant speed drive (CSD) and integrated drive generator (IDG) systems</i></b>										
(01)		Describe the function of a CSD.	X	X								
(02)		Explain the parameters of a CSD that are monitored.	X	X								
(03)		Describe the function of an IDG.	X	X								
(04)		Explain the consequences of a mechanical disconnection during flight for a CSD and an IDG.	X	X								
(05)		Explain that a CSD/IDG has its own, independent oil system and how a	X	X								

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Syllabus reference	BK	Syllabus details and associated Learning Objectives	Aeroplane		Helicopter			IR	CB-IR(A)	BIR Exam	BIR BK	Remarks
			ATPL	CPL	ATPL/IR	ATPL	CPL					
		leak from this may appear as an engine oil leak.										
<b>021 09 03 04</b>		<b>Transformers, transformer rectifier units (TRUs), static inverters</b>										
(01)		State the function of a transformer.	X	X	X	X	X					
(02)		State the function of a TRU and its purpose, including type of output.	X	X	X	X	X					
(03)		State the function of a static inverter and its purpose, including type of output.	X	X	X	X	X					
<b>021 09 04 00</b>		<b>Distribution</b>										
<b>021 09 04 01</b>		<b>General</b>										
(01)		Explain the function of a busbar.	X	X	X	X	X					
(02)		Describe the function of the following buses: — AC bus; — DC bus; — emergency AC or DC bus; — essential AC or DC bus; — battery bus; — hot bus, ground servicing or maintenance bus.	X	X	X	X	X					
(03)		State that the aircraft structure can be used as a part of the electrical circuit (common earth) and explain the implications for electrical bonding.	X	X	X	X	X					
(04)		Explain the function of external power.	X	X	X	X	X					
(05)		State that a priority sequence exists between the different sources of	X	X	X	X	X					

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Syllabus reference	BK	Syllabus details and associated Learning Objectives	Aeroplane		Helicopter			IR	CB-IR(A)	BIR Exam	BIR BK	Remarks
			ATPL	CPL	ATPL/IR	ATPL	CPL					
		electrical power on ground and in flight.										
(06)		Explain the term 'load sharing'.	X	X	X	X	X					
(07)		Explain the term 'load shedding'.	X	X	X	X	X					
(08)		Describe typical systems that can be shed in the event of a supply failure, such as passenger entertainment system and galley power.	X	X	X	X	X					
(09)		Interpret a typical electrical system schematic to the level of detail as found in an aircraft FCOM.	X	X	X	X	X					
(10)		Explain the difference between a supply (e.g. generator) failure and a bus failure, and the operating consequences of either.	X	X	X	X	X					
<b>021 09 04 02</b>		<b>DC distribution</b>										
(01)		Describe a simple DC electrical system of a single-engine aircraft.	X	X	X	X	X					
(02)		Describe a DC electrical system of a multi-engine aircraft (CS-23/CS-27) including the distribution consequences of loss of generator(s) or bus failure.	X	X	X	X	X					
(03)		Describe the DC part of an electrical system of a transport aircraft (CS-25/CS-29) including the distribution consequences of loss of DC supply or bus failure.	X	X	X	X	X					
(04)		Give examples of DC consumers.	X	X	X	X	X					
<b>021 09 04 03</b>		<b>AC distribution</b>										

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Syllabus reference	BK	Syllabus details and associated Learning Objectives	Aeroplane		Helicopter			IR	CB-IR(A)	BIR Exam	BIR BK	Remarks
			ATPL	CPL	ATPL/IR	ATPL	CPL					
(01)		Explain the difference in the principle of operation for a split AC electrical system and a parallel AC electrical system.	X	X	X	X	X					
(02)		Describe the following distribution consequences: — power transfer between different power supplies; — power transfer in the event of a supply failure; — loss of all normal AC supplies.	X	X	X	X	X					
(03)		Give examples of AC consumers.	X	X	X	X	X					
(04)		Explain the conditions to be met for paralleling AC generators.	X	X	X	X	X					
(05)		State that volt-ampere (VA) is the unit for total power consumed in an AC system.	X	X	X	X	X					
<b>021 09 04 04</b>		<b><i>Electrical load management and monitoring systems: automatic generators and bus switching during normal and failure operation, indications and warnings</i></b>										
(01)		Give examples of system control, monitoring and annunciators using the following terms: — generator control unit (GCU) for monitoring generator output and providing network protection;	X	X	X	X	X					

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Syllabus reference	BK	Syllabus details and associated Learning Objectives	Aeroplane		Helicopter			IR	CB-IR(A)	BIR Exam	BIR BK	Remarks
			ATPL	CPL	ATPL/IR	ATPL	CPL					
		<ul style="list-style-type: none"> <li>— exciter contactor/breaker/relay for control of generator exciter field;</li> <li>— generator contactor/breaker/relay for connecting the generator to the network;</li> <li>— bus-tie contactor/breaker/relay for connecting busbars together;</li> <li>— generator switch on the flight deck for manual control of exciter contactor;</li> <li>— IDG/CSD disconnect switch on the flight deck for mechanical disconnection of the generator;</li> <li>— bus-tie switch on the flight deck with AUTO and OFF positions only.</li> </ul>										
(02)		<p>Describe, for normal and degraded modes of operation, the following functions of an electrical load management system on ground and in flight using the terms in 021 09 04 04 (01):</p> <ul style="list-style-type: none"> <li>— distribution;</li> <li>— monitoring;</li> <li>— protection in the event of incorrect voltage;</li> <li>— protection in the event of incorrect frequency;</li> </ul>	X	X	X	X	X					

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Syllabus reference	BK	Syllabus details and associated Learning Objectives	Aeroplane		Helicopter			IR	CB-IR(A)	BIR Exam	BIR BK	Remarks
			ATPL	CPL	ATPL/IR	ATPL	CPL					
		— protection in the event of a differential fault.										
(03)		Describe the requirement for monitoring the aircraft batteries.	X	X	X	X	X					
(04)		Explain the importance of monitoring the temperature of nickel-cadmium and lithium-type batteries.	X	X	X	X	X					
(05)		Interpret various different ammeter indications of an ammeter which monitors the charge current of the battery.	X	X	X	X	X					
<b>021 09 05 00</b>		<b>Electrical motors</b>										
<b>021 09 05 01</b>		<b>General</b>										
(01)	X	State that the purpose of an electrical motor is to convert electrical energy into mechanical energy.	X	X	X	X	X					
(02)		State that because of the similarity in design, a generator and an electrical motor may be combined into a starter generator.	X	X	X	X	X					
(03)		Explain that the size of the engine determines how much energy is required for starting, and state the following: — small turbine engines may be able to use the battery for a very limited number of start attempts;	X	X	X	X	X					

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Syllabus reference	BK	Syllabus details and associated Learning Objectives	Aeroplane		Helicopter			IR	CB-IR(A)	BIR Exam	BIR BK	Remarks
			ATPL	CPL	ATPL/IR	ATPL	CPL					
		— large turbine engines require one or more power sources, either external or on-board.										
<b>021 09 05 02</b>		<b>Operating principle</b>										
(01)		Describe how the torque of an electrical motor is determined by the supplied voltage and current, and the resulting magnetic fields within the motor.	X	X	X	X	X					
(02)	X	State that electrical motors can be either AC or DC.	X	X	X	X	X					
(03)		Explain the consequences of the following: — rotor seizure; — rotor runaway.	X	X	X	X	X					
<b>021 09 05 03</b>		<b>Components</b>										
(01)	X	Name the following components of an electrical motor: — rotor (rotating part of an electrical motor); — stator (stationary part of an electrical motor).	X	X	X	X	X					
<b>021 10 00 00</b>		<b>PISTON ENGINES</b>										
		<i>Remark: This topic includes diesel and petrol engines.</i>										
<b>021 10 01 00</b>		<b>General</b>										
<b>021 10 01 01</b>		<b>Types of internal-combustion engines: basic principles, definitions</b>										
(01)		Define the following terms and expressions:	X	X	X	X	X					

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Syllabus reference	BK	Syllabus details and associated Learning Objectives	Aeroplane		Helicopter			IR	CB-IR(A)	BIR Exam	BIR BK	Remarks
			ATPL	CPL	ATPL/IR	ATPL	CPL					
		<ul style="list-style-type: none"> <li>— rpm;</li> <li>— torque;</li> <li>— manifold absolute pressure (MAP);</li> <li>— power output;</li> <li>— specific fuel consumption;</li> <li>— compression ratio, clearance volume, swept (displaced) volume, total volume.</li> </ul>										
<b>021 10 01 02</b>		<b>Engine: design, operation, components</b>										
(01)		Describe the basic operating principle of a piston engine: <ul style="list-style-type: none"> <li>— crankcase;</li> <li>— crankshaft;</li> <li>— connecting rod;</li> <li>— piston;</li> <li>— piston pin;</li> <li>— piston rings;</li> <li>— cylinder;</li> <li>— cylinder head;</li> <li>— valves;</li> <li>— valve springs;</li> <li>— push rod;</li> <li>— camshaft;</li> <li>— rocker arm;</li> <li>— camshaft gear;</li> <li>— bearings.</li> </ul>	X	X	X	X	X					
(02)		Name and identify the various types of engine design with regard to cylinder arrangement and their advantages/disadvantages:	X	X	X	X	X					



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Syllabus reference	BK	Syllabus details and associated Learning Objectives	Aeroplane		Helicopter			IR	CB-IR(A)	BIR Exam	BIR BK	Remarks
			ATPL	CPL	ATPL/IR	ATPL	CPL					
		<ul style="list-style-type: none"> <li>— horizontally opposed;</li> <li>— in line;</li> <li>— radial; and</li> <li>— working cycle (four stroke: petrol and diesel).</li> </ul>										
(03)		Describe the differences between petrol and diesel engines with respect to: <ul style="list-style-type: none"> <li>— means of ignition;</li> <li>— maximum compression ratio;</li> <li>— regulating air or mixture supply to the cylinder;</li> <li>— pollution from the exhaust.</li> </ul>	X	X	X	X	X					
<b>021 10 02 00</b>		<b>Fuel</b>										
<b>021 10 02 01</b>		<b>Types, grades, characteristics, limitations</b>										
(01)		Name the type of fuel used for petrol engines including its colour (AVGAS); <ul style="list-style-type: none"> <li>— 100 (green);</li> <li>— 100LL (blue).</li> </ul>	X	X	X	X	X					
(02)		Name the type of fuel normally used for aviation diesel engines (JET-A1).	X	X	X	X	X					
(03)	X	Define the term 'octane rating'.	X	X	X	X	X					
(04)		Define the term 'detonation' and describe the causes and effects of detonation for both petrol and diesel engines.	X	X	X	X	X					
(05)		Define the term 'pre-ignition' and describe the causes and effects of pre-	X	X	X	X	X					

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Syllabus reference	BK	Syllabus details and associated Learning Objectives	Aeroplane		Helicopter			IR	CB-IR(A)	BIR Exam	BIR BK	Remarks
			ATPL	CPL	ATPL/IR	ATPL	CPL					
		ignition for both petrol and diesel engines.										
(06)		Identify the conditions and power settings that promote detonation for petrol engines.	X	X	X	X	X					
(07)		Describe how detonation in petrol engines is recognised.	X	X	X	X	X					
(08)		Describe the method and occasions for checking the fuel for water content.	X	X	X	X	X					
(09)		State the typical value of fuel density for aviation gasoline and diesel fuel.	X	X	X	X	X					
(10)		Explain volatility, viscosity and vapour locking for petrol and diesel fuels.	X	X	X	X	X					
<b>021 10 03 00</b>		<b>Engine fuel pumps</b>										
<b>021 10 03 01</b>		<b><i>Engine-driven fuel pump</i></b>										
(01)		Explain the need for a separate engine-driven fuel pump.	X	X	X	X	X					
<b>021 10 04 00</b>		<b>Carburettor/injection system</b>										
<b>021 10 04 01</b>		<b><i>Carburettor: design, operation, degraded modes of operation, indications and warnings</i></b>										
(01)		State the purpose of a carburettor.	X	X	X	X	X					
(02)		Describe the operating principle of the simple float chamber carburettor.	X	X	X	X	X					
(03)		Describe the methods of obtaining mixture control over the whole operating engine power setting range (compensation jet, diffuser).	X	X	X	X	X					

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Syllabus reference	BK	Syllabus details and associated Learning Objectives	Aeroplane		Helicopter			IR	CB-IR(A)	BIR Exam	BIR BK	Remarks
			ATPL	CPL	ATPL/IR	ATPL	CPL					
(04)		Describe the methods of obtaining mixture control over the whole operating altitude range.	X	X	X	X	X					
(05)		Explain the purpose and the operating principle of an accelerator pump.	X	X	X	X	X					
(06)		Explain the purpose of power enrichment.	X	X	X	X	X					
(07)		Describe the function of the carburettor heat system.	X	X	X	X	X					
(08)		Explain the effect of carburettor heat on mixture ratio and power output.	X	X	X	X	X					
(09)		Explain the purpose and the operating principle of a primer pump.	X	X	X	X	X					
(10)		Discuss other methods for priming an engine (acceleration pumps).	X	X	X	X	X					
(11)		Explain the danger of carburettor fire, including corrective measures.	X	X	X	X	X					
<b>021 10 04 02</b>		<b><i>Injection: design, operation, degraded modes of operation, indications and warnings</i></b>										
(01)		Explain the advantages and difference in operation of an injection system compared with a carburettor system.	X	X	X	X	X					
<b>021 10 04 03</b>		<b><i>Icing</i></b>										
(01)		Describe the causes and effects of carburettor icing and the action to be taken if carburettor icing is suspected.	X	X	X	X	X					

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Syllabus reference	BK	Syllabus details and associated Learning Objectives	Aeroplane		Helicopter			IR	CB-IR(A)	BIR Exam	BIR BK	Remarks
			ATPL	CPL	ATPL/IR	ATPL	CPL					
(02)		Name the meteorological conditions under which carburettor icing may occur.	X	X	X	X	X					
(03)		Describe the indications of the presence of carburettor icing for both a fixed pitch and a constant speed propeller.	X	X								
(04)		Describe the indications of the presence of carburettor icing for a helicopter.			X	X	X					
(05)		Describe the indications that will occur upon selection of carburettor heat depending on whether ice is present or not.	X	X	X	X	X					
(06)		Explain the reason for the use of alternate air on fuel injection systems and describe its operating principle.	X	X	X	X	X					
(07)		State the meteorological conditions under which induction system icing may occur.	X	X	X	X	X					
<b>021 10 05 00</b>		<b>Cooling systems</b>										
<b>021 10 05 01</b>		<b>Design, operation, indications and warnings</b>										
(01)		Specify the reasons for cooling a piston engine.	X	X	X	X	X					
(02)		Describe the design features to enhance cylinder air cooling for aeroplanes.	X	X								

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Syllabus reference	BK	Syllabus details and associated Learning Objectives	Aeroplane		Helicopter			IR	CB-IR(A)	BIR Exam	BIR BK	Remarks
			ATPL	CPL	ATPL/IR	ATPL	CPL					
(03)		Describe the design features to enhance cylinder air cooling for helicopters (e.g. engine-driven impeller and scroll assembly, baffles).			X	X	X					
(04)		Compare the differences between liquid- and air-cooling systems.	X	X	X	X	X					
(05)		Identify the cylinder head temperature indication to monitor engine cooling.	X	X	X	X	X					
(06)		Describe the function and the operation of cowl flaps.	X	X								
<b>021 10 06 00</b>		<b>Lubrication systems</b>										
<b>021 10 06 01</b>		<b><i>Lubricants: characteristics, limitations</i></b>										
(01)		Describe the term 'viscosity' including the effect of temperature.	X	X	X	X	X					
(02)		Describe the viscosity grade numbering system used in aviation.	X	X	X	X	X					
<b>021 10 06 02</b>		<b><i>Design, operation, indications and warnings</i></b>										
(01)		State the functions of a piston-engine lubrication system.	X	X	X	X	X					
(02)		Describe the working principle of a dry-sump lubrication system and describe the functions of the following components: — oil tank (reservoir) and its internal components: hot well, de-aerator, vent, expansion space;	X	X	X	X	X					

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Syllabus reference	BK	Syllabus details and associated Learning Objectives	Aeroplane		Helicopter			IR	CB-IR(A)	BIR Exam	BIR BK	Remarks
			ATPL	CPL	ATPL/IR	ATPL	CPL					
		<ul style="list-style-type: none"> <li>— check valve (non-return valve);</li> <li>— pressure pump and pressure-relief valve;</li> <li>— scavenge pump;</li> <li>— filters (suction, pressure and scavenge);</li> <li>— oil cooler;</li> <li>— oil cooler bypass valve (anti-surge and thermostatic);</li> <li>— pressure and temperature sensors;</li> <li>— lines.</li> </ul>										
(03)		Describe a wet-sump lubrication system.	X	X	X	X	X					
(04)		State the differences between a wet- and a dry-sump lubrication system and their advantages and disadvantages.	X	X	X	X	X					
(05)		List the following factors that influence oil consumption: <ul style="list-style-type: none"> <li>— oil grade;</li> <li>— cylinder and piston wear;</li> <li>— condition of piston rings.</li> </ul>	X	X	X	X	X					
(06)		Describe the interaction between oil pressure, oil temperature and oil quantity.	X	X	X	X	X					
<b>021 10 07 00</b>		<b>Ignition circuits</b>										
<b>021 10 07 01</b>		<b>Design, operation</b>										
(01)		Describe the working principle of a magneto-ignition system and the	X	X	X	X	X					

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Syllabus reference	BK	Syllabus details and associated Learning Objectives	Aeroplane		Helicopter			IR	CB-IR(A)	BIR Exam	BIR BK	Remarks
			ATPL	CPL	ATPL/IR	ATPL	CPL					
		functions of the following components: — magneto; — contact-breaker points; — capacitor (condenser); — coils or windings; — ignition switches; — distributor; — spark plug; — high-tension (HT) cable.										
(02)		State why piston engines are equipped with two electrically independent ignition systems.	X	X	X	X	X					
(03)		State the function and operating principle of the following methods of spark augmentation: — starter vibrator (booster coil); — impulse-start coupling.	X	X								
(04)		State the function and operating principle of the following methods of spark augmentation: — starter vibrator (booster coil); — both magnetos live.			X	X	X					
(05)		Explain the function of the magneto check.	X	X	X	X	X					
(06)		Explain how combustion is initiated in diesel engines.	X	X	X	X	X					
<b>021 10 08 00</b>		<b>Mixture</b>										
<b>021 10 08 01</b>		<b>Definition, characteristic mixtures, control instruments, associated control levers, indications</b>										

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Syllabus reference	BK	Syllabus details and associated Learning Objectives	Aeroplane		Helicopter			IR	CB-IR(A)	BIR Exam	BIR BK	Remarks
			ATPL	CPL	ATPL/IR	ATPL	CPL					
(01)		Define the following terms: — mixture; — chemically correct ratio (stoichiometric); — best power ratio; — lean (weak) mixture (lean or rich side of the exhaust gas temperature (EGT) top); — rich mixture.	X	X	X	X	X					
(02)		State the typical fuel-to-air ratio values or range of values for the above mixtures.	X	X	X	X	X					
(03)		Describe the advantages and disadvantages of weak and rich mixtures.	X	X	X	X	X					
(04)		Describe the relation between engine-specific fuel consumption and mixture ratio.	X	X	X	X	X					
(05)		Describe the use of the exhaust gas temperature as an aid to mixture-setting.	X	X	X	X	X					
(06)		Explain the relation between mixture ratio, cylinder head temperature, detonation and pre-ignition.	X	X	X	X	X					
(07)		Explain the absence of mixture control in diesel engines.	X	X	X	X	X					
<b>021 10 09 00</b>		<b>Aeroplane: propellers</b>										
<b>021 10 09 01</b>		<b>Definitions, general</b>										
		<i>Remark: Definitions and aerodynamic concepts are detailed in Subject 081 'Principles of flight (aeroplane)', Topic 07 (Propellers), but</i>	X	X								



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Syllabus reference	BK	Syllabus details and associated Learning Objectives	Aeroplane		Helicopter			IR	CB-IR(A)	BIR Exam	BIR BK	Remarks
			ATPL	CPL	ATPL/IR	ATPL	CPL					
		<i>need to be appreciated for this Subject as well.</i>										
<b>021 10 09 02</b>		<b><i>Constant-speed propeller: design, operation, system components</i></b>										
(01)		Describe the operating principle of a constant-speed propeller system under normal flight operations with the aid of a schematic.	X	X								
(02)		Explain the need for a MAP indicator to control the power setting with a constant-speed propeller.	X	X								
(03)		State the purpose of a torque-meter.	X	X								
(04)		State the purpose and describe the operation of a low-pitch stop (centrifugal latch).	X	X								
(05)		Describe the operating principle of a single-acting and a double-acting variable pitch propeller for single- and multi-engine aeroplanes.	X	X								
(06)		Describe the function and the basic operating principle of synchronising and synchro-phasing systems.	X	X								
(07)		Explain the purpose and the basic operating principle of an auto-feathering system and unfeathering.	X	X								
<b>021 10 09 03</b>		<b><i>Reduction gearing: design</i></b>										
(01)		State the purpose of reduction gearing.	X	X								
<b>021 10 09 04</b>		<b><i>Propeller handling: associated control levers, degraded modes of</i></b>										

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Syllabus reference	BK	Syllabus details and associated Learning Objectives	Aeroplane		Helicopter			IR	CB-IR(A)	BIR Exam	BIR BK	Remarks
			ATPL	CPL	ATPL/IR	ATPL	CPL					
		<b><i>operation, indications and warnings</i></b>										
(01)		Describe the checks to be carried out on a constant-speed propeller system after engine start.	X	X								
(02)		Describe the operation of a constant-speed propeller system during flight at different true airspeeds (TAS) and rpm including an overspeeding propeller.	X	X								
(03)		Describe the operating principle of a variable pitch propeller when feathering and unfeathering, including the operation of cockpit controls.	X	X								
(04)		Describe the operating principle of a variable pitch propeller when reverse pitch is selected, including the operation of cockpit controls.	X	X								
(05)		Describe the operation of the propeller levers during different phases of flight.	X	X								
<b>021 10 10 00</b>		<b>Performance and engine handling</b>										
<b>021 10 10 01</b>		<b>Performance</b>										
(01)		Describe the effect on power output of a petrol and diesel engine taking into consideration the following parameters: — ambient pressure, exhaust back pressure; — temperature; — density altitude;	X	X	X	X	X					

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Syllabus reference	BK	Syllabus details and associated Learning Objectives	Aeroplane		Helicopter			IR	CB-IR(A)	BIR Exam	BIR BK	Remarks
			ATPL	CPL	ATPL/IR	ATPL	CPL					
		— humidity.										
(02)		Explain the term 'normally aspirated engine'.	X	X	X	X	X					
(03)		Power-augmentation devices: explain the requirement for power augmentation (turbocharging) of a piston engine.	X	X	X	X	X					
(04)		Describe the function and the principle of operation of the following main components of a turbocharger: — turbine; — compressor; — waste gate; — waste-gate actuator.	X	X	X	X	X					
(05)		Explain the difference between an altitude-boosted turbocharger and a ground-boosted turbocharger.	X	X	X	X	X					
(06)		Explain turbo lag.	X	X	X	X	X					
(07)		Define the term 'critical altitude'.	X	X	X	X	X					
(08)		Explain the function of an inter-cooler.	X	X	X	X	X					
(09)		Define the terms 'full-throttle height' and 'rated altitude'.	X	X	X	X	X					
(10)		Explain the purpose of a super-charger and the basic differences from a turbocharger.	X	X	X	X	X					
<b>021 10 10 02</b>		<b>Engine handling</b>										
(01)		State the correct procedures for setting the engine controls when increasing or decreasing power.	X	X	X	X	X					

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Syllabus reference	BK	Syllabus details and associated Learning Objectives	Aeroplane		Helicopter			IR	CB-IR(A)	BIR Exam	BIR BK	Remarks
			ATPL	CPL	ATPL/IR	ATPL	CPL					
(02)		Define the following terms: — take-off power; — maximum continuous power.	X	X	X	X	X					
(03)		Describe the start problems associated with extreme cold weather.	X	X	X	X	X					
(04)		Describe the principal difference between a full-authority digital engine control (FADEC) system-controlled engine and traditional manual engine controls.	X	X	X	X	X					
(05)		Describe the engine controls available on the flight deck for a FADEC-controlled engine.	X	X	X	X	X					
(06)		Explain that the FADEC has full authority of the control of all engine parameters ensuring efficient and correct running of the engine, including protection in the event of failure.	X	X	X	X	X					
(07)		Explain the need for FADEC redundancy with regard to power supply and data input and output.	X	X	X	X	X					
<b>021 11 00 00</b>		<b>TURBINE ENGINES</b>										
<b>021 11 01 00</b>		<b>Basic principles</b>										
<b>021 11 01 01</b>		<b>Basic generation of thrust and the thrust formula</b>										
(01)		Describe how thrust is produced by a basic gas turbine engine.	X	X								
(02)		Describe the simple form of the thrust formula for a basic, straight jet	X	X								

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Syllabus reference	BK	Syllabus details and associated Learning Objectives	Aeroplane		Helicopter			IR	CB-IR(A)	BIR Exam	BIR BK	Remarks
			ATPL	CPL	ATPL/IR	ATPL	CPL					
		engine and perform simple calculations (including pressure thrust).										
(03)		State that thrust can be considered to remain approximately constant over the whole aeroplane subsonic speed range.	X	X								
<b>021 11 01 02</b>		<b>Design, types and components of turbine engines</b>										
(01)		List the main components of a basic gas turbine engine: — inlet; — compressor; — combustion chamber; — turbine; — outlet.	X	X	X	X	X					
(02)		Describe the variation of static pressure, temperature and axial velocity in a gas turbine engine under normal operating conditions and with the aid of a working cycle diagram.	X	X	X	X	X					
(03)		Describe the differences between absolute, circumferential (tangential) and axial velocity.	X	X	X	X	X					
(04)		List the different types of gas turbine engines: — straight jet; — turbofan; — turboprop.	X	X								
(05)		State that a gas turbine engine can have one or more spools.	X	X	X	X	X					

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Syllabus reference	BK	Syllabus details and associated Learning Objectives	Aeroplane		Helicopter			IR	CB-IR(A)	BIR Exam	BIR BK	Remarks
			ATPL	CPL	ATPL/IR	ATPL	CPL					
(06)		Describe how thrust is produced by turbojet and turbofan engines.	X	X								
(07)		Describe how power is produced by turboprop engines.	X	X								
(08)		Describe the term 'equivalent horsepower' (= thrust horsepower + shaft horsepower).	X	X								
(09)		Explain the principle of a free turbine or free-power turbine.	X	X	X	X	X					
(10)		Define the term 'bypass ratio' and perform simple calculations to determine it.	X	X								
(11)		Define the terms 'propulsive power', 'propulsive efficiency', 'thermal efficiency' and 'total efficiency'.	X	X								
(12)		Describe the influence of compressor-pressure ratio on thermal efficiency.	X	X	X	X	X					
(13)		Explain the variations of propulsive efficiency with forward speed for turbojet, turbofan and turboprop engines.	X	X								
(14)		Define the term 'specific fuel consumption' for turbojets and turboprops.	X	X								
<b>021 11 01 03</b>		<b><i>Coupled turbine engine: design, operation, components and materials</i></b>										
(01)		Name the main assembly parts of a coupled turbine engine and explain its operation.			X	X	X					

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Syllabus reference	BK	Syllabus details and associated Learning Objectives	Aeroplane		Helicopter			IR	CB-IR(A)	BIR Exam	BIR BK	Remarks
			ATPL	CPL	ATPL/IR	ATPL	CPL					
(02)		Explain the limitations of the materials used with regard to maximum turbine temperature, engine and drive train torque limits.			X	X	X					
(03)		Describe the possible effects on engine components when limits are exceeded.			X	X	X					
(04)		Explain that when engine limits are exceeded, this event must be reported.			X	X	X					
<b>021 11 01 04</b>		<b>Free-turbine engine: design, components and materials</b>										
(01)		Describe the design methods to keep the engine's size small for installation in helicopters.			X	X	X					
(02)		List the main components of a free-turbine engine.			X	X	X					
(03)		Describe how the power is developed by a turboshaft/free-turbine engine.			X	X	X					
(04)		Explain how the exhaust gas temperature is used to monitor turbine stress.			X	X	X					
<b>021 11 02 00</b>		<b>Main-engine components</b>										
<b>021 11 02 01</b>		<b>Aeroplane: air intake</b>										
(01)		State the functions of the engine air inlet/air intake.	X	X								
(02)		Describe the geometry of a subsonic (pitot-type) air inlet.	X	X								

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Syllabus reference	BK	Syllabus details and associated Learning Objectives	Aeroplane		Helicopter			IR	CB-IR(A)	BIR Exam	BIR BK	Remarks
			ATPL	CPL	ATPL/IR	ATPL	CPL					
(03)		Explain the gas-parameter changes in a subsonic air inlet at different flight speeds.	X	X								
(04)		Describe the reasons for, and the dangers of, the following operational problems concerning the engine air inlet: — airflow separation; — inlet icing; — inlet damage; — foreign object damage (FOD); — heavy in-flight turbulence.	X	X								
<b>021 11 02 02</b>		<b>Compressor and diffuser</b>										
(01)		State the purpose of the compressor.	X	X	X	X	X					
(02)		Describe the working principle of a centrifugal and an axial flow compressor.	X	X	X	X	X					
(03)		Name the following main components of a single stage and describe their function for a centrifugal compressor: — impeller; — diffuser.	X	X	X	X	X					
(04)		Name the following main components of a single stage and describe their function for an axial compressor: — rotor vanes; — stator vanes.	X	X	X	X	X					



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			ATPL	CPL	ATPL/IR	ATPL	CPL					
(05)		Describe the gas-parameter changes in a compressor stage.	X	X	X	X	X					
(06)		Define the term 'pressure ratio' and state a typical value for one stage of a centrifugal and an axial flow compressor and for the complete compressor.	X	X	X	X	X					
(07)		State the advantages and disadvantages of increasing the number of stages in a centrifugal compressor.	X	X	X	X	X					
(08)		Explain the difference in sensitivity for FOD of a centrifugal compressor compared with an axial flow type.	X	X	X	X	X					
(09)		Explain the convergent air annulus through an axial flow compressor.	X	X	X	X	X					
(10)		Describe the reason for twisting the compressor blades.	X	X	X	X	X					
(11)		State the tasks of inlet guide vanes (IGVs).	X	X	X	X	X					
(12)		State the reason for the clicking noise whilst the compressor slowly rotates on the ground.	X	X	X	X	X					
(13)		State the advantages of increasing the number of spools.	X	X	X	X	X					
(14)		Explain the implications of tip losses and describe the design features to minimise the problem.	X	X	X	X	X					
(15)		Explain the problems of blade bending and flapping and describe the	X	X	X	X	X					

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			ATPL	CPL	ATPL/IR	ATPL	CPL					
		design features to minimise the problem.										
(16)		Explain the following terms: — compressor stall; — engine surge.	X	X	X	X	X					
(17)		State the conditions that are possible causes of stall and surge.	X	X	X	X	X					
(18)		Describe the indications of stall and surge.	X	X	X	X	X					
(19)		Describe the design features used to minimise the occurrence of stall and surge.	X	X	X	X	X					
(20)		Describe a compressor map (surge envelope) with rpm lines, stall limit, steady state line and acceleration line.	X	X	X	X	X					
(21)		Describe the function of the diffuser.	X	X	X	X	X					
<b>021 11 02 03</b>		<b>Combustion chamber</b>										
(01)		Define the purpose of the combustion chamber.	X	X	X	X	X					
(02)		List the requirements for combustion.	X	X	X	X	X					
(03)		Describe the working principle of a combustion chamber.	X	X	X	X	X					
(04)		Explain the reason for reducing the airflow axial velocity at the combustion chamber inlet (snout).	X	X	X	X	X					
(05)		State the function of the swirl vanes (swirler).	X	X	X	X	X					

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			ATPL	CPL	ATPL/IR	ATPL	CPL					
(06)		State the function of the drain valves.	X	X	X	X	X					
(07)		Define the terms 'primary airflow' and 'secondary airflow', and explain their purpose.	X	X	X	X	X					
(08)		Explain the following two mixture ratios: — primary airflow to fuel; — total airflow (within the combustion chamber) to fuel.	X	X	X	X	X					
(09)		Describe the gas-parameter changes in the combustion chamber.	X	X	X	X	X					
(10)		State a typical maximum value of the outlet temperature of the combustion chamber.	X	X	X	X	X					
(11)		Describe the following types of combustion chambers and state the differences between them: — can type; — can-annular, cannular or turbo-annular; — annular; — reverse-flow annular.	X	X	X	X	X					
<b>021 11 02 04</b>		<b>Turbine</b>										
(01)		Explain the purpose of a turbine in different types of gas turbine engines.	X	X	X	X	X					
(02)		Describe the principles of operation of impulse, reaction and impulse-reaction axial flow turbines.	X	X	X	X	X					

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			ATPL	CPL	ATPL/IR	ATPL	CPL					
(03)		Name the main components of a turbine stage and their function.	X	X	X	X	X					
(04)		Describe the working principle of a turbine.	X	X	X	X	X					
(05)		Describe the gas-parameter changes in a turbine stage.	X	X	X	X	X					
(06)		Describe the function and the working principle of active clearance control.	X	X								
(07)		Describe the implications of tip losses and the means to minimise them.	X	X	X	X	X					
(08)		Explain why the available engine thrust is limited by the turbine inlet temperature.	X	X								
(09)		Explain the divergent gas-flow annulus through an axial-flow turbine.	X	X	X	X	X					
(10)		Explain the high mechanical thermal stress in the turbine blades and wheels/discs.	X	X	X	X	X					
<b>021 11 02 05</b>		<b>Aeroplane: exhaust</b>										
(01)		Name the following main components of the exhaust unit and their function: — jet pipe; — propelling nozzle; — exhaust cone.	X	X								
(02)		Describe the working principle of the exhaust unit.	X	X								

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			ATPL	CPL	ATPL/IR	ATPL	CPL					
(03)		Describe the gas-parameter changes in the exhaust unit.	X	X								
(04)		Define the term 'choked exhaust nozzle' (not applicable to turbo-props).	X									
(05)		Explain how jet exhaust noise can be reduced.	X	X								
<b>021 11 02 06</b>		<b>Helicopter: air intake</b>										
(01)		Name and explain the main task of the engine air intake.			X	X	X					
(02)		Describe the use of a convergent air-intake ducting on helicopters.			X	X	X					
(03)		Describe the reasons for and the dangers of the following operational problems concerning engine air intake: — airflow separations; — intake icing; — intake damage; — FOD; — heavy in-flight turbulence.			X	X	X					
(04)		Describe the conditions and circumstances during ground operations when FOD is most likely to occur.			X	X	X					
(05)		Describe and explain the principles of air intake filter systems that can be fitted to some helicopters for operations in icing and sand conditions.			X	X	X					
(06)		Describe the function of the heated pads on some helicopter air intakes.			X	X	X					

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			ATPL	CPL	ATPL/IR	ATPL	CPL					
<b>021 11 02 07</b>		<b>Helicopter: exhaust</b>										
(01)		Describe the working principle of the exhaust unit.			X	X	X					
(02)		Describe the gas-parameter changes in the exhaust unit.			X	X	X					
<b>021 11 03 00</b>		<b>Additional components and systems</b>										
<b>021 11 03 01</b>		<b>Engine fuel system</b>										
(01)		Name the main components of the engine fuel system and state their function: — filters; — low-pressure (LP) pump; — high-pressure (HP) pump; — fuel manifold; — fuel nozzles; — HP fuel cock; — fuel control; or — hydromechanical unit.	X	X	X	X	X					
(02)		Name the two types of engine-driven high-pressure pumps, such as: — gear-type; — swash plate-type.	X	X	X	X	X					
(03)		State the tasks of the fuel control unit.	X	X	X	X	X					
(04)		List the possible input parameters to a fuel control unit to achieve a given thrust/power setting.	X	X	X	X	X					
<b>021 11 03 02</b>		<b>Engine control system</b>										

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			ATPL	CPL	ATPL/IR	ATPL	CPL					
(01)		State the tasks of the engine control system.	X	X	X	X	X					
(02)		List the following different types of engine control systems: — hydromechanical; — hydromechanical with a limited authority electronic supervisor; — single-channel FADEC with hydromechanical backup; — dual-channel FADEC with no backup or any other combination.	X	X	X	X	X					
(03)		Describe a FADEC as a full-authority dual-channel system including functions such as an electronic engine control unit, wiring, sensors, variable vanes, active clearance control, bleed configuration, electrical signalling of thrust lever angle (TLA) (see also AMC to CS-E-50), and an EGT protection function and engine overspeed.	X		X	X						
(04)		Explain how redundancy is achieved by using more than one channel in a FADEC system.	X		X	X						
(05)		State the consequences of a FADEC single input data failure.	X		X	X						
(06)		State that all input and output data is checked by both channels in a FADEC system.	X		X	X						

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			ATPL	CPL	ATPL/IR	ATPL	CPL					
(07)		State that a FADEC system uses its own sensors and that, in some cases, also data from aircraft systems is used.	X		X	X						
(08)		State that a FADEC must have its own source of electrical power.	X		X	X						
<b>021 11 03 03</b>		<b>Engine lubrication</b>										
(01)		State the tasks of an engine lubrication system.	X	X								
(02)		Name the following main components of a lubrication system and state their function: — oil tank and centrifugal breather; — oil pumps (pressure and scavenge pumps); — oil filters (including the bypass); — oil sumps; — chip detectors; — coolers.	X	X								
(03)		Explain that each spool is fitted with at least one ball bearing and two or more roller bearings.	X	X								
(04)		Explain the use of compressor air in oil-sealing systems (e.g. labyrinth seals).	X	X								
<b>021 11 03 04</b>		<b>Engine auxiliary gearbox</b>										
(01)		State the tasks of the auxiliary gearbox.	X	X								



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			ATPL	CPL	ATPL/IR	ATPL	CPL					
(02)		Describe how the gearbox is driven and lubricated.	X	X								
<b>021 11 03 05</b>		<b>Engine ignition</b>										
(01)		State the task of the ignition system.	X	X								
(02)		Name the following main components of the ignition system and state their function: — power sources; — igniters.	X	X								
(03)		State why jet turbine engines are equipped with two electrically independent ignition systems.	X	X								
(04)		Explain the different modes of operation of the ignition system.	X	X								
<b>021 11 03 06</b>		<b>Engine starter</b>										
(01)		Name the main components of the starting system and state their function.	X	X								
(02)		Explain the principle of a turbine engine start.	X	X								
(03)		Describe the following two types of starters: — electric; — pneumatic.	X	X								
(04)		Describe a typical start sequence (on ground/in flight) for a turbofan.	X	X								
(05)		Define 'self-sustaining rpm'.	X	X								
<b>021 11 03 07</b>		<b>Reverse thrust</b>										

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			ATPL	CPL	ATPL/IR	ATPL	CPL					
(01)		Name the following main components of a reverse-thrust system and state their function: — reverse-thrust select lever; — power source (pneumatic or hydraulic); — actuators; — doors; — annunciations.	X	X								
(02)		Explain the principle of a reverse-thrust system.	X	X								
(03)		Identify the advantages and disadvantages of using reverse thrust.	X	X								
(04)		Describe and explain the following different types of thrust-reverser systems: — hot-stream reverser; — clamshell or bucket-door system; — cold-stream reverser (only turbofan engines); — blocker doors; — cascade vanes.	X	X								
(05)		Explain the implications of reversing the cold stream (fan reverser) only on a high bypass ratio engine.	X	X								
(06)		Describe the protection features against inadvertent thrust-reverse deployment in flight as present on most transport aeroplanes.	X	X								

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			ATPL	CPL	ATPL/IR	ATPL	CPL					
(07)		Describe the controls and indications provided for the thrust-reverser system.	X	X								
<b>021 11 03 08</b>		<b>Helicopter specifics on design, operation and components for additional components and systems such as lubrication system, ignition circuit, starter, accessory gearbox</b>										
(01)		State the task of the lubrication system.			X	X	X					
(02)		List and describe the common helicopter lubrication systems.			X	X	X					
(03)		Name the following main components of a helicopter lubrication system: — reservoir; — pump assembly; — external oil filter; — magnetic chip detectors, electronic chip detectors; — thermostatic oil coolers; — breather.			X	X	X					
(04)		Identify and name the components of a helicopter lubrication system from a diagram.			X	X	X					
(05)		Identify the indications used to monitor a lubrication system including warning systems.			X	X	X					
(06)		Explain the differences and appropriate use of straight oil and compound			X	X	X					

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			ATPL	CPL	ATPL/IR	ATPL	CPL					
		oil, and describe the oil numbering system for aviation use.										
(07)		Explain and describe the ignition circuit for engine start and engine re-light facility when the selection is set for both automatic and manual functions.			X	X	X					
(08)		Explain and describe the starter motor and the sequence of events when starting, and that for most helicopters the starter becomes the generator after the starting sequence is over.			X	X	X					
(09)		Explain and describe why the engine drives the accessory gearbox.			X	X	X					
<b>021 11 04 00</b>		<b>Engine operation and monitoring</b>										
<b>021 11 04 01</b>		<b>General</b>										
(01)		Explain the following aeroplane engine ratings: — take-off; — go-around; — maximum continuous thrust/power; — maximum climb thrust/power.	X	X								
(02)		Explain spool-up time.	X	X	X	X	X					
(03)		Explain the reason for the difference between ground and approach flight idle values (rpm).	X	X								
(04)		State the parameters that can be used for setting and monitoring the thrust/power.	X	X	X	X	X					

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			ATPL	CPL	ATPL/IR	ATPL	CPL					
(05)		Describe the terms 'alpha range', 'beta range' and 'reverse thrust' as applied to a turboprop power lever.	X	X								
(06)		Explain the dangers of inadvertent beta-range selection in flight for a turboprop.	X	X								
(07)		Explain the purpose of engine trending.	X	X								
(08)		Explain how the exhaust gas temperature is used to monitor turbine stress.	X	X	X	X	X					
(09)		Describe the effect of engine acceleration and deceleration on the EGT.	X	X	X	X						
(10)		Describe the possible effects on engine components when EGT limits are exceeded.	X	X	X	X	X					
(11)		Explain why engine-limit exceedances must be reported.	X	X	X	X	X					
(12)		Explain the limitations on the use of the thrust-reverser system at low forward speed.	X	X			X					
(13)		Explain the term 'engine seizure'.	X	X	X	X	X					
(14)		State the possible causes of engine seizure and explain their preventative measures.	X	X	X	X	X					
(15)		Describe the potential consequences of a leak in the following two designs of fuel and oil heat exchanger: — oil pressure higher than fuel pressure with oil leaking into	X	X	X	X	X					

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Syllabus reference	BK	Syllabus details and associated Learning Objectives	Aeroplane		Helicopter			IR	CB-IR(A)	BIR Exam	BIR BK	Remarks
			ATPL	CPL	ATPL/IR	ATPL	CPL					
		the fuel system, potentially affecting the combustion and running of the engine; — fuel pressure higher than oil pressure with fuel leaking into the oil system, potentially increasing the risk of a fire due to fuel entering warm parts of the engine that should be free from fuel.										
(16)		Explain oil-filter clogging (blockage) and the implications for the lubrication system.	X	X	X	X	X					
(17)		Give examples of monitoring instruments of an engine.	X	X	X	X	X					
(18)		Describe how to identify and assess engine damage based on instrument indications.	X	X	X	X	X					
<b>021 11 04 02</b>		<b>Starting malfunctions</b>										
(01)		Describe the indications and the possible causes of the following aeroplane starting malfunctions: — false (dry or wet) start; — tailpipe fire (torching); — hot start; — abortive (hung) start; — no N1 rotation; — no FADEC indications.	X	X								
(02)		Describe the indications and the possible causes of the following helicopter starting malfunctions:			X	X	X					

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Syllabus reference	BK	Syllabus details and associated Learning Objectives	Aeroplane		Helicopter			IR	CB-IR(A)	BIR Exam	BIR BK	Remarks
			ATPL	CPL	ATPL/IR	ATPL	CPL					
		<ul style="list-style-type: none"> <li>— false (dry or wet) start;</li> <li>— tailpipe fire (torching);</li> <li>— hot start;</li> <li>— abortive (hung) start;</li> <li>— no N1 rotation;</li> <li>— freewheel failure;</li> <li>— no FADEC indications.</li> </ul>										
<b>021 11 04 03</b>		<b>Relight envelope</b>										
(01)		Explain the relight envelope.	X	X								
<b>021 11 05 00</b>		<b>Performance aspects</b>										
<b>021 11 05 01</b>		<b>Thrust, performance aspects, and limitations</b>										
(01)		Describe the variation of thrust and specific fuel consumption with altitude at constant TAS.	X	X								
(02)		Describe the variation of thrust and specific fuel consumption with TAS at constant altitude.	X	X								
(03)		Explain the term 'flat-rated engine' by describing the change of take-off thrust, turbine inlet temperature and engine rpm with outside air temperature (OAT).	X	X								
(04)		Define the term 'engine pressure ratio' (EPR).	X	X								
(05)		Explain the use of reduced (flexible) and derated thrust for take-off, and explain the advantages and disadvantages when compared with a full-rated take-off.	X	X								

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Syllabus reference	BK	Syllabus details and associated Learning Objectives	Aeroplane		Helicopter			IR	CB-IR(A)	BIR Exam	BIR BK	Remarks
			ATPL	CPL	ATPL/IR	ATPL	CPL					
(06)		Describe the effects of use of bleed air on rpm, EGT, thrust, and specific fuel consumption.	X	X								
<b>021 11 05 02</b>		<b>Helicopter engine ratings, engine performance and limitations, engine handling: torque, performance aspects and limitations</b>										
(01)		Describe engine rating torque limits for take-off, transient and maximum continuous.			X	X	X					
(02)		Describe turbine outlet temperature (TOT) limits for take-off.			X	X	X					
(03)		Explain why TOT is a limiting factor for helicopter performance.			X	X	X					
(04)		Describe and explain the relationship between maximum torque available and density altitude, which leads to decreasing torque available with the increase of density altitude.			X	X	X					
(05)		Explain that hovering downwind, on some helicopters, will noticeably increase the engine TOT.			X	X	X					
(06)		Explain the reason why the engine performance is less when aircraft accessories (i.e. anti-ice, heating, hoist, filters) are switched on.			X	X	X					
(07)		Describe the effects of use of bleed air on engine parameters.			X	X	X					
(08)		Explain that, on some helicopters, exceeding the TOT limit may cause the main rotor to droop (slow down).			X	X	X					



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Syllabus reference	BK	Syllabus details and associated Learning Objectives	Aeroplane		Helicopter			IR	CB-IR(A)	BIR Exam	BIR BK	Remarks
			ATPL	CPL	ATPL/IR	ATPL	CPL					
(09)		Describe overtorquing and explain the consequences.			X	X	X					
<b>021 11 06 00</b>		<b>Auxiliary power unit (APU)</b>										
<b>021 11 06 01</b>		<b><i>Design, operation, functions, operational limitations</i></b>										
(01)		State that an APU is a gas turbine engine and list its tasks.	X		X	X						
(02)		State the difference between the two types of APU inlets.	X		X	X						
(03)		Define 'maximum operating and maximum starting altitude'.	X		X	X						
(04)		Name the typical APU control and monitoring instruments.	X		X	X						
(05)		Describe the APU's automatic shut-down protection.	X		X	X						
<b>021 12 00 00</b>		<b>PROTECTION AND DETECTION SYSTEMS</b>										
<b>021 12 01 00</b>		<b>Smoke detection</b>										
<b>021 12 01 01</b>		<b><i>Types, design, operation, indications and warnings</i></b>										
(01)		Explain the operating principle of the following types of smoke detection sensors: — optical; — ionising.	X	X	X	X	X					
(02)		Give an example of warnings, indications and function tests.	X	X	X	X	X					
<b>021 12 02 00</b>		<b>Fire-protection systems</b>										
<b>021 12 02 01</b>		<b><i>Fire extinguishing (engine and cargo compartments)</i></b>										

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Syllabus reference	BK	Syllabus details and associated Learning Objectives	Aeroplane		Helicopter			IR	CB-IR(A)	BIR Exam	BIR BK	Remarks
			ATPL	CPL	ATPL/IR	ATPL	CPL					
(01)		Explain the operating principle of a built-in fire-extinguishing system and describe its components.	X	X	X	X	X					
(02)		State that two discharges must be provided for each engine (see CS 25.1195(c) Fire-extinguisher systems).	X	X								
<b>021 12 02 02</b>		<b>Fire detection</b>										
(01)		Explain the following principles of fire detection: — resistance and capacitance; — gas pressure.	X	X	X	X	X					
(02)		Explain fire-detection applications such as: — bimetallic; — continuous loop; — gaseous loop (gas-filled detectors).	X	X	X	X	X					
(03)		Explain why generally double-loop systems are used.	X	X	X	X	X					
(04)		Give an example of warnings, indications and function tests of a fire-protection system.	X	X	X	X	X					
<b>021 12 03 00</b>		<b>Rain-protection system</b>										
<b>021 12 03 01</b>		<b>Principle and method of operation</b>										
(01)		Explain the principle and method of operation of the following windshield rain-protection systems for an aeroplane: — wipers; — liquids (rain-repellent);	X	X								

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Syllabus reference	BK	Syllabus details and associated Learning Objectives	Aeroplane		Helicopter			IR	CB-IR(A)	BIR Exam	BIR BK	Remarks
			ATPL	CPL	ATPL/IR	ATPL	CPL					
		— coating.										
(02)		Explain the principle and method of operation of wipers for a helicopter.			X	X	X					
<b>021 13 00 00</b>		<b>OXYGEN SYSTEMS</b>										
<b>021 13 01 00</b>		<b>Cockpit, portable and chemical oxygen systems</b>										
<b>021 13 01 01</b>		<b><i>Operating principles, actuation methods, comparison</i></b>										
(01)		Describe the basic operating principle of a cockpit oxygen system and describe the following different modes of operation: — normal (diluter demand); — 100 %; — emergency.	X	X								
(02)		Describe the operating principle and the purposes of the following two portable oxygen systems: — smoke hood; — portable bottle.	X	X								
(03)		Describe the following two oxygen systems that can be used to supply oxygen to passengers: — fixed system (chemical oxygen generator or gaseous system); — portable.	X	X								
(04)		Describe the actuation methods (automatic and manual) and the functioning of a passenger oxygen mask.	X	X								

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Syllabus reference	BK	Syllabus details and associated Learning Objectives	Aeroplane		Helicopter			IR	CB-IR(A)	BIR Exam	BIR BK	Remarks
			ATPL	CPL	ATPL/IR	ATPL	CPL					
(05)		Compare chemical oxygen generators to gaseous systems with respect to: — capacity; — flow regulation.	X	X								
(06)		State the dangers of grease or oil related to the use of oxygen systems.	X	X								
<b>021 14 00 00</b>		<b>HELICOPTER: MISCELLANEOUS SYSTEMS</b>										
<b>021 14 01 00</b>		<b>Variable rotor speed, active vibration suppression, night-vision goggles (NVG)</b>										
<b>021 14 01 01</b>		<b>Variable rotor speed</b>										
(01)		Explain the system for 'beeping' the NR to its upper limit.			X	X	X					
<b>021 14 01 02</b>		<b>Active vibration suppression</b>										
(01)		Explain and describe how the active vibration suppression system works through high-speed actuators and accelerometer inputs.			X	X	X					
<b>021 14 01 03</b>		<b>NVG</b>										
		To be introduced at a later date.			X	X	X					
<b>021 15 00 00</b>		<b>HELICOPTER: ROTOR HEADS</b>										
<b>021 15 01 00</b>		<b>Main rotor</b>										
<b>021 15 01 01</b>		<b>Types</b>										
(01)		Describe the following rotor-head systems: — teetering (semi-articulated); — articulated; — hingeless (rigid);			X	X	X					

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Syllabus reference	BK	Syllabus details and associated Learning Objectives	Aeroplane		Helicopter			IR	CB-IR(A)	BIR Exam	BIR BK	Remarks
			ATPL	CPL	ATPL/IR	ATPL	CPL					
		— bearingless (semi-articulated).										
(02)		Describe in basic terms the following configuration of rotor systems and their advantages and disadvantages: — tandem; — coaxial; — side by side.			X	X	X					
(03)		Explain how flapping, dragging and feathering is achieved in each rotor-head system.			X	X	X					
<b>021 15 01 02</b>		<b>Structural components and materials, stresses, structural limitations</b>										
(01)		Identify from a diagram the main structural components of the main types of rotor-head systems.			X	X	X					
(02)		List and describe the methods used to detect damage and cracks.			X	X	X					
(03)		Explain and describe the structural limitations to respective rotor systems, including the dangers of negative G inputs to certain rotor-head systems.			X	X	X					
(04)		Describe the various rotor-head lubrication methods.			X	X	X					
<b>021 15 01 03</b>		<b>Design and construction</b>										
(01)		Describe the material technology used in rotor-head design, including construction, using the following materials or mixture of materials: — composites;			X	X	X					

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Syllabus reference	BK	Syllabus details and associated Learning Objectives	Aeroplane		Helicopter			IR	CB-IR(A)	BIR Exam	BIR BK	Remarks
			ATPL	CPL	ATPL/IR	ATPL	CPL					
		<ul style="list-style-type: none"> <li>— fibreglass;</li> <li>— alloys;</li> <li>— elastomers.</li> </ul>										
<b>021 15 01 04</b>		<b>Adjustment</b>										
(01)		Describe and explain the methods of adjustment which are possible on various helicopter rotor-head assemblies.			X	X	X					
<b>021 15 02 00</b>		<b>Tail rotor</b>										
<b>021 15 02 01</b>		<b>Types</b>										
(01)		Describe the following tail-rotor systems: <ul style="list-style-type: none"> <li>— delta-3 hinge effect;</li> <li>— multi-bladed delta-3 effect;</li> <li>— Fenestron or ducted fan tail rotor;</li> <li>— no tail rotor (NOTAR) low-velocity air jet flows from tangential slots (the Coandă effect);</li> <li>— NOTAR high-velocity air jet flows from adjustable nozzles (the Coandă effect).</li> </ul>			X	X	X					
(02)		Identify from a diagram the main structural components of the four main types of tail-rotor systems.			X	X	X					
(03)		Explain and describe the methods to detect damage and cracks on the tail rotor and assembly.			X	X	X					
(04)		Explain and describe the structural limitations to the respective tail-rotor			X	X	X					

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Syllabus reference	BK	Syllabus details and associated Learning Objectives	Aeroplane		Helicopter			IR	CB-IR(A)	BIR Exam	BIR BK	Remarks
			ATPL	CPL	ATPL/IR	ATPL	CPL					
		systems and possible limitations regarding the turning rate of the helicopter.										
(05)		Explain and describe the following methods that helicopter designers use to minimise tail-rotor drift and roll: — reducing the couple arm (tail rotor on a pylon); — offsetting the rotor mast; — use of 'bias' in cyclic control mechanism.			X	X	X					
(06)		Explain pitch-input mechanisms.			X	X	X					
(07)		Explain the relationship between tail-rotor thrust and engine power.			X	X	X					
(08)		Describe how the vertical fin on some types reduces the power demand of the tail rotor.			X	X	X					
<b>021 15 02 02</b>		<b>Design and construction</b>										
(01)		List and describe the various tail-rotor designs and construction methods used on helicopters currently in service.			X	X	X					
<b>021 16 00 00</b>		<b>HELICOPTER: TRANSMISSION</b>										
<b>021 16 01 00</b>		<b>Main gearbox</b>										
<b>021 16 01 01</b>		<b>Different types, design, operation, limitations</b>										

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Syllabus reference	BK	Syllabus details and associated Learning Objectives	Aeroplane		Helicopter			IR	CB-IR(A)	BIR Exam	BIR BK	Remarks
			ATPL	CPL	ATPL/IR	ATPL	CPL					
(01)		Describe the following main principles of helicopter transmission systems for single- and twin-engine helicopters: — drive for the main and tail rotor; — accessory drive for the generator(s), alternator(s), hydraulic and oil pumps, oil cooler(s) and tachometers.			X	X	X					
(02)		Describe the reason for limitations on multi-engine helicopter transmissions in various engine-out situations.			X	X	X					
(03)		Describe how the passive vibration control works with gearbox mountings.			X	X	X					
<b>021 16 02 00</b>		<b>Rotor brake</b>										
<b>021 16 02 01</b>		<b>Types, operational considerations</b>										
(01)		Describe the main function of the disc type of rotor brake.			X	X	X					
(02)		Describe both hydraulic- and cable-operated rotor-brake systems.			X	X	X					
(03)		Describe the different options for the location of the rotor brake.			X	X	X					
(04)		List the following operational considerations for the use of rotor brakes: — rotor speed at engagement of rotor brake; — risk of blade sailing in windy conditions;			X	X	X					



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Syllabus reference	BK	Syllabus details and associated Learning Objectives	Aeroplane		Helicopter			IR	CB-IR(A)	BIR Exam	BIR BK	Remarks
			ATPL	CPL	ATPL/IR	ATPL	CPL					
		<ul style="list-style-type: none"> <li>— risk of rotor-brake overheating and possible fire when brake is applied above the maximum limit, particularly when spilled hydraulic fluid is present;</li> <li>— avoid stopping blades over jet-pipe exhaust with engine running;</li> <li>— cockpit annunciation of rotor-brake operation.</li> </ul>										
<b>021 16 03 00</b>		<b>Auxiliary systems</b>										
<b>021 16 03 01</b>		<b><i>Powering the air-conditioning system</i></b>										
(01)		Explain how power for the air-conditioning system is taken from the auxiliary gearbox.			X	X	X					
<b>021 16 04 00</b>		<b>Driveshaft and associated installation</b>										
<b>021 16 04 01</b>		<b><i>Power, construction, materials, speed and torque</i></b>										
(01)		Describe how power is transmitted from the engine to the main-rotor gearbox.			X	X	X					
(02)		Describe the material and construction of the driveshaft.			X	X	X					
(03)		Explain the need for alignment between the engine and the main- rotor gearbox.			X	X	X					
(04)		Identify how temporary misalignment occurs between driving and driven components.			X	X	X					

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Syllabus reference	BK	Syllabus details and associated Learning Objectives	Aeroplane		Helicopter			IR	CB-IR(A)	BIR Exam	BIR BK	Remarks
			ATPL	CPL	ATPL/IR	ATPL	CPL					
(05)		Explain the relationship between driveshaft speed and torque.			X	X	X					
(06)		Describe the methods with which power is delivered to the tail rotor.			X	X	X					
(07)		Describe and identify the construction and materials of tail-rotor/Fenestron driveshafts.			X	X	X					
<b>021 16 05 00</b>		<b>Intermediate and tail gearbox</b>										
<b>021 16 05 01</b>		<b><i>Lubrication, gearing</i></b>										
(01)		Explain and describe the various arrangements when the drive changes direction and the need for an intermediate or tail gearbox.			X	X	X					
(02)		Explain the lubrication requirements for intermediate and tail-rotor gearboxes and methods of checking levels.			X	X	X					
(03)		Explain how on most helicopters the tail-rotor gearbox contains gearing, etc., for the tail-rotor pitch-change mechanism.			X	X	X					
<b>021 16 06 00</b>		<b>Clutches</b>										
<b>021 16 06 01</b>		<b><i>Purpose, operation, components, serviceability</i></b>										
(01)		Explain the purpose of a clutch.			X	X	X					
(02)		Describe and explain the operation of a: — centrifugal clutch; — actuated clutch.			X	X	X					

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Syllabus reference	BK	Syllabus details and associated Learning Objectives	Aeroplane		Helicopter			IR	CB-IR(A)	BIR Exam	BIR BK	Remarks
			ATPL	CPL	ATPL/IR	ATPL	CPL					
(03)		List the typical components of the various clutches.			X	X	X					
(04)		Identify the following methods by which clutch serviceability can be ascertained: — brake-shoe dust; — vibration; — main-rotor run-down time; — engine speed at time of main-rotor engagement; — belt tensioning; — start protection in a belt-drive clutch system.			X	X	X					
<b>021 16 07 00</b>		<b>Freewheels</b>										
<b>021 16 07 01</b>		<b>Purpose, operation, components, location</b>										
(01)		Explain the purpose of a freewheel.			X	X	X					
(02)		Describe and explain the operation of a: — cam- and roller-type free-wheel; — sprag-clutch-type freewheel.			X	X	X					
(03)		List the typical components of the various freewheels.			X	X	X					
(04)		Identify the various locations of free-wheels in power plant and transmission systems.			X	X	X					
(05)		Explain the implications regarding the engagement and disengagement of the freewheel.			X	X	X					
<b>021 17 00 00</b>		<b>HELICOPTER: BLADES</b>										

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Syllabus reference	BK	Syllabus details and associated Learning Objectives	Aeroplane		Helicopter			IR	CB-IR(A)	BIR Exam	BIR BK	Remarks
			ATPL	CPL	ATPL/IR	ATPL	CPL					
<b>021 17 01 00</b>		<b>Main-rotor design and blade design</b>										
<b>021 17 01 01</b>		<b>Design, construction</b>										
(01)		Describe the different types of blade construction and the need for torsional stiffness.			X	X	X					
(02)		Describe the principles of heating systems/pads on some blades for anti-icing/de-icing.			X	X	X					
(03)		Describe the fully articulated rotor with hinges and feathering hinges.			X	X	X					
<b>021 17 01 02</b>		<b>Structural components and materials</b>										
(01)		List the materials used in the construction of main-rotor blades.			X	X	X					
(02)		List the main structural components of a main-rotor blade and their function.			X	X	X					
(03)		Describe the drag hinge of the fully articulated rotor and the lag flexure in the hingeless rotor.			X	X	X					
(04)		Explain the necessity for drag dampers.			X	X	X					
<b>021 17 01 03</b>		<b>Forces and stresses</b>										
(01)		Describe main-rotor blade-loading on the ground and in flight.			X	X	X					
(02)		Describe where the most common stress areas are on rotor blades.			X	X	X					
(03)		Show how the centrifugal forces depend on rotor rpm and blade mass			X	X	X					

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Syllabus reference	BK	Syllabus details and associated Learning Objectives	Aeroplane		Helicopter			IR	CB-IR(A)	BIR Exam	BIR BK	Remarks
			ATPL	CPL	ATPL/IR	ATPL	CPL					
		and how they pull on the blade's attachment to the hub. Justify the upper limit of the rotor rpm.										
(04)		Assume a rigid attachment and show how thrust may cause huge oscillating bending moments which stress the attachment.			X	X	X					
(05)		Explain why flapping hinges do not transfer such moments. Show the small flapping hinge offset on fully articulated rotors and zero offset in the case of teetering rotors.			X	X	X					
(06)		Describe the working principle of the flexible element in the hingeless rotor and describe the equivalent flapping hinge offset compared to that of the articulated rotor.			X	X	X					
<b>021 17 01 04</b>		<b>Structural limitations</b>										
(01)		Explain the structural limitations in terms of bending and rotor rpm.			X	X	X					
<b>021 17 01 05</b>		<b>Adjustment</b>										
(01)	X	Explain the use of trim tabs.			X	X	X					
<b>021 17 01 06</b>		<b>Tip shape</b>										
(01)		Describe the various blade-tip shapes used by different manufacturers and compare their advantages and disadvantages.			X	X	X					
<b>021 17 01 07</b>		<b>Origins of the vertical vibrations</b>										

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Syllabus reference	BK	Syllabus details and associated Learning Objectives	Aeroplane		Helicopter			IR	CB-IR(A)	BIR Exam	BIR BK	Remarks
			ATPL	CPL	ATPL/IR	ATPL	CPL					
(01)		Explain the lift (thrust) variations per revolution of a blade and the resulting vertical total rotor thrust (TRT) variation in the case of perfectly identical blades.			X	X	X					
(02)		Show the resulting frequencies and amplitudes as a function of the number of blades.			X	X	X					
(03)		Explain the thrust variation in the case of an out-of-track blade, causes, and frequencies (one-per-revolution).			X	X	X					
<b>021 17 01 08</b>		<b>Lateral vibrations</b>										
(01)		Explain blade imbalances, causes, and effects.			X	X	X					
<b>021 17 02 00</b>		<b>Tail-rotor design and blade design</b>										
<b>021 17 02 01</b>		<b>Design, construction</b>										
(01)		Describe the most common design of tail-rotor blade construction, consisting of stainless steel shell reinforced by a honeycomb filler and stainless steel leading abrasive strip.			X	X	X					
(02)		Explain that ballast weights are located at the inboard trailing edge and tip of blades, and that the weights used are determined when the blades are manufactured.			X	X	X					
(03)		Describe how, for some helicopters, anti-icing/de-icing systems are designed into the blade construction.			X	X	X					

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Syllabus reference	BK	Syllabus details and associated Learning Objectives	Aeroplane		Helicopter			IR	CB-IR(A)	BIR Exam	BIR BK	Remarks
			ATPL	CPL	ATPL/IR	ATPL	CPL					
(04)		Describe the two-bladed rotor with a teetering hinge, and rotors with more than two blades.			X	X	X					
(05)		Describe the dangers to ground personnel and to the rotor blades, and how to minimise these dangers.			X	X	X					
<b>021 17 02 02</b>		<b><i>Intentionally left blank</i></b>										
<b>021 17 02 03</b>		<b><i>Stresses, vibrations and balancing</i></b>										
(01)		Describe the tail-rotor blade-loading on the ground and in flight.			X	X	X					
(02)		Explain the sources of vibration of the tail rotor and the resulting high frequencies.			X	X	X					
(03)		Explain balancing and tracking of the tail rotor.			X	X	X					
<b>021 17 02 04</b>		<b><i>Structural limitations</i></b>										
(01)		Describe the structural limitations of the tail-rotor blades.			X	X	X					
(02)		Describe the method of checking the strike indicators placed on the tip of some tail-rotor blades.			X	X	X					
<b>021 17 02 05</b>		<b><i>Adjustment</i></b>										
(01)		Describe the adjustment of yaw pedals in the cockpit to obtain full-control authority of the tail rotor.			X	X	X					
<b>021 17 02 06</b>		<b><i>The Fenestron</i></b>										
(01)		Describe the technical layout of a Fenestron tail rotor.			X	X	X					

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Syllabus reference	BK	Syllabus details and associated Learning Objectives	Aeroplane		Helicopter			IR	CB-IR(A)	BIR Exam	BIR BK	Remarks
			ATPL	CPL	ATPL/IR	ATPL	CPL					
(02)		Explain the advantages and disadvantages of a Fenestron tail rotor.			X	X	X					
<b>021 17 02 07</b>		<b>No tail rotor (NOTAR)</b>										
(01)		Describe the technical layout of a NOTAR design.			X	X	X					
(02)		Explain the control concepts of a NOTAR.			X	X	X					
(03)		Explain the advantages and disadvantages of a NOTAR design.			X	X	X					



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**SUBJECT 022 – AIRCRAFT GENERAL KNOWLEDGE – INSTRUMENTATION**

Syllabus reference	BK	Syllabus details and associated Learning Objectives	Aeroplane		Helicopter			IR	CB-IR(A)	BIR Exam	BIR BK	Remarks
			ATPL	CPL	ATPL /IR	ATPL	CPL					
020 00 00 00		<b>AIRCRAFT GENERAL KNOWLEDGE</b>										
022 00 00 00		<b>AIRCRAFT GENERAL KNOWLEDGE — INSTRUMENTATION</b>										
022 01 00 00		<b>SENSORS AND INSTRUMENTS</b>										
022 01 01 00		<b>Pressure gauge</b>										
022 01 01 01		<b><i>Units for pressure, sensor types, measurements</i></b>										
(01)	X	Define 'pressure', 'absolute pressure' and 'differential pressure'.	X	X	X	X	X					
(02)	X	List the following units used for pressure measurement: — Pascal; — bar; — inches of mercury (in Hg); — pounds per square inch (psi).	X	X	X	X	X					
(03)	X	State the relationship between the different units.	X	X	X	X	X					
(04)		List and describe the following different types of sensors used according to the pressure to be measured: — aneroid capsules; — bellows; — diaphragms; — bourdon tube.	X	X	X	X	X					

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Syllabus reference	BK	Syllabus details and associated Learning Objectives	Aeroplane		Helicopter			IR	CB-IR(A)	BIR Exam	BIR BK	Remarks
			ATPL	CPL	ATPL /IR	ATPL	CPL					
(05)		Identify pressure measurements that are applicable to an aircraft: — liquid-pressure measurement (fuel, oil, hydraulic); — air-pressure measurement (bleed-air systems, air-conditioning systems); — engine-pressure measurement manifold pressure (MAP), engine pressure ratio (EPR)).	X	X	X	X	X					
(06)		Identify and read pressure measurement indications both for engine indications and other systems.	X	X	X	X	X					
(07)		Explain the implications of the following pressure measurement errors both for engine indications and other systems: — loss of pressure sensing; — incorrect pressure indications.	X	X	X	X	X					
<b>022 01 02 00</b>		<b>Temperature sensing</b>										
<b>022 01 02 01</b>		<b>Units for temperature, measurements</b>										
(01)	X	Explain temperature.	X	X	X	X	X					
(02)	X	List the following units that can be used for temperature measurement: — Kelvin; — Celsius; — Fahrenheit.	X	X	X	X	X					
(03)	X	State the relationship between these units and convert between them.	X	X	X	X	X					

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Syllabus reference	BK	Syllabus details and associated Learning Objectives	Aeroplane		Helicopter			IR	CB-IR(A)	BIR Exam	BIR BK	Remarks
			ATPL	CPL	ATPL /IR	ATPL	CPL					
(04)		Identify temperature measurements that are applicable to an aircraft: — gas temperature measurement (ambient air, bleed-air systems, air-conditioning systems, air inlet, exhaust gas, gas turbine outlets); — liquid-temperature measurement (fuel, oil, hydraulic); — component-temperature measurement (generator, transformer rectifier unit (TRU), pumps (fuel, hydraulic), power transfer unit (PTU).	X	X	X	X	X					
(05)		Identify and read temperature measurement indications for both engine indications and other systems.	X	X	X	X	X					
<b>022 01 03 00</b>		<b>Fuel gauge</b>										
<b>022 01 03 01</b>		<b>Units for fuel, measurements, fuel gauges</b>										
(01)		State that the quantity of fuel can be measured by volume or mass.	X	X	X	X	X					
(02)		List the following units used for fuel quantity: — kilogramme; — pound; — litres; — gallons (US and imperial).	X	X	X	X	X					
(03)		Convert between the various units.	X	X	X	X	X					

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Syllabus reference	BK	Syllabus details and associated Learning Objectives	Aeroplane		Helicopter			IR	CB-IR(A)	BIR Exam	BIR BK	Remarks
			ATPL	CPL	ATPL /IR	ATPL	CPL					
(04)		Explain the parameters that can affect the measurement of the volume or mass of the fuel in a fuel tank: — temperature; — aircraft accelerations and attitudes; — and explain how the fuel-gauge system design compensates for these changes.	X	X	X	X	X					
(05)		Describe and explain the operating principles of the following types of fuel gauges: — float system; — capacitance-type of fuel-gauge system; — ultrasound-type of fuel-gauge system: to be introduced at a later date.	X	X	X	X	X					
(06)		Describe and complete a typical post-refuelling procedure for a pilot: — recording the volume that was filled; — converting to the appropriate unit used by the aircraft fuel gauge(s) to compare the actual indicated fuel content to the calculated fuel content; — assess appropriate action if the numbers does not compare.	X	X	X	X	X					

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Syllabus reference	BK	Syllabus details and associated Learning Objectives	Aeroplane		Helicopter			IR	CB-IR(A)	BIR Exam	BIR BK	Remarks
			ATPL	CPL	ATPL /IR	ATPL	CPL					
<b>022 01 04 00</b>		<b>Fuel flowmeters</b>										
<b>022 01 04 01</b>		<b><i>Fuel flow, units for fuel flow, total fuel consumption</i></b>										
(01)		Define 'fuel flow' and where it is measured.	X	X	X	X	X					
(02)		State that fuel flow may be measured by volume or mass per unit of time.	X	X	X	X	X					
(03)		List the following units used for fuel flow when measured by mass per hour: — kilogrammes/hour; — pounds/hour.	X	X	X	X	X					
(04)		List the following units used for fuel flow when measured by volume per hour: — litres/hour; — imperial gallons/hour; — US gallons/hour.	X	X	X	X	X					
(05)		Explain how total fuel consumption is obtained.	X	X	X	X	X					
<b>022 01 05 00</b>		<b>Tachometer</b>										
<b>022 01 05 01</b>		<b><i>Types, operating principles, units for engine speed</i></b>										
(01)	X	List the following types of tachometers, describe their basic operating principle and give examples of use: — mechanical (rotating magnet); — electrical (three-phase tacho-generator);	X	X	X	X	X					

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Syllabus reference	BK	Syllabus details and associated Learning Objectives	Aeroplane		Helicopter			IR	CB-IR(A)	BIR Exam	BIR BK	Remarks
			ATPL	CPL	ATPL /IR	ATPL	CPL					
		<ul style="list-style-type: none"> <li>— electronic (impulse measurement with speed probe and phonic wheel);</li> <li>— and describe the operating principle of each type.</li> </ul>										
(02)		Explain the typical units for engine speed: <ul style="list-style-type: none"> <li>— rpm for piston-engine aircraft;</li> <li>— percentage for turbine-engine aircraft.</li> </ul>	X	X	X	X	X					
(03)		Explain that some types of rpm indicators require electrical power to provide an indication.	X	X	X	X	X					
<b>022 01 06 00</b>		<b>Thrust measurement</b>										
<b>022 01 06 01</b>		<b>Parameters, operating principle</b>										
(01)		List and describe the following two parameters used to represent thrust: <ul style="list-style-type: none"> <li>— N1;</li> <li>— EPR.</li> </ul>	X	X								
(02)		Explain the operating principle of using an engine with EPR indication and explain the consequences of incorrect or missing EPR to the operation of the engine, including reverting to N1 mode.	X	X								
(03)		Give examples of display for N1 and EPR.	X	X								
<b>022 01 07 00</b>		<b>Engine torquemeter</b>										
<b>022 01 07 01</b>		<b>Torque, torquemeters</b>										

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Syllabus reference	BK	Syllabus details and associated Learning Objectives	Aeroplane		Helicopter			IR	CB-IR(A)	BIR Exam	BIR BK	Remarks
			ATPL	CPL	ATPL /IR	ATPL	CPL					
(01)		Define 'torque'.	X	X	X	X	X					
(02)		Explain the relationship between power, torque and rpm.	X	X	X	X	X					
(03)		List the following units used for torque: — Newton meters; — inch or foot pounds.	X	X	X	X	X					
(04)		State that engine torque can be displayed as a percentage.	X	X	X	X	X					
(05)	X	List and describe the following different types of torquemeters, and explain their operating principles: — mechanical; — electronic.	X	X	X	X	X					
(06)	X	Compare the two systems with regard to design and weight.	X	X	X	X	X					
(07)		Give examples of display.	X	X	X	X	X					
<b>022 01 08 00</b>		<b>Synchroscope</b>										
<b>022 01 08 01</b>		<b>Purpose, operating principle, display</b>										
(01)		State the purpose of a synchroscope.	X	X								
(02)	X	Explain the operating principle of a synchroscope.	X	X								
(03)		Give examples of display.	X	X								
<b>022 01 09 00</b>		<b>Engine-vibration monitoring</b>										
<b>022 01 09 01</b>		<b>Purpose, operating principle of a vibration-monitoring system, display</b>										

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Syllabus reference	BK	Syllabus details and associated Learning Objectives	Aeroplane		Helicopter			IR	CB-IR(A)	BIR Exam	BIR BK	Remarks
			ATPL	CPL	ATPL /IR	ATPL	CPL					
(01)		State the purpose of a vibration-monitoring system for a jet engine.	X	X								
(02)	X	Describe the operating principle of a vibration-monitoring system using the following two types of sensors: — piezoelectric crystal; — magnet.	X	X								
(03)		Explain that there is no specific unit for vibration monitoring, i.e. it is determined by specified numeric threshold values.	X	X								
(04)		Give examples of display.	X	X								
<b>022 01 10 00</b>		<b>Time measurement</b>										
<b>022 01 10 01</b>		<b>On-board clock</b>										
(01)		Explain that the on-board aircraft clock provides a time reference for several of the on-board systems including aircraft communications addressing and reporting system (ACARS) and engine and systems maintenance.	X	X	X	X	X					
<b>022 02 00 00</b>		<b>MEASUREMENT OF AIR-DATA PARAMETERS</b>										
<b>022 02 01 00</b>		<b>Pressure measurement</b>										
<b>022 02 01 01</b>		<b>Definitions</b>										
(01)		Define the following pressure measurements and state the relationship between them: — static pressure; — dynamic pressure;	X	X	X	X	X	X				



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Syllabus reference	BK	Syllabus details and associated Learning Objectives	Aeroplane		Helicopter			IR	CB-IR(A)	BIR Exam	BIR BK	Remarks
			ATPL	CPL	ATPL /IR	ATPL	CPL					
		— total pressure.										
<b>022 02 01 02</b>		<b><i>Pitot/static system: design and errors</i></b>										
(01)		Describe the design and the operating principle of a: — static port/source; — pitot tube; — combined pitot/static probe.	X	X	X	X	X	X	X	1		
(02)		For each of these indicate the various locations and describe the following associated errors and how to correct, minimise the effect of or compensate for them: — position errors; — instrument errors; — errors due to a non-longitudinal axial flow (including manoeuvre-induced errors).	X	X	X	X	X	X	X	1		
(03)		Describe a typical pitot/static system and list the possible outputs.	X	X	X	X	X	X				
(04)		Explain the redundancy and the inter-connections that typically exist in complex pitot/static systems found in large aircraft.	X	X	X	X	X	X				
(05)		Explain the purpose of pitot/static system heating.	X	X	X	X	X	X	X	1		
(06)		Describe alternate static sources and their effects when used, particularly in unpressurised aircraft.	X	X	X	X	X	X	X	1		

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Syllabus reference	BK	Syllabus details and associated Learning Objectives	Aeroplane		Helicopter			IR	CB-IR(A)	BIR Exam	BIR BK	Remarks
			ATPL	CPL	ATPL /IR	ATPL	CPL					
(07)		Describe a modern pitot static system using solid-state sensors near the pitot probe or static port converting the air data to numerical data (electrical signals) before being sent to the air-data computer(s).	X	X	X	X	X	X				
<b>022 02 02 00</b>		<b>Temperature measurement</b>										
<b>022 02 02 01</b>		<b>Definitions</b>										
(01)		Define the following and explain the relationship between them: — outside air temperature (OAT); — total air temperature (TAT); — static air temperature (SAT).	X	X	X	X	X	X	X		1	
(02)		Explain the term 'ram rise' and convert TAT to SAT.	X					X				
(03)		Explain why TAT is often displayed and that TAT is the temperature input to the air-data computer.	X	X	X	X	X	X	X			
<b>022 02 02 02</b>		<b>Design and operation</b>										
(01)		Indicate typical locations for both direct-reading and remote-reading temperature probes, and describe the following errors: — position error; — instrument error.	X	X	X	X	X	X				
(02)		Explain the purpose of temperature probe heating and interpret the effect of heating on sensed temperature unless automatically compensated for.	X	X	X	X	X	X				

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Syllabus reference	BK	Syllabus details and associated Learning Objectives	Aeroplane		Helicopter			IR	CB-IR(A)	BIR Exam	BIR BK	Remarks
			ATPL	CPL	ATPL /IR	ATPL	CPL					
<b>022 02 03 00</b>		<b>Angle-of-attack (AoA) measurement</b>										
<b>022 02 03 01</b>		<b><i>Sensor types, operating principles, ice protection, displays, incorrect indications</i></b>										
(01)		Describe the following two types of AoA sensors: — null-seeking (slotted) probe; — vane detector.	X	X								
(02)		For each type, explain the operating principles.	X	X								
(03)		Explain how both types are protected against ice.	X	X								
(04)		Give examples of systems that use the AoA as an input, such as: — air-data computer; — stall warning systems; — flight-envelope protection systems.	X	X								
(05)		Give examples of and interpret different types of AoA displays: — simple light arrays of green, amber and red lights; — gauges showing a numerical scale.	X	X								
(06)		Explain the implications for the pilot if the AoA indication becomes incorrect but still provides data, e.g. if the sensor is frozen in a fixed position.	X	X								

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Syllabus reference	BK	Syllabus details and associated Learning Objectives	Aeroplane		Helicopter			IR	CB-IR(A)	BIR Exam	BIR BK	Remarks
			ATPL	CPL	ATPL /IR	ATPL	CPL					
(07)		Explain how an incorrect AoA measurement can affect the controllability of an aircraft with flight-envelope protection.	X	X								
<b>022 02 04 00</b>		<b>Altimeter</b>										
<b>022 02 04 01</b>		<b><i>Units, terms, types, operating principles, displays, errors, corrections</i></b>										
(01)		List the following two units used for altimeters and state the relationship between them: — feet; — metres.	X	X	X	X	X	X				
(02)	X	Define the following terms: — height, altitude; — indicated altitude, true altitude; — pressure altitude, density altitude.	X	X	X	X	X	X	X		1	
(03)	X	Define the following barometric references: 'QNH', 'QFE', '1013.25'.	X	X	X	X	X	X	X		1	
(04)		Explain the operating principles of an altimeter.	X	X	X	X	X	X	X	1	2, 3	
(05)	X	Describe and compare the following three types of altimeters and reason(s) why particular designs may be required in certain airspace: — simple altimeter (single capsule); — sensitive altimeter (multi-capsule);	X	X	X	X	X	X	X		1	

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Syllabus reference	BK	Syllabus details and associated Learning Objectives	Aeroplane		Helicopter			IR	CB-IR(A)	BIR Exam	BIR BK	Remarks
			ATPL	CPL	ATPL /IR	ATPL	CPL					
		— servo-assisted altimeter.										
(06)	X	Give examples of associated displays: pointer, multi-pointer, drum, vertical straight scale.	X	X	X	X	X	X	X		1	
(07)		Describe the following errors: — static system error; — instrument error; — barometric error; — temperature error (air column not at ISA conditions); — lag (altimeter response to change of height).	X	X	X	X	X	X	X		1	
(08)		Demonstrate the use of an altimeter correction table for the following errors: — temperature corrections; — aircraft position errors.	X	X	X	X	X	X	X		1	
(09)		Describe the effects of a blockage or a leakage on the static pressure line.	X	X	X	X	X	X	X	1		
(10)		Describe the use of GPS altitude as an alternative means of checking erroneous altimeter indications, and highlight the limitations of the GPS altitude indication.	X	X	X	X	X	X	X		1, 3	
<b>022 02 05 00</b>		<b>Vertical speed indicator (VSI)</b>										
<b>022 02 05 01</b>		<b>VSI and instantaneous vertical speed indicator (IVSI)</b>										
(01)		List the two units used for VSIs and state the relationship between them: — metres per second;	X	X	X	X	X	X				

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Syllabus reference	BK	Syllabus details and associated Learning Objectives	Aeroplane		Helicopter			IR	CB-IR(A)	BIR Exam	BIR BK	Remarks
			ATPL	CPL	ATPL /IR	ATPL	CPL					
		— feet per minute.										
(02)		Explain the operating principles of a VSI and an IVSI.	X	X	X	X	X	X	X	1		
(03)		Describe and compare the following types of VSIs: — barometric type (VSI); — instantaneous barometric type (IVSI); — inertial type (inertial information provided by an inertial reference unit).	X	X	X	X	X	X	X	1		
(04)		Describe the following VSI errors: — static system errors; — instrument errors; — time lag.	X	X	X	X	X	X	X	1		
(05)		Describe the effects on a VSI of a blockage or a leakage on the static pressure line.	X	X	X	X	X	X	X	1		
(06)		Give examples of a VSI display.	X	X	X	X	X	X				
(07)		Compare the indications of a VSI and an IVSI during flight in turbulence and appropriate pilot technique during manoeuvring using either type.	X	X	X	X	X	X				
<b>022 02 06 00</b>		<b>Airspeed indicator (ASI)</b>										
<b>022 02 06 01</b>		<b>Units, errors, operating principles, displays, position errors, unreliable airspeed indications</b>										
(01)		List the following three units used for airspeed and state the relationship between them:	X	X	X	X	X	X				

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Syllabus reference	BK	Syllabus details and associated Learning Objectives	Aeroplane		Helicopter			IR	CB-IR(A)	BIR Exam	BIR BK	Remarks
			ATPL	CPL	ATPL /IR	ATPL	CPL					
		<ul style="list-style-type: none"> <li>— nautical miles/hour (kt);</li> <li>— statute miles/hour (mph);</li> <li>— kilometres/hour (km/h).</li> </ul>										
(02)		Describe the following ASI errors and state when they must be considered: <ul style="list-style-type: none"> <li>— pitot/static system errors;</li> <li>— instrument errors;</li> <li>— position errors;</li> <li>— compressibility errors;</li> <li>— density errors.</li> </ul>	X	X	X	X	X	X	X	1		
(03)		Explain the operating principles of an ASI (as appropriate to aeroplanes or helicopters).	X	X	X	X	X	X	X	1		
(04)		Give examples of an ASI display: pointer, vertical straight scale, and digital (HUD display).	X	X	X	X	X	X				
(05)		Demonstrate the use of an ASI correction table for position error.	X	X	X	X	X	X				
(06)		Define and explain the following colour codes that can be used on an ASI: <ul style="list-style-type: none"> <li>— white arc (flap operating speed range);</li> <li>— green arc (normal operating speed range);</li> <li>— yellow arc (caution speed range);</li> <li>— red line (VNE) or barber's pole (VMO);</li> </ul>	X	X								

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Syllabus reference	BK	Syllabus details and associated Learning Objectives	Aeroplane		Helicopter			IR	CB-IR(A)	BIR Exam	BIR BK	Remarks
			ATPL	CPL	ATPL /IR	ATPL	CPL					
		— blue line (best rate of climb speed, one-engine-out for multi-engine piston light aeroplanes).										
(07)		Define and explain the following colour codes that can be used on an ASI: — green arc (normal operating speed range); — red line (VNE); — blue line (maximum airspeed during autorotation).			X	X	X					
(08)		Describe the effects on an ASI of a blockage or a leakage in the static or total pressure line(s).	X	X	X	X	X	X	X			
(09)		Define the term ‘unreliable airspeed’ and describe the means by which it can be recognised such as: — different airspeed indications between ASIs; — unexpected aircraft behaviour; — buffeting; — aircraft systems warning; — aircraft attitude.	X	X	X	X	X	X	X		1	
(10)		Describe the appropriate procedures available to the pilot in the event of unreliable airspeed indications: — combination of a pitch attitude and power setting;	X	X	X	X	X	X	X		1	



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Syllabus reference	BK	Syllabus details and associated Learning Objectives	Aeroplane		Helicopter			IR	CB-IR(A)	BIR Exam	BIR BK	Remarks
			ATPL	CPL	ATPL /IR	ATPL	CPL					
		<ul style="list-style-type: none"> <li>— ambient wind noise inside the aircraft;</li> <li>— use of GPS speed indications and the associated limitations.</li> </ul>										
<b>022 02 07 00</b>		<b>Machmeter</b>										
<b>022 02 07 01</b>		<b><i>Operating principle, display, CAS, TAS and Mach number</i></b>										
(01)		Define 'Mach number' and 'local speed sound' (LSS). Calculate between LSS, TAS and Mach number.	X									
(02)	X	Describe the operating principle of a Machmeter.	X									
(03)	X	Explain why a Machmeter does not suffer from compressibility error.	X									
(04)		Give examples of a Machmeter display: pointer, drum, vertical straight scale, digital.	X									
(05)		Describe the effects on a Machmeter of a blockage or a leakage in the static or total pressure line(s).	X									
(06)		Explain the relationship between CAS, TAS and Mach number. Explain how CAS, TAS and Mach number vary in relation to each other during a climb, a descent, or in level flight in different temperature conditions.	X									

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Syllabus reference	BK	Syllabus details and associated Learning Objectives	Aeroplane		Helicopter			IR	CB-IR(A)	BIR Exam	BIR BK	Remarks
			ATPL	CPL	ATPL /IR	ATPL	CPL					
(07)		State the existence of maximum operating limit speed (VMO) and maximum operating Mach number (MMO).	X									
(08)		Describe typical indications of MMO and VMO on analogue and digital instruments.	X									
(09)		Describe the relationship between MMO and VMO with change in altitude and the implications of climbing at constant IAS and descending at constant Mach number with respect to the margin to MMO and VMO.	X									
(10)		Describe the implications of climbing or descending at constant Mach number or constant IAS with respect to the margin to the stall speed or maximum speed.	X									
<b>022 02 08 00</b>		<b>Air-data computer (ADC)</b>										
<b>022 02 08 01</b>		<b><i>Operating principle, data, errors, air-data inertial reference unit</i></b>										
(01)		Explain the operating principle of an ADC.	X	X	X	X	X	X				
(02)	X	List the following possible input data: — TAT; — static pressure; — total pressure; — measured temperature; — AoA; — flaps position; — landing gear position;	X	X	X	X	X	X				

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Syllabus reference	BK	Syllabus details and associated Learning Objectives	Aeroplane		Helicopter			IR	CB-IR(A)	BIR Exam	BIR BK	Remarks
			ATPL	CPL	ATPL /IR	ATPL	CPL					
		— stored aircraft data.										
(03)	X	List the following possible output data, as applicable to aeroplanes or helicopters: — IAS; — TAS; — SAT; — TAT; — Mach number; — AoA; — altitude; — vertical speed; — VMO/MMO pointer.	X	X	X	X	X	X				
(04)		Explain how position, instrument, compressibility and density errors can be compensated/corrected to achieve a TAS calculation.	X	X	X	X	X	X				
(05)		Give examples of instruments or systems which may use ADC output data.	X	X	X	X	X	X				
(06)		Explain that an air-data inertial reference unit (ADIRU) is an ADC integrated with an inertial reference unit (IRU), that there will be separate controls for the ADC part and inertial reference (IR) part, and that incorrect selection during failure scenarios may lead to unintended and potentially irreversible consequences.	X	X	X	X	X	X				

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Syllabus reference	BK	Syllabus details and associated Learning Objectives	Aeroplane		Helicopter			IR	CB-IR(A)	BIR Exam	BIR BK	Remarks
			ATPL	CPL	ATPL /IR	ATPL	CPL					
(07)	X	Explain the ADC architecture for air-data measurement including sensors, processing units and displays, as opposed to stand-alone air-data measurement instruments.	X	X	X	X	X	X				
(08)		Describe the consequences of the loss of an ADC compared to the failure of individual instruments.	X	X	X	X	X	X				
<b>022 03 00 00</b>		<b>MAGNETISM — DIRECT-READING COMPASS AND FLUX VALVE</b>										
<b>022 03 01 00</b>		<b>Earth's magnetic field</b>										
<b>022 03 01 01</b>		<b><i>Magnetic field, variation, dip</i></b>										
(01)		Describe the magnetic field of the Earth.	X	X	X	X	X	X				
(02)	X	Explain the properties of a magnet.	X	X	X	X	X	X				
(03)		Define the following terms: — magnetic variation; — magnetic dip (inclination).	X	X	X	X	X	X				
(04)		Describe that a magnetic compass will align itself to both the horizontal (azimuth) and vertical (dip) components of the Earth's magnetic field, thus will not function in the vicinity of the magnetic poles.	X	X	X	X	X	X				
(05)		Demonstrate the use of variation values (given as East/West (E/W) or +/-) to calculate: true heading to magnetic heading; magnetic heading to true heading.	X	X	X	X	X	X				
<b>022 03 02 00</b>		<b>Aircraft magnetic field</b>										

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Syllabus reference	BK	Syllabus details and associated Learning Objectives	Aeroplane		Helicopter			IR	CB-IR(A)	BIR Exam	BIR BK	Remarks
			ATPL	CPL	ATPL /IR	ATPL	CPL					
<b>022 03 02 01</b>		<b><i>Permanent magnetism, electro-magnetism, deviation</i></b>										
(01)	X	Explain the following differences between permanent magnetism and electromagnetism: when they are present; what affects their magnitude.	X	X	X	X	X	X				
(02)	X	Explain the principles of and the reasons for: — compass swinging (determination of initial deviations); — compass compensation (correction of deviations found); — compass calibration (determination of residual deviations).	X	X	X	X	X	X				
(03)		Explain how permanent magnetism within the aircraft structure and electromagnetism from the aircraft systems affect the accuracy of a compass.	X	X	X	X	X	X				
(04)		Describe the purpose and the use of a deviation correction card.	X	X	X	X	X	X				
(05)		Demonstrate the use of deviation values (either given as E/W or +/-) from a compass deviation card to calculate: — compass heading to magnetic heading;	X	X	X	X	X	X	X	1		

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Syllabus reference	BK	Syllabus details and associated Learning Objectives	Aeroplane		Helicopter			IR	CB-IR(A)	BIR Exam	BIR BK	Remarks
			ATPL	CPL	ATPL /IR	ATPL	CPL					
		— magnetic heading to compass heading.										
<b>022 03 03 00</b>		<b>Direct-reading magnetic compass</b>										
<b>022 03 03 01</b>		<b>Purpose, errors, timed turns, serviceability</b>										
(01)		Explain the purpose of a direct-reading magnetic compass.	X	X	X	X	X	X				
(02)		Describe how the direct-reading magnetic compass will only show correct indications during straight, level and unaccelerated flight, and that an error will occur during the following flight manoeuvres (no numerical examples): — acceleration and deceleration; — turning; — during pitch-up or pitch-down manoeuvres.	X	X	X	X	X	X				
(03)		Explain how the use of timed turns eliminates the problem of the turning errors of a direct-reading magnetic compass, and calculate the duration of a rate-1 turn for a given change of heading.	X	X	X	X	X	X				
(04)		Describe the serviceability check for a direct-reading magnetic compass prior to flight, such as: — the physical appearance of the device;	X	X	X	X	X	X	X	1		

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Syllabus reference	BK	Syllabus details and associated Learning Objectives	Aeroplane		Helicopter			IR	CB-IR(A)	BIR Exam	BIR BK	Remarks
			ATPL	CPL	ATPL /IR	ATPL	CPL					
		— comparing the indication to another known direction such as a different compass or runway direction.										
<b>022 03 04 00</b>		<b>Flux valve</b>										
<b>022 03 04 01</b>		<b><i>Purpose, operating principle, location, errors</i></b>										
(01)		Explain the purpose of a flux valve.	X	X	X	X	X	X				
(02)	X	Explain its operating principle.	X	X	X	X	X	X				
(03)		Indicate typical locations of the flux valve(s).	X	X	X	X	X	X				
(04)		Give the remote-reading compass system as example of application for a flux valve.	X	X	X	X	X	X				
(05)		Explain that deviation is compensated for and, therefore, eliminates the need for a deviation correction card.	X	X	X	X	X	X				
(06)		Explain that a flux valve does not suffer from the same magnitude of errors as a direct-reading magnetic compass when turning, accelerating or decelerating and during pitch-up or pitch-down manoeuvres.	X	X	X	X	X	X				
<b>022 04 00 00</b>		<b>GYROSCOPIC INSTRUMENTS</b>										
<b>022 04 01 00</b>		<b>Gyroscope: basic principles</b>										
<b>022 04 01 01</b>		<b><i>Gyroscopic forces, degrees of freedom, gyro wander, driving gyroscopes</i></b>										
(01)	X	Define a 'gyro'.	X	X	X	X	X	X	X		1	

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Syllabus reference	BK	Syllabus details and associated Learning Objectives	Aeroplane		Helicopter			IR	CB-IR(A)	BIR Exam	BIR BK	Remarks
			ATPL	CPL	ATPL /IR	ATPL	CPL					
(02)	X	Explain the fundamentals of the theory of gyroscopic forces.	X	X	X	X	X	X	X		1	
(03)	X	Define the 'degrees of freedom' of a gyro. <i>Remark: As a convention, the degrees of freedom of a gyroscope do not include its own axis of rotation (the spin axis).</i>	X	X	X	X	X	X	X		1	
(04)	X	Explain the following terms: — rigidity; — precession; — wander (drift/topple).	X	X	X	X	X	X				
(05)		Explain the three types of gyro wander: — real wander; — apparent wander; — transport wander.	X	X	X	X	X	X				
(06)		Describe the two ways of driving gyroscopes and any associated indications: — air/vacuum; — electrically.	X	X	X	X	X	X	X	1		
<b>022 04 02 00</b>		<b>Rate-of-turn indicator — Turn coordinator — Balance (slip) indicator</b>										
<b>022 04 02 01</b>		<b>Indications, relation between bank angle, rate of turn and TAS</b>										
(01)		Explain the purpose of a rate-of-turn and balance (slip) indicator.	X	X	X	X	X	X	X	1		
(02)		Define a 'rate-1 turn'.	X	X	X	X	X	X	X	1		



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Syllabus reference	BK	Syllabus details and associated Learning Objectives	Aeroplane		Helicopter			IR	CB-IR(A)	BIR Exam	BIR BK	Remarks
			ATPL	CPL	ATPL /IR	ATPL	CPL					
(03)		Describe the indications given by a rate-of-turn indicator.	X	X	X	X	X	X	X		1	
(04)		Explain the relation between bank angle, rate of turn and TAS, and how bank angle becomes the limiting factor at high speed (no calculations).	X	X	X	X	X	X	X	1		
(05)		Explain the purpose of a balance (slip) indicator and its principle of operation.	X	X	X	X	X	X	X	1		
(06)		Describe the indications of a rate-of-turn and balance (slip) indicator during a balanced, slip or skid turn.	X	X	X	X	X	X	X	1		
(07)		Describe the indications given by a turn coordinator (or turn-and-bank indicator).	X	X	X	X	X	X	X	1		
(08)		Compare the indications on the rate-of-turn indicator and the turn coordinator.	X	X	X	X	X	X	X	1		
<b>022 04 03 00</b>		<b>Attitude indicator (artificial horizon)</b>										
<b>022 04 03 01</b>		<b>Purpose, types, effect of aircraft acceleration, display</b>										
(01)		Explain the purpose of the attitude indicator.	X	X	X	X	X	X	X	1		
(02)		Identify the two types of attitude indicators: — attitude indicator; — attitude and director indicator (ADI).	X	X	X	X	X	X	X	1		
(03)	X	State the degrees of freedom.	X	X	X	X	X	X				

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Syllabus reference	BK	Syllabus details and associated Learning Objectives	Aeroplane		Helicopter			IR	CB-IR(A)	BIR Exam	BIR BK	Remarks
			ATPL	CPL	ATPL /IR	ATPL	CPL					
(04)		Describe the effects of the aircraft's acceleration and turns on instrument indications.	X	X	X	X	X	X				
(05)		Describe a typical attitude display and instrument markings.	X	X	X	X	X	X	X	1		
<b>022 04 04 00</b>		<b>Directional gyroscope</b>										
<b>022 04 04 01</b>		<b><i>Purpose, types, drift, alignment to compass heading</i></b>										
(01)		Explain the purpose of the directional gyroscope.	X	X	X	X	X	X	X	1		
(02)		Identify the two types of gyro-driven direction indicators: direction indicator; horizontal situation indicator (HSI).	X	X	X	X	X	X	X	1		
(03)		Explain how the directional gyroscope will drift over time due to the following: — rotation of the Earth; — aircraft manoeuvring; — aircraft movement over the Earth's surface/direction of travel.	X	X	X	X	X	X				
(04)		Describe the procedure for the pilot to align the directional gyroscope to the correct compass heading.	X	X	X	X	X	X				
<b>022 04 05 00</b>		<b>Remote-reading compass systems</b>										
<b>022 04 05 01</b>		<b><i>Operating principles, components, comparison with a direct-reading magnetic compass</i></b>										
(01)		Describe the principles of operation of a remote-reading compass system.	X	X	X	X	X	X	X		1	

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Syllabus reference	BK	Syllabus details and associated Learning Objectives	Aeroplane		Helicopter			IR	CB-IR(A)	BIR Exam	BIR BK	Remarks
			ATPL	CPL	ATPL /IR	ATPL	CPL					
(02)		Using a block diagram, list and explain the function of the following components of a remote-reading compass system: — flux detection unit; — gyro unit; — transducers, precession amplifiers, annunciator; — display unit (compass card, synchronising and set-heading knob, DG/compass/slave/free switch).	X	X	X	X	X	X	X		1	
(03)		State the advantages and disadvantages of a remote-reading compass system compared to a direct-reading magnetic compass with regard to: — design (power source, weight and volume); — deviation due to aircraft magnetism; — turning and acceleration errors; — attitude errors; — accuracy and stability of the information displayed; — availability of the information for several systems (compass card, RMI, automatic flight control system (AFCS)).	X	X	X	X	X	X				

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Syllabus reference	BK	Syllabus details and associated Learning Objectives	Aeroplane		Helicopter			IR	CB-IR(A)	BIR Exam	BIR BK	Remarks
			ATPL	CPL	ATPL /IR	ATPL	CPL					
<b>022 04 06 00</b>		<b>Solid-state systems — attitude and heading reference system (AHRS)</b>										
<b>022 04 06 01</b>		<b>Components, indications</b>										
(01)		Explain that the AHRS is a replacement for traditional gyros using solid-state technology with no moving parts and is a single unit consisting of: <ul style="list-style-type: none"> <li>— solid-state accelerometers;</li> <li>— solid-state rate sensor gyroscopes;</li> <li>— solid-state magnetometers (measurement of the Earth's magnetic field).</li> </ul>	X	X	X	X	X	X	X	1		
(02)		Explain that the AHRS senses rotation and acceleration for all three axes and senses the direction of the Earth's magnetic field where the indications are normally provided on electronic screens (electronic flight instrument system (EFIS)).	X	X	X	X	X	X	X			
<b>022 05 00 00</b>		<b>INERTIAL NAVIGATION</b>										
<b>022 05 01 00</b>		<b>Basic principles</b>										
<b>022 05 01 01</b>		<b>Systems</b>										
(01)		State that inertial navigation/reference systems are the main source of attitude and one of the main sources of navigational data in commercial air transport aeroplanes.	X		X	X						

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Syllabus reference	BK	Syllabus details and associated Learning Objectives	Aeroplane		Helicopter			IR	CB-IR(A)	BIR Exam	BIR BK	Remarks
			ATPL	CPL	ATPL /IR	ATPL	CPL					
(02)		State that inertial systems require no external input, except TAS, to determine aircraft attitude and navigational data.	X		X	X						
(03)		State that earlier gyro mechanically stabilised platforms are (technically incorrectly but conventionally) referred to as inertial navigation systems (INSs) and more modern fixed (strap down) platforms are conventionally referred to as inertial reference systems (IRSs). INSs can be considered to be stand-alone, whereas IRSs are integrated with the FMS.	X		X	X						
(04)		Explain the basic principles of inertial navigation (including double integration of measured acceleration and the necessity for north–south, east–west and vertical components to be measured/extracted).	X		X	X						
(05)		Explain the necessity of applying correction for transport precession, and Earth rate precession, coriolis and gravity.	X		X	X						
(06)		State that in modern aircraft fitted with inertial reference system (IRS) and flight management system (FMS), the flight management computer (FMC) position is normally derived from a mathematical analysis of IRS, global	X		X	X						

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Syllabus reference	BK	Syllabus details and associated Learning Objectives	Aeroplane		Helicopter			IR	CB-IR(A)	BIR Exam	BIR BK	Remarks
			ATPL	CPL	ATPL /IR	ATPL	CPL					
		positioning system (GPS), and distance measuring equipment (DME) data, VHF omnidirectional radio range (VOR) and LOC.										
(07)		List all navigational data that can be determined by a stand-alone inertial navigation system.	X		X	X						
(08)		State that a strap-down system is fixed to the structure of the aircraft and normally consists of three laser ring gyros and three accelerometers.	X		X	X						
(09)		State the differences between a laser ring gyro and a conventional mechanical gyro.	X		X	X						
<b>022 05 02 00</b>		<b>Alignment and operation</b>										
<b>022 05 02 01</b>		<b>Alignment process, incorrect data entry, and control panels</b>										
(01)		State that during the alignment process, the inertial platform is levelled (INS) or the local vertical is determined (IRS), and true north/aircraft heading is established.	X		X	X						
(02)		Explain that the aircraft must be stationary during alignment, the aircraft position is entered during the alignment phase, and that the alignment process takes around 10 to 20 minutes at mid latitudes (longer at high latitudes).	X		X	X						
(03)		State that in-flight realignment is not possible and loss of alignment leads	X		X	X						

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Syllabus reference	BK	Syllabus details and associated Learning Objectives	Aeroplane		Helicopter			IR	CB-IR(A)	BIR Exam	BIR BK	Remarks
			ATPL	CPL	ATPL /IR	ATPL	CPL					
		to loss of navigational data although attitude information may still be available.										
(04)		Explain that the inertial navigation system (INS) platform is maintained level and north-aligned after alignment is complete and the aircraft is in motion.	X		X	X						
(05)		State that an incorrect entry of latitude may lead to a loss of alignment and is more critical than the incorrect entry of longitude.	X		X	X						
(06)		State that the positional error of a stand-alone INS varies (a typical value can be quoted as 1–2 NM/h) and is dependent on the gyro drift rate, accelerometer bias, misalignment of the platform, and computational errors.	X		X	X						
(07)		Explain that, on a modern aircraft, there is likely to be an air-data inertial reference unit (ADIRU), which is an inertial reference unit (IRU) integrated with an air-data computer (ADC).	X		X	X						
(08)		Identify examples of IRS control panels.	X		X	X						
(09)		Explain the following selections on the IRU mode selector: — NAV (normal operation); — ATT (attitude only).	X		X	X						

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			ATPL	CPL	ATPL /IR	ATPL	CPL					
(10)		State that the majority of the IRS data can be accessed through the FMS control and display unit (CDU)/flight management and guidance system (FMGS) multifunction control and display unit (MCDU).	X		X	X						
(11)		Describe the procedure available to the pilot for assessing the performance of individual IRUs after a flight: <ul style="list-style-type: none"> <li>— reviewing the residual indicated ground speed when the aircraft has parked;</li> <li>— reviewing the drift given as NM/h.</li> </ul>	X		X	X						
<b>022 06 00 00</b>		<b>AEROPLANE: AUTOMATIC FLIGHT CONTROL SYSTEMS</b>										
<b>022 06 01 00</b>		<b>General</b>										
<b>022 06 01 01</b>		<b>Definitions and control loops</b>										
(01)		Describe the following purposes of an automatic flight control system (AFCS): <ul style="list-style-type: none"> <li>— enhancement of flight controls;</li> <li>— reduction of pilot workload.</li> </ul>	X	X				X				
(02)		Define and explain the following two functions of an AFCS: <ul style="list-style-type: none"> <li>— aircraft control: stabilise the aircraft around its centre of gravity (CG);</li> </ul>	X	X				X				



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			ATPL	CPL	ATPL /IR	ATPL	CPL					
		— aircraft guidance: guidance of the aircraft's flight path.										
(03)		Describe the following two automatic control principles: — closed loop, where a feedback from an action or state is compared to the desired action or state; — open loop, where there is no feedback loop.	X	X								
(04)		List the following elements of a closed-loop control system and explain their basic function: — input signal; — error detector; — signal processor providing a measured output signal according to set criteria or laws; — control element such as an actuator; — feedback signal to error detector for comparison with input signal.	X	X								
(05)		Describe how a closed-loop system may enter a state of self-induced oscillation if the system overcompensates for deviations from the desired state.	X	X								

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Syllabus reference	BK	Syllabus details and associated Learning Objectives	Aeroplane		Helicopter			IR	CB-IR(A)	BIR Exam	BIR BK	Remarks
			ATPL	CPL	ATPL /IR	ATPL	CPL					
(06)		Explain how a state of self-induced oscillations may be detected and describe the effects of self-induced oscillations: — aircraft controllability; — aircraft safety; — timely manual intervention as a way of mitigating loss of control; — techniques that may be used to maintain positive control of the aircraft.	X	X								
<b>022 06 02 00</b>		<b>Autopilot system</b>										
<b>022 06 02 01</b>		<b>Design and operation</b>										
(01)		Define the three basic control channels.	X	X								
(02)		Define the three different types of autopilots: — single or 1 axis (roll); — 2 axes (pitch and roll); — 3 axes (pitch, roll and yaw).	X	X								
(03)		Describe the purpose of the following components of an autopilot system: — flight control unit (FCU), mode control panel (MCP) or equivalent; — flight mode annunciator (FMA) (see Subject 022 06 04 00); — autopilot computer; — actuator.	X	X								

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			ATPL	CPL	ATPL /IR	ATPL	CPL					
(04)		Explain the following lateral modes: — heading (HDG)/track (TRK); — VOR (VOR)/localiser (LOC); — lateral navigation/managed navigation (LNAV or NAV).	X	X								
(05)		Describe the purpose of control laws for pitch and roll modes.	X	X								
(06)		Explain the following vertical modes: — vertical speed (V/S); — flight path angle (FPA); — level change (LVL CHG)/open climb (OP CLB) or open descent (OP DES); — speed reference system (SRS); — altitude (ALT) hold; — vertical navigation (VNAV)/managed climb (CLB) or descent (DES); — glideslope (G/S).	X	X								
(07)		Describe how the autopilot uses speed, aircraft configuration or flight phase as a measure for the magnitude of control inputs and how this may affect precision and stability.	X	X								
(08)		Explain the following mixed modes: — take-off; — go-around; — approach (APP).	X	X								

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			ATPL	CPL	ATPL /IR	ATPL	CPL					
(09)		Describe the two types of autopilot configurations and explain the implications to the pilot for either and when comparing the two principles: — flight-deck controls move with the control surface when the autopilot is engaged; — flight-deck controls remain static when the autopilot is engaged.	X	X								
(10)		Describe the purpose of the following inputs and outputs for an autopilot system: — attitude information; — flight path/trajectory information; — control surface position information; — airspeed information; — aircraft configuration information; — FCU/MCP selections; — FMAs.	X	X								
(11)		Describe the purpose of the synchronisation function when engaging the autopilot and explain why the autopilot should be engaged when the aircraft is in trim.	X	X								

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Syllabus reference	BK	Syllabus details and associated Learning Objectives	Aeroplane		Helicopter			IR	CB-IR(A)	BIR Exam	BIR BK	Remarks
			ATPL	CPL	ATPL /IR	ATPL	CPL					
(12)		Define the control wheel steering (CWS) mode as manual manoeuvring of the aircraft through the autopilot computer and autopilot servos/actuators using the control column/control wheel.	X	X								
(13)		Describe the following elements of CWS: — CWS as an autopilot mode; — flight phases where CWS cannot be used; — whether the pilot or the autopilot is controlling the flight path; — the availability of flight path/performance protections; — potential different feel and control response compared to manual flight.	X	X								
(14)		Describe touch control steering (TCS) and highlight the differences when compared to CWS: — autopilot remains engaged but autopilot servos/actuators are disconnected from the control surfaces; — manual control of the aircraft as long as TCS button is depressed;	X	X				X				

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			ATPL	CPL	ATPL /IR	ATPL	CPL					
		— autopilot servos/actuators reconnect when TCS button is released and the autopilot returns to previously engaged mode(s).										
(15)		Explain that only one autopilot may be engaged at any time except for when APP is armed in order to facilitate a fail-operational autoland.	X	X				X				
(16)		Explain the difference between an armed and an engaged mode: — not all modes have an armed state available; — a mode will only become armed if certain criteria are met; — an armed mode will become engaged (replacing the previously engaged mode, if any) when certain criteria are met.	X	X				X				
(17)		Describe the sequence of events when a mode is engaged and the different phases: — initial phase where attitude is changed to obtain a new trajectory in order to achieve the new parameter; — the trajectory will be based on rate of closure which is	X	X				X				

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Syllabus reference	BK	Syllabus details and associated Learning Objectives	Aeroplane		Helicopter			IR	CB-IR(A)	BIR Exam	BIR BK	Remarks
			ATPL	CPL	ATPL /IR	ATPL	CPL					
		again based on the difference between the original parameter and the new parameter; — capture phase where the aircraft will follow a predefined rate of change of trajectory to achieve the new parameter without overshooting/ undershooting; — tracking or hold phase where the aircraft will maintain the set parameter until a new change has been initiated.										
(18)		Explain automatic mode reversion and typical situations where it may occur: — no suitable data for the current mode such as flight plan discontinuity when in LNAV/managed NAV; — change of parameter during capture phase for original parameter such as change of altitude target during ALT ACQ/ALT*; — mismanagement of a mode resulting in engagement of	X	X				X				

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Syllabus reference	BK	Syllabus details and associated Learning Objectives	Aeroplane		Helicopter			IR	CB-IR(A)	BIR Exam	BIR BK	Remarks
			ATPL	CPL	ATPL /IR	ATPL	CPL					
		the autopilot envelope protection, e.g. selecting excessive V/S resulting in a loss of speed control.										
(19)		<p>Explain the dangers of mismanagement of the following modes:</p> <ul style="list-style-type: none"> <li>— use of V/S and lack of speed protection, i.e. excessive V/S or FPA may be selected with subsequent uncontrolled loss or gain of air-speed;</li> <li>— arming VOR/LOC or APP outside the protected area of the localiser or ILS.</li> </ul>	X	X				X				
(20)		<p>Describe how failure of other systems may influence the availability of the autopilot and how incorrect data from other systems may result in an undesirable aircraft state, potentially without any failure indications.</p> <p>Explain the importance of prompt and appropriate pilot intervention during such events.</p>	X	X				X				
(21)		Explain an appropriate procedure for disengaging the autopilot and why both aural and visual warnings are used to indicate that the autopilot is being disengaged:	X	X				X				



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Syllabus reference	BK	Syllabus details and associated Learning Objectives	Aeroplane		Helicopter			IR	CB-IR(A)	BIR Exam	BIR BK	Remarks
			ATPL	CPL	ATPL /IR	ATPL	CPL					
		<ul style="list-style-type: none"> <li>temporary warning for intended disengagement using the design method;</li> <li>continuous warning for unintended disengagement or using a method other than the design method.</li> </ul>										
(22)		Explain the following regarding autopilot and aircraft with manual trim: <ul style="list-style-type: none"> <li>the autopilot may not engage unless the aircraft controls are in trim;</li> <li>the aircraft will normally be in trim when the autopilot is disconnected;</li> <li>use of manual trim when the autopilot is engaged will normally lead to autopilot disconnection and a risk of an out-of-trim situation.</li> </ul>	X	X				X				
<b>022 06 03 00</b>		<b>Flight director: design and operation</b>										
<b>022 06 03 01</b>		<b>Purpose, use, indications, modes, data</b>										
(01)		Explain the purpose of a flight director system.	X	X				X				
(02)		Describe the different types of display: <ul style="list-style-type: none"> <li>pitch and roll crossbars;</li> <li>V-bar.</li> </ul>	X	X				X				

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Syllabus reference	BK	Syllabus details and associated Learning Objectives	Aeroplane		Helicopter			IR	CB-IR(A)	BIR Exam	BIR BK	Remarks
			ATPL	CPL	ATPL /IR	ATPL	CPL					
(03)		Explain the differences between a flight director and an autopilot and how the flight director provides a means of cross-checking the control/guidance commands sent to the autopilot.	X	X				X				
(04)		Explain why the flight director must be followed when engaged/shown, and describe the appropriate use of the flight director: — flight director only; — autopilot only; — flight director and autopilot; — typical job-share between pilots (pilot flying (PF)/pilot monitoring (PM)) for selecting the parameters when autopilot is engaged versus disengaged; — highlight when the flight director should not be followed or should be disengaged.	X	X				X				
(05)		Give examples of different scenarios and the resulting flight director indications.	X	X				X				
(06)		Explain that the flight director computes and indicates the direction and magnitude of control inputs required in order to achieve an attitude to follow a trajectory.	X	X				X				

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Syllabus reference	BK	Syllabus details and associated Learning Objectives	Aeroplane		Helicopter			IR	CB-IR(A)	BIR Exam	BIR BK	Remarks
			ATPL	CPL	ATPL /IR	ATPL	CPL					
(07)		Explain how the modes available for the flight director are the same as those available for the autopilot, and that the same panel (FCU/MCP) is normally used for selection.	X	X				X				
(08)		Explain the importance of checking the FMC data or selected autopilot modes through the FMA when using the flight directors. If the flight directors are showing incorrect guidance, they should not be followed and should be turned off.	X	X				X				
<b>022 06 04 00</b>		<b>Aeroplane: flight mode annunciator (FMA)</b>										
<b>022 06 04 01</b>		<b>Purpose, modes, display scenarios</b>										
(01)		Explain the purpose of FMAs and their importance being the only indication of the state of a system rather than a switch position.	X	X				X				
(02)		Describe where the FMAs are normally shown and how the FMAs will be divided into sections (as applicable to aircraft complexity): — vertical modes; — lateral modes; — autothrust modes; — autopilot and flight director annunciators; — landing capability.	X	X				X				

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Syllabus reference	BK	Syllabus details and associated Learning Objectives	Aeroplane		Helicopter			IR	CB-IR(A)	BIR Exam	BIR BK	Remarks
			ATPL	CPL	ATPL /IR	ATPL	CPL					
(03)		Explain why FMAs for engaged or armed modes have different colour or different font size.	X	X				X				
(04)		Describe the following FMA display scenarios: — engagement of a mode; — mode change from armed to becoming engaged; — mode reversion.	X	X				X				
(05)		Explain the importance of monitoring the FMAs and announcing mode changes at all times (including when selecting a new mode) and why only certain mode changes will be accompanied by an aural notification or additional visual cues.	X	X				X				
(06)		Describe the consequences of not understanding what the FMAs imply or missing mode changes, and how it may lead to an undesirable aircraft state.	X	X				X				
<b>022 06 05 00</b>		<b>Autoland</b>										
<b>022 06 05 01</b>		<b>Design and operation</b>										
(01)		Explain the purpose of an autoland system.	X					X				
(02)		Explain the significance of the following components required for an autoland: — autopilot; — autothrust;	X					X				

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Syllabus reference	BK	Syllabus details and associated Learning Objectives	Aeroplane		Helicopter			IR	CB-IR(A)	BIR Exam	BIR BK	Remarks
			ATPL	CPL	ATPL /IR	ATPL	CPL					
		<ul style="list-style-type: none"> <li>— radio altimeter;</li> <li>— ILS receivers.</li> </ul>										
(03)		Explain the following terms (reference to CS-AWO 'All Weather Operations'): <ul style="list-style-type: none"> <li>— fail-passive automatic landing system;</li> <li>— fail-operational automatic landing system;</li> <li>— fail-operational hybrid landing system;</li> <li>— alert height.</li> </ul>	X									
(04)		Describe the autoland sequence including the following: <ul style="list-style-type: none"> <li>— FMAs regarding the landing capability of the aircraft;</li> <li>— the significance of monitoring the FMAs to ensure the automatic arming/engagement of modes triggered by defined radio altitudes or other thresholds;</li> <li>— in the event of a go-around, that the aircraft performs the go-around manoeuvre both by reading the FMAs and supporting those readings by raw data;</li> <li>— during the landing phase, that 'FLARE' mode engages</li> </ul>	X									

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Syllabus reference	BK	Syllabus details and associated Learning Objectives	Aeroplane		Helicopter			IR	CB-IR(A)	BIR Exam	BIR BK	Remarks
			ATPL	CPL	ATPL /IR	ATPL	CPL					
		at the appropriate radio altitude, including typical time frame and actions if 'FLARE' does not engage; — after landing, that 'ROLL-OUT' mode engages and the significance of disconnecting the autopilot prior to vacating the runway.										
(05)		Explain that there are operational limitations in order to legally perform an autoland beyond the technical capability of the aircraft.	X									
(06)		Explain the purpose and significance of alert height, describe the indications and implications, and consider typical pilot actions for a failure situation: — above the alert height; — below the alert height.	X									
(07)		Describe typical failures that, if occurring below the alert height, will trigger a warning: — all autopilots disengage; — loss of ILS signal or components thereof; — excessive ILS deviations; — radio-altimeter failure.	X									

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Syllabus reference	BK	Syllabus details and associated Learning Objectives	Aeroplane		Helicopter			IR	CB-IR(A)	BIR Exam	BIR BK	Remarks
			ATPL	CPL	ATPL /IR	ATPL	CPL					
(08)		Describe how the failure of various systems, including systems not directly involved in the autoland process, can influence the ability to perform an autoland or affect the minima down to which the approach may be conducted.	X									
(09)		Describe the fail-operational hybrid landing system as a primary fail-passive automatic landing system with a secondary independent guidance system such as a head-up display (HUD) to enable the pilot to complete a manual landing if the primary system fails.	X									
<b>022 07 00 00</b>		<b>HELICOPTER: AUTOMATIC FLIGHT CONTROL SYSTEMS</b>										
<b>022 07 01 00</b>		<b>General principles</b>										
<b>022 07 01 01</b>		<b>Stabilisation</b>										
(01)		Explain the similarities and differences between SAS and AFCS (the latter can actually fly the helicopter to perform certain functions selected by the pilot). Some AFCSs just have altitude and heading hold whilst others include a vertical speed or IAS hold mode, where a constant rate of climb/decent or IAS is maintained by the AFCS.			X	X	X					
<b>022 07 01 02</b>		<b>Reduction of pilot workload</b>										

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Syllabus reference	BK	Syllabus details and associated Learning Objectives	Aeroplane		Helicopter			IR	CB-IR(A)	BIR Exam	BIR BK	Remarks
			ATPL	CPL	ATPL /IR	ATPL	CPL					
(01)		Appreciate how effective the AFCS is in reducing pilot workload by improving basic aircraft control harmony and decreasing disturbances.			X	X	X					
<b>022 07 01 03</b>		<b>Enhancement of helicopter capability</b>										
(01)		Explain how an AFCS improves helicopter flight safety during: <ul style="list-style-type: none"> <li>— search and rescue (SAR) because of increased capabilities;</li> <li>— flight by sole reference to instruments;</li> <li>— underslung load operations;</li> <li>— white-out conditions in snow-covered landscapes;</li> <li>— an approach to land with lack of visual cues.</li> </ul>			X	X	X					
(02)		Explain that the SAR modes of AFCS include the following functions: <ul style="list-style-type: none"> <li>— ability to autohover;</li> <li>— facility for mark on target (MOT) approach to hover;</li> <li>— automatically transition from cruise down to a predetermined point or over-flown point;</li> <li>— ability for the rear crew to move the helicopter around in the hover;</li> </ul>			X	X	X					



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Syllabus reference	BK	Syllabus details and associated Learning Objectives	Aeroplane		Helicopter			IR	CB-IR(A)	BIR Exam	BIR BK	Remarks
			ATPL	CPL	ATPL /IR	ATPL	CPL					
		<ul style="list-style-type: none"> <li>the ability to automatically transition from the hover back to cruise flight;</li> <li>the ability to fly various search patterns.</li> </ul>										
(03)		Explain that earlier autohover systems use Doppler velocity sensors and modern systems use inertial sensors plus GPS, and normally include a two-dimensional hover-velocity indicator for the pilots.			X	X	X					
(04)		Explain why some SAR helicopters have both radio-altimeter height hold and barometric altitude hold.			X	X	X					
<b>022 07 01 04</b>		<b>Failures</b>										
(01)		Explain the various redundancies and independent systems that are built into the AFCSSs.			X	X	X					
(02)		Appreciate that the pilot can override the system in the event of a failure.			X	X	X					
(03)		Explain a series actuator 'hard over' which equals aircraft attitude runway.			X	X	X					
(04)		Explain the consequences of a saturation of the series actuators.			X	X	X					
<b>022 07 02 00</b>		<b>Components: operation</b>										
<b>022 07 02 01</b>		<b>Basic sensors</b>										
(01)		Explain the basic sensors in the system and their functions.			X	X	X					

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Syllabus reference	BK	Syllabus details and associated Learning Objectives	Aeroplane		Helicopter			IR	CB-IR(A)	BIR Exam	BIR BK	Remarks
			ATPL	CPL	ATPL /IR	ATPL	CPL					
(02)		Explain that the number of sensors will be dependent on the number of coupled modes of the system.			X	X	X					
<b>022 07 02 02</b>		<b>Specific sensors</b>										
(01)		Explain the function of the micro-switches and strain gauges in the system which sense pilot input to prevent excessive feedback forces from the system.			X	X	X					
<b>022 07 02 03</b>		<b>Actuators</b>										
(01)		Explain the principles of operation of the series and parallel actuators, spring-box clutches and the autotrim system.			X	X	X					
(02)		Explain the principle of operation of the electronic hydraulic actuators in the system.			X	X	X					
<b>022 07 02 04</b>		<b>Pilot–system interface: control panels, system indications, warnings</b>										
(01)		Describe the typical layout of the AFCS control panel.			X	X	X					
(02)		Describe the system indications and warnings.			X	X	X					
<b>022 07 02 05</b>		<b>Operation</b>										
(01)		Explain the functions of the redundant sensors' simplex and duplex channels (single/dual channel).			X	X	X					
<b>022 07 03 00</b>		<b>Stability augmentation system (SAS)</b>										

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Syllabus reference	BK	Syllabus details and associated Learning Objectives	Aeroplane		Helicopter			IR	CB-IR(A)	BIR Exam	BIR BK	Remarks
			ATPL	CPL	ATPL /IR	ATPL	CPL					
<b>022 07 03 01</b>		<b>General principles and operation</b>										
(01)		Explain the general principles and operation of an SAS with regard to: — rate damping; — short-term attitude hold; — effect on static stability; — effect on dynamic stability; — aerodynamic cross-coupling; — effect on manoeuvrability; — control response; — engagement/disengagement; — authority.			X	X	X					
(02)		Explain and describe the general working principles and primary use of an SAS by damping pitch, roll and yaw motions.			X	X	X					
(03)		Describe a simple SAS with force trim system which uses magnetic clutch and springs to hold cyclic control in the position where it was last released.			X	X	X					
(04)		Explain the interaction of trim with SAS/stability and control augmentation system (SCAS).			X	X	X					
(05)		Appreciate that the system can be overridden by the pilot and that individual channels can be deselected.			X	X	X					
(06)		Describe the operational limits of the system.			X	X	X					

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Syllabus reference	BK	Syllabus details and associated Learning Objectives	Aeroplane		Helicopter			IR	CB-IR(A)	BIR Exam	BIR BK	Remarks
			ATPL	CPL	ATPL /IR	ATPL	CPL					
(07)		Explain why the system should be turned off in severe turbulence or when extreme flight attitudes are reached.			X	X	X					
(08)		Explain the safety design features built into some SASs to limit the authority of the actuators to 10–20 % of the full-control throw in order to allow the pilot to override if actuators demand an unsafe control input.			X	X	X					
(09)		Explain how cross-coupling produces an adverse effect on roll-to-yaw coupling when the helicopter is subjected to gusts.			X	X	X					
(10)		Explain the collective-to-pitch coupling, side-slip-to-pitch coupling and inter-axis coupling.			X	X	X					
<b>022 07 04 00</b>		<b>Autopilot — automatic stability equipment</b>										
<b>022 07 04 01</b>		<b>General principles</b>										
(01)		Explain the general autopilot principles with regard to: — long-term attitude hold; — fly-through; — changing the reference (beep trim, trim release).			X	X	X					
<b>022 07 04 02</b>		<b>Basic modes (3/4 axes)</b>										

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			ATPL	CPL	ATPL /IR	ATPL	CPL					
(01)		Explain the AFCS operation on cyclic axes (pitch/roll), yaw axis, and on collective (fourth axis).			X	X	X					
<b>022 07 04 03</b>		<b>Automatic guidance (upper modes of AFCS)</b>										
(01)		Explain the function of the attitude-hold system in an AFCS.			X	X	X					
(02)		Explain the function of the heading-hold system in an AFCS.			X	X	X					
(03)		Explain the function of the vertical-speed hold system in an AFCS.			X	X	X					
(04)		Explain the function of the navigation-coupling system in an AFCS.			X	X	X					
(05)		Explain the function of the VOR-/ILS-coupling system in an AFCS.			X	X	X					
(06)		Explain the function of the hover-mode system in an AFCS (including Doppler and radio-altimeter systems).			X	X	X					
(07)		Explain the function of the SAR mode (automatic transition to hover and back to cruise) in an AFCS.			X	X	X					
<b>022 07 04 04</b>		<b>Flight director: design and operation</b>										
(01)		Explain the purpose of a flight director system.			X	X	X					
(02)		Describe the different types of display: — pitch and roll crossbars; — V-bar.			X	X	X					

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Syllabus reference	BK	Syllabus details and associated Learning Objectives	Aeroplane		Helicopter			IR	CB-IR(A)	BIR Exam	BIR BK	Remarks
			ATPL	CPL	ATPL /IR	ATPL	CPL					
(03)		State the difference between the flight director system and the autopilot system. Explain how each can be used independently.			X	X	X					
(04)		List and describe the main components of the flight director system.			X	X	X					
(05)		Give examples of different situations with the respective indications of the command bars.			X	X	X					
(06)		Explain the architecture of the different flight directors fitted to helicopters and the importance to monitor other instruments as well as the flight director.			X	X	X					
(07)		Explain how some helicopter types have the collective setting as a flight director command; however, the command does not provide protection against a transmission overtorque.			X	X	X					
(08)		Describe the collective setting and yaw depiction on flight director for some helicopters.			X	X	X					
<b>022 07 04 05</b>		<b>Automatic flight control panel (AFCP)</b>										
(01)		Explain the purpose and the importance of the AFCP.			X	X	X					
(02)		State that the AFCP provides: — AFCS basic and upper modes; — flight director selection, SAS and AP engagement;			X	X	X					

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Syllabus reference	BK	Syllabus details and associated Learning Objectives	Aeroplane		Helicopter			IR	CB-IR(A)	BIR Exam	BIR BK	Remarks
			ATPL	CPL	ATPL /IR	ATPL	CPL					
		— failure and alert messages.										
<b>022 08 00 00</b>		<b>TRIMS — YAW DAMPER — FLIGHT-ENVELOPE PROTECTION</b>										
<b>022 08 01 00</b>		<b>Trim systems</b>										
<b>022 08 01 01</b>		<b><i>Design and operation</i></b>										
(01)		Explain the purpose of the trim system and describe the layout with one trim system for each control axis, depending on the complexity of the aircraft.	X	X								
(02)		Give examples of trim indicators and their function, and explain the significance of a 'green band/area' for the pitch trim.	X	X								
(03)		Describe and explain an automatic pitch-trim system for a conventional aeroplane.	X	X								
(04)		Describe and explain an automatic pitch-trim system for an FBW aeroplane and that it is also operating during manual flight; however, during certain phases it may be automatically disabled to alter the handling characteristics of the aircraft.	X	X								
(05)		Describe the consequences of manual operation on the trim wheel when the automatic pitch-trim system is engaged.	X	X								
(06)		Describe and explain the engagement and disengagement conditions of the autopilot according to trim controls.	X	X								

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Syllabus reference	BK	Syllabus details and associated Learning Objectives	Aeroplane		Helicopter			IR	CB-IR(A)	BIR Exam	BIR BK	Remarks
			ATPL	CPL	ATPL /IR	ATPL	CPL					
(07)		Define 'Mach trim' and state that the Mach-trim system can be independent.	X	X								
(08)		Describe the implications for the pilot in the event of a runaway trim or significant out-of-trim state.	X	X								
<b>022 08 02 00</b>		<b>Yaw damper</b>										
<b>022 08 02 01</b>		<b>Design and operation</b>										
(01)		Explain the purpose of the yaw-damper system.	X	X								
(02)		Explain the purpose of the Dutch-roll filter (filtering of the yaw input signal).	X	X								
(03)		Explain the operation of a yaw-damper system and state the difference between a yaw-damper system and a 3-axis autopilot operation on the rudder channel.	X	X								
<b>022 08 03 00</b>		<b>Flight-envelope protection (FEP)</b>										
<b>022 08 03 01</b>		<b>Purpose, input parameters, functions</b>										
(01)		Explain the purpose of the FEP.	X	X				X				
(02)		Explain typical input parameters to the FEP: AoA; — aircraft configuration; — airspeed information.	X	X				X				
(03)		Explain the following functions of the FEP: — stall protection; — overspeed protection.	X	X				X				



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Syllabus reference	BK	Syllabus details and associated Learning Objectives	Aeroplane		Helicopter			IR	CB-IR(A)	BIR Exam	BIR BK	Remarks
			ATPL	CPL	ATPL /IR	ATPL	CPL					
(04)		Explain how the stall-protection function and the overspeed-protection function apply to both mechanical/conventional and FBW control systems, but other functions (e.g. pitch or bank limitation) can only apply to FBW control systems.	X	X				X				
<b>022 09 00 00</b>		<b>AUTOTHRUST — AUTOMATIC THRUST CONTROL SYSTEM</b>										
<b>022 09 01 00</b>		<b>Autothrust system</b>										
<b>022 09 01 01</b>		<b><i>Purpose, operation, overcompensation, speed control</i></b>										
(01)		Describe the purpose of the autothrust system and explain how the FMAs will be the only indication on active autothrust modes.	X									
(02)		Explain the operation of an autothrust system with regard to the following modes: — take-off/go-around (TOGA); — climb or maximum continuous thrust (MCT), N1 or EPR targeted (THR CLB, THR MCT, N1, THR HOLD, EPR); — speed (SPEED, MCP SPD); — idle thrust (THR IDLE, RETARD/ARM); — landing (RETARD, THR IDLE).	X									

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Syllabus reference	BK	Syllabus details and associated Learning Objectives	Aeroplane		Helicopter			IR	CB-IR(A)	BIR Exam	BIR BK	Remarks
			ATPL	CPL	ATPL /IR	ATPL	CPL					
(03)		Describe the two main variants of autothrust systems: — mode selections available on the FCU/MCP and thrust levers move with autothrust commands; — mode selections made using the thrust levers which remain static during autothrust operation.	X									
(04)		Explain how flight in turbulence/wind shear giving fluctuating airspeed indications may lead to the autothrust overcompensating in an oscillating manner and that manual thrust may be required to settle the airspeed. Airspeed indications/trend vectors may give an indication of appropriate thrust adjustments but any reaction should not be too aggressive.	X									
(05)		Explain the threats associated with the use of autothrust resulting in the pilot losing the sense of energy awareness (e.g. speed, thrust).	X									
(06)		Explain the relationship between autopilot pitch modes and autothrust modes, and how the autopilot and autothrust will interact upon selecting modes for one of the systems.	X									
(07)		Explain the principles of speed control and how speed can be controlled:	X									

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Syllabus reference	BK	Syllabus details and associated Learning Objectives	Aeroplane		Helicopter			IR	CB-IR(A)	BIR Exam	BIR BK	Remarks
			ATPL	CPL	ATPL /IR	ATPL	CPL					
		<ul style="list-style-type: none"> <li>— by varying the engine thrust;</li> <li>— by varying the aircraft pitch.</li> </ul>										
(08)		Explain the potential implications on speed control when the autothrust controls speed and the autopilot pitch channel has a fixed pitch target for the following mode combinations: <ul style="list-style-type: none"> <li>— MCP SPD/SPEED and ALT HOLD/ALT;</li> <li>— MCP SPD/SPEED and VSP (climb);</li> <li>— MCP SPD/SPEED and VSP (descent).</li> </ul>	X									
(09)		Explain the potential implications on speed control when the autothrust has a fixed thrust target and the autopilot pitch channel controls speed for the following mode combinations: <ul style="list-style-type: none"> <li>— N1/THR CLB and LVL CHG/OP CLB;</li> <li>— ARM/THR IDLE and LVL CHG/OP DES.</li> </ul>	X									
<b>022 10 00 00</b>		<b>COMMUNICATION SYSTEMS</b>										
<b>022 10 01 00</b>		<b>Voice communication, data-link transmission</b>										
<b>022 10 01 01</b>		<b>Definitions and transmission modes</b>										
(01)		Describe the purpose of a data-link transmission system.	X		X	X						

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Syllabus reference	BK	Syllabus details and associated Learning Objectives	Aeroplane		Helicopter			IR	CB-IR(A)	BIR Exam	BIR BK	Remarks
			ATPL	CPL	ATPL /IR	ATPL	CPL					
(02)		Compare voice communication versus data-link transmission systems.	X		X	X						
(03)		Describe the communication links that are used in aircraft: — high-frequency (HF) communications; — very high-frequency (VHF) communications; — satellite communications (SATCOM).	X		X	X						
(04)		Consider the properties of the communication links with regard to: — signal quality; — range/area coverage; — range; — line-of-sight limitations; — quality of the signal received; — interference due to ionospheric conditions; — data transmission speed.	X		X	X						
(05)		Define and explain the following terms in relation to aircraft data-link communications: — message/data uplink; — message/data downlink.	X		X	X						
<b>022 10 01 02</b>		<b>Systems: architecture, design and operation</b>										
(01)		Describe the purpose of the ACARS network.	X									

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Syllabus reference	BK	Syllabus details and associated Learning Objectives	Aeroplane		Helicopter			IR	CB-IR(A)	BIR Exam	BIR BK	Remarks
			ATPL	CPL	ATPL /IR	ATPL	CPL					
(02)		Describe the systems using the ACARS network through the air traffic service unit (ATSU) suite: — aeronautical/airline operational control (AOC); — air traffic control (ATC).	X									
(03)		Explain the purpose of the following parts of the on-board equipment: — ATSU communications computer; — control and display unit (CDU)/multifunction control and display unit (MCDU); — data communication display unit (DCDU); — ATC message visual annunciator; — printer.	X									
(04)		Give examples of airline operations communications (AOC) data-link messages such as: — out of the gate, off the ground, on the ground, into the gate (OOOI); — load sheet; — passenger information (connecting flights); — weather reports (METAR, TAF);	X									

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Syllabus reference	BK	Syllabus details and associated Learning Objectives	Aeroplane		Helicopter			IR	CB-IR(A)	BIR Exam	BIR BK	Remarks
			ATPL	CPL	ATPL /IR	ATPL	CPL					
		<ul style="list-style-type: none"> <li>— maintenance reports (engine exceedances);</li> <li>— aircraft technical data;</li> <li>— free-text messages.</li> </ul>										
(05)		Give examples of ATC data-link messages such as: <ul style="list-style-type: none"> <li>— departure clearance;</li> <li>— oceanic clearance;</li> <li>— digital ATIS (D-ATIS);</li> <li>— controller-pilot data-link communications (CPDLC).</li> </ul>	X									
<b>022 10 02 00</b>		<b>Future air navigation systems (FANSs)</b>										
<b>022 10 02 01</b>		<b><i>Versions, applications, CPDLC messages, ADS contracts</i></b>										
(01)		Describe the existence of the ICAO communication, navigation, surveillance/air traffic management (CNS/ATM) concept.	X									
(02)		Explain the two versions of FANSs: <ul style="list-style-type: none"> <li>— FANS A/FANS 1 using the ACARS network;</li> <li>— FANS B/FANS 2 using the ACARS network and the aeronautical telecommunication network (ATN).</li> </ul>	X									
(03)		List and explain the following FANS A/FANS 1 applications: <ul style="list-style-type: none"> <li>— ATS facility notification (AFN);</li> </ul>	X									

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Syllabus reference	BK	Syllabus details and associated Learning Objectives	Aeroplane		Helicopter			IR	CB-IR(A)	BIR Exam	BIR BK	Remarks
			ATPL	CPL	ATPL /IR	ATPL	CPL					
		<ul style="list-style-type: none"> <li>— automatic dependent surveillance (ADS);</li> <li>— CPDLC.</li> </ul>										
(04)		Compare the ADS application with the secondary surveillance radar function, and the CPDLC application with VHF communication systems.	X									
(05)		State that an ATCU can use the ADS application only, or the CPDLC application only, or both of them (not including AFN).	X									
(06)		Describe the AFN process for logging on with an ATCU and typical data that will be included in the message.	X									
(07)		Describe typical types of CPDLC messages and the typical pilot work practices when requesting or accepting a CPDLC clearance.	X									
(08)		List and describe the different types of ADS contracts that are controlled by the ATCU and beyond the control of the pilot: <ul style="list-style-type: none"> <li>— periodic: data sent at set time intervals;</li> <li>— on demand: data sent when requested;</li> <li>— on event: data sent when an event occurs (e.g. heading change, climb initiated, etc.);</li> <li>— emergency mode.</li> </ul>	X									

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Syllabus reference	BK	Syllabus details and associated Learning Objectives	Aeroplane		Helicopter			IR	CB-IR(A)	BIR Exam	BIR BK	Remarks
			ATPL	CPL	ATPL /IR	ATPL	CPL					
(09)		Describe the purpose of the ADS emergency mode contract and highlight the difference to the ATCU controlled contracts.	X									
<b>022 11 00 00</b>		<b>FLIGHT MANAGEMENT SYSTEM (FMS)/ FLIGHT MANAGEMENT AND GUIDANCE SYSTEM (FMGS)</b>										
<b>022 11 01 00</b>		<b>Design</b>										
<b>022 11 01 01</b>		<b><i>Purpose, architecture, failures, functions</i></b>										
(01)		Explain the purpose of an FMS.	X		X	X		X				
(02)		Describe a typical dual FMS architecture including the following components: — flight management computer (FMC); — CDU/MCDU; — cross-talk bus.	X		X	X						
(03)		Describe the following failures of a dual FMS architecture and explain the potential implications to the pilots: — failure of one FMC; — failure of one CDU/MCDU; — failure of the cross-talk bus.	X		X	X						
(04)		Describe how the FMS integrates with other systems and gathers data in order to provide outputs depending on its level of complexity.	X		X	X		X				



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Syllabus reference	BK	Syllabus details and associated Learning Objectives	Aeroplane		Helicopter			IR	CB-IR(A)	BIR Exam	BIR BK	Remarks
			ATPL	CPL	ATPL /IR	ATPL	CPL					
(05)		Explain how the FMS may provide the following functions: — navigation; — lateral and vertical flight planning; — performance parameters.	X	X	X	X		X				
<b>022 11 02 00</b>		<b>FMC databases</b>										
<b>022 11 02 01</b>		<b>Navigation database</b>										
(01)		Explain the purpose of, and describe typical content of, the navigation database.	X		X	X		X	X	3	1, 2	
(02)		Describe the 28-day aeronautical information regulation and control (AIRAC) update cycle of the navigation database and explain the reason for having two navigation databases (one active, one standby) and the implication this has to the pilot.	X		X	X		X	X	3	1, 2	
(03)		Explain the purpose of typical user-defined waypoints such as: — latitude/longitude coordinates; — place/bearing/distance (PBD); — place/bearing place/bearing (PBX); — place/distance (PD).	X		X	X		X				
(04)		Explain that the pilot cannot change or overwrite any of the data in the navigation database and that any	X		X	X		X	X	3	1, 2	

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Syllabus reference	BK	Syllabus details and associated Learning Objectives	Aeroplane		Helicopter			IR	CB-IR(A)	BIR Exam	BIR BK	Remarks
			ATPL	CPL	ATPL /IR	ATPL	CPL					
		user-defined waypoints, routes and inputted data will be erased when a different database is activated.										
(05)		Explain the threats and implications to the pilot of changing the database by error either on the ground or while flying.	X		X	X		X		3	1	
<b>022 11 02 02</b>		<b>Aircraft performance database</b>										
(01)		Explain the purpose of, and describe the typical content of, the aircraft performance database.	X		X	X		X				
(02)		Explain the importance of verifying that the aircraft performance database is based on the correct data, such as engine type and aircraft variant.	X		X	X		X				
(03)		Explain that the contents of the aircraft performance database cannot be modified by the pilot.	X		X	X		X				
(04)		Explain the purpose of performance factor and how it influences the calculations.	X		X	X		X				
(05)		Explain the purpose of cost index (CI) and how it influences the calculations.	X									
<b>022 11 03 00</b>		<b>Operations, limitations</b>										
<b>022 11 03 01</b>		<b>Data, calculations, position inputs, raw data</b>										
(01)		Describe typical data that may be provided by the FMS:	X		X	X		X				

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Syllabus reference	BK	Syllabus details and associated Learning Objectives	Aeroplane		Helicopter			IR	CB-IR(A)	BIR Exam	BIR BK	Remarks
			ATPL	CPL	ATPL /IR	ATPL	CPL					
		<ul style="list-style-type: none"> <li>— lateral and vertical navigation guidance;</li> <li>— present position;</li> <li>— time predictions;</li> <li>— fuel predictions;</li> <li>— altitude/flight level predictions.</li> </ul>										
(02)		Explain how the FMS will use a combination of inputted/database and measured data in order to calculate projections and provide output data.	X		X	X		X				
(03)		Explain the issues and threats using inputted/database data and give examples of consequences of inputting data incorrectly/using incorrect data.	X		X	X		X			2, 3	
(04)		Describe fuel consumption calculations during standard operations and explain typical data that will have an influence on the accuracy of the calculations.	X		X	X					2, 3	
(05)		Explain the implications on the accuracy of the calculations during flight in abnormal configurations (such as engine out, gear down, flaps extended, spoilers extended, etc.) if the FMS is unable to detect the failure.	X		X	X					2, 3	
(06)		Describe and explain the purpose of an FMS having dedicated radio-navigation receivers that it will tune automatically.	X		X	X						
(07)		Explain typical position inputs to an FMS:	X		X	X			X	3		

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Syllabus reference	BK	Syllabus details and associated Learning Objectives	Aeroplane		Helicopter			IR	CB-IR(A)	BIR Exam	BIR BK	Remarks
			ATPL	CPL	ATPL /IR	ATPL	CPL					
		<ul style="list-style-type: none"> <li>— GPS;</li> <li>— IRS;</li> <li>— DME;</li> <li>— VOR;</li> <li>— LOC;</li> <li>— runway threshold (RWY THR).</li> </ul>										
(08)		<p>Explain how the FMS will create its own FMS position fix and that the FMS calculations will be based on the FMS position. Depending on the type of system, the FMS position may be calculated from:</p> <ul style="list-style-type: none"> <li>— a single source of position data where the most accurate data available at a given time will be used;</li> <li>— multiple sources from which a position will be derived using the combined inputs.</li> </ul>	X		X	X						
(09)		Explain the implications of a reduction in available position inputs to the FMS, especially GPS in relation to the capability of performing RNP/PBN approaches.	X		X	X						
(10)		Explain the difference between following the FMS data compared to following raw data from radio-navigation receivers and describe how there may be limitations for using FMS data as	X		X	X		X				

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Syllabus reference	BK	Syllabus details and associated Learning Objectives	Aeroplane		Helicopter			IR	CB-IR(A)	BIR Exam	BIR BK	Remarks
			ATPL	CPL	ATPL /IR	ATPL	CPL					
		primary source to follow an instrument approach procedure (IAP) such as LOC, VOR or NDB.										
<b>022 11 04 00</b>		<b>Human-machine interface (control and display unit (CDU)/ multifunction control and display unit (MCDU))</b>										
<b>022 11 04 01</b>		<b><i>Purpose, scratchpad, data input, set-up process</i></b>										
(01)		Describe the purpose of a CDU/MCDU.	X		X	X		X				
(02)		Describe the typical layout of a CDU/MCDU and the general purpose of the following: — screen; — line select keys; — menu select keys; — alphanumerical keys.	X		X	X		X				
(03)		Explain the function of the 'scratch-pad' part of the screen.	X		X	X		X				
(04)		Describe how input of some data is compulsory for the function of the FMS and other data is optional, and that different symbology is used to highlight this: — rectangular boxes = compulsory information; — dashed line = optional information.	X		X	X		X				

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Syllabus reference	BK	Syllabus details and associated Learning Objectives	Aeroplane		Helicopter			IR	CB-IR(A)	BIR Exam	BIR BK	Remarks
			ATPL	CPL	ATPL /IR	ATPL	CPL					
(05)		Describe a typical FMS pre-flight set-up process through the CDU/MCDU to cover the most basic information (with the aim to create awareness of required information as this is irrespective of aircraft type and FMS/FMGS make): — ident page (who am I = aircraft type/variant, engine type/rating and appropriate navigation database); — position initialisation (where am I = position for aligning the IRS and FMS position); — route initialisation (where am I going to = place of departure/destination and alternate(s)); — route programming (how will I get there = SIDs, STARS, route (company or otherwise)); — performance initialisation (when will I arrive = weights, flap setting, FLEX/assumed temperature/derate, take-off speeds).	X									
<b>022 12 00 00</b>		<b>ALERTING SYSTEMS, PROXIMITY SYSTEMS</b>										
<b>022 12 01 00</b>		<b>General</b>										

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Syllabus reference	BK	Syllabus details and associated Learning Objectives	Aeroplane		Helicopter			IR	CB-IR(A)	BIR Exam	BIR BK	Remarks
			ATPL	CPL	ATPL /IR	ATPL	CPL					
<b>022 12 01 01</b>		<b>Alerting systems according to CS-25 and CS-29</b>										
(01)		State definitions, category, criteria and characteristics of alerting systems according to CS-25/AMC 25.1322 for aeroplanes and CS-29 for helicopters as appropriate.	X	X	X	X	X					
022 12 02 00		Flight warning systems (FWSs)										
022 12 02 01		Annunciations, master warning, master caution, advisory										
(01)		State the annunciations given by the FWS and typical location for the annunciator(s): — master warning; — master caution; — advisory.	X	X	X	X	X	X				
(02)		Explain master warning: — colour of annunciator: red; — nature of aural alerts: continuous; — typical failure scenarios triggering the alert.	X	X	X	X	X	X				
(03)		Explain master caution: — colour of the annunciator: amber or yellow; — nature of aural alerts: attention-getter; — typical failure scenarios triggering the alert.	X	X	X	X	X	X				

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Syllabus reference	BK	Syllabus details and associated Learning Objectives	Aeroplane		Helicopter			IR	CB-IR(A)	BIR Exam	BIR BK	Remarks
			ATPL	CPL	ATPL /IR	ATPL	CPL					
(04)		Describe a typical procedure following a master warning or master caution alert: — acknowledging the failure; — silencing the aural warning; — initiating the appropriate response/procedure.	X	X	X	X	X	X				
(05)		Explain advisory: — colour of the annunciator: any other than red, amber, yellow or green; — absence of aural alert; — typical scenarios triggering the advisory.	X	X	X	X	X	X				
<b>022 12 03 00</b>		<b>Stall warning systems (SWSs)</b>										
<b>022 12 03 01</b>		<b>Function, types, components</b>										
(01)		Describe the function of an SWS and explain why the warning must be unique.	X	X								
(02)		Describe the different types of SWSs.	X	X								
(03)		List the main components of an SWS.	X	X								
(04)		Explain the difference between the stall warning speed and the actual stalling speed of the aeroplane.	X	X								
<b>022 12 04 00</b>		<b>Stall protection</b>										
<b>022 12 04 01</b>		<b>Function, types</b>										
(01)		Describe the function of a stall protection system.	X									



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Syllabus reference	BK	Syllabus details and associated Learning Objectives	Aeroplane		Helicopter			IR	CB-IR(A)	BIR Exam	BIR BK	Remarks
			ATPL	CPL	ATPL /IR	ATPL	CPL					
(02)		Describe the different types of stall protection systems including the difference between mechanical and FBW controls.	X									
(03)		Explain the difference between an SWS and a stall protection system.	X									
<b>022 12 05 00</b>		<b>Overspeed warning</b>										
<b>022 12 05 01</b>		<b><i>Purpose, aural warning, VMO/MMO pointer</i></b>										
(01)		Explain the purpose of an overspeed warning system (V <sub>MO</sub> /M <sub>MO</sub> pointer).	X	X								
(02)		State that for large aeroplanes, an aural warning must be associated to the overspeed warning if an electronic display is used (see AMC 25.11, paragraph 10.b(2), p. 2-GEN-22).	X	X								
(03)		Describe and give examples of VMO/MMO pointer: barber's/barber pole pointer, barber's/barber pole vertical scale.	X	X								
<b>022 12 06 00</b>		<b>Take-off warning</b>										
<b>022 12 06 01</b>		<b><i>Purpose</i></b>										
(01)		Explain the purpose of a take-off warning system and list the typical abnormal situations which generate a warning (see AMC 25.703, paragraphs 4 and 5).	X									
<b>022 12 07 00</b>		<b>Altitude alert system</b>										
<b>022 12 07 01</b>		<b><i>Function, displays, alerts</i></b>										

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Syllabus reference	BK	Syllabus details and associated Learning Objectives	Aeroplane		Helicopter			IR	CB-IR(A)	BIR Exam	BIR BK	Remarks
			ATPL	CPL	ATPL /IR	ATPL	CPL					
(01)		Describe the function of an altitude alert system.	X	X	X	X	X	X				
(02)		Describe different types of displays and possible alerts.	X	X	X	X	X	X				
<b>022 12 08 00</b>		<b>Radio altimeter</b>										
<b>022 12 08 01</b>		<b><i>Purpose, range, displays, incorrect indications</i></b>										
(01)		Explain the purpose of a low-altitude radio altimeter.	X	X	X	X	X	X				
(02)		Describe the principle of the distance (height) measurement.	X	X	X	X	X	X				
(03)		Describe the different types of radio-altimeter displays.	X	X	X	X	X	X				
(04)		Describe how the radio altimeter provides input to other systems and how a radio-altimeter failure may impact on the functioning of these systems.	X	X	X	X	X	X				
(05)		State the range of a radio altimeter.	X	X	X	X	X	X				
(06)		Explain the potential implications of a faulty radio-altimeter and how this in particular may affect the following systems: — autothrust (flare/retard); — ground-proximity warning systems (GPWSs).	X	X				X				
<b>022 12 09 00</b>		<b>Ground-proximity warning systems (GPWSs)</b>										
<b>022 12 09 01</b>		<b><i>GPWSs: design, operation, indications</i></b>										
(01)		Explain the purpose of GPWSs.	X		X	X						

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Syllabus reference	BK	Syllabus details and associated Learning Objectives	Aeroplane		Helicopter			IR	CB-IR(A)	BIR Exam	BIR BK	Remarks
			ATPL	CPL	ATPL /IR	ATPL	CPL					
(02)		Explain inputs and outputs of a GPWS and describe its operating principle.	X		X	X						
(03)		List and describe the different modes of operation of a GPWS.	X		X	X						
<b>022 12 09 02</b>		<b><i>Terrain-avoidance warning system (TAWS); other name: enhanced GPWS (EGPWS)</i></b>										
(01)		Explain the purpose of a TAWS for aeroplanes and of a HTAWS for helicopters, and explain the difference from a GPWS.	X		X	X						
(02)		Explain inputs and outputs of a TAWS/HTAWS and describe its working principle.	X		X	X						
(03)		Give examples of terrain displays and list the different possible alerts.	X		X	X						
(04)		Give examples of time response left to the pilot according to look-ahead distance, speed and aircraft performances.	X		X	X						
(05)		Explain why the TAWS/HTAWS must be coupled to a precise-position sensor.	X		X	X						
(06)		Explain the possibility of triggering spurious TAWS/HTAWS warnings as a result of mismanaging the flight path in the proximity to obstacles: — high rate of descent; — high airspeed;	X		X	X						

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Syllabus reference	BK	Syllabus details and associated Learning Objectives	Aeroplane		Helicopter			IR	CB-IR(A)	BIR Exam	BIR BK	Remarks
			ATPL	CPL	ATPL /IR	ATPL	CPL					
		— a combination of high rate of descent and high airspeed.										
<b>022 12 09 03</b>		<b><i>Intentionally left blank</i></b>										
<b>022 12 10 00</b>		<b>ACAS/TCAS</b>										
<b>022 12 10 01</b>		<b><i>Principles and operations</i></b>										
(01)		State that ACAS II is an ICAO standard for anti-collision purposes.	X	X	X	X	X	X				
(02)		Explain that ACAS II is an anti-collision system and does not guarantee any specific separation.	X	X	X	X	X	X				
(03)		Describe the purpose of an ACAS II system as an anti-collision system.	X	X	X	X	X	X				
(04)		Describe the following outputs from a TCAS: — other intruders; — proximate intruders; — traffic advisory (TA); — resolution advisory (RA).	X	X	X	X	X	X				
(05)		State that ACAS II will issue commands in the vertical plane only (climb, descent or maintain), and that the commands are complied with as a manual manoeuvre.	X	X	X	X	X	X				
(06)		Explain that an RA may or may not require any active control input and the implications of reacting instinctively without awareness of actual control inputs required to comply with the RA.	X	X	X	X	X	X				

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Syllabus reference	BK	Syllabus details and associated Learning Objectives	Aeroplane		Helicopter			IR	CB-IR(A)	BIR Exam	BIR BK	Remarks
			ATPL	CPL	ATPL /IR	ATPL	CPL					
(07)		Explain that if two aircraft are fitted with ACAS II, the RA will be coordinated.	X	X	X	X	X	X				
(08)		State that ACAS II equipment can take into account several threats simultaneously.	X	X	X	X	X	X				
(09)		State that a detected aircraft without altitude-reporting can only generate a TA; describe typical type of traffic and how this can create distractions during flight in certain areas of significant air traffic activity.	X	X	X	X	X	X				
(10)		Describe the interaction between the TCAS II system and the transponder, radio altimeter and the air-data computer: — antenna used; — computer and links with radio altimeter, air-data computer and mode-S transponder.	X	X	X	X	X	X				
(11)		Explain the principle of TCAS II interrogations.	X	X	X	X	X	X				
(12)		State the typical standard detection range for TCAS II: — 35–40 NM horizontally; — approximately 2 000 ft above and below (any setting); — extension to approximately 10 000 ft above (ABV selected) or approximately	X	X	X	X	X	X				

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Syllabus reference	BK	Syllabus details and associated Learning Objectives	Aeroplane		Helicopter			IR	CB-IR(A)	BIR Exam	BIR BK	Remarks
			ATPL	CPL	ATPL /IR	ATPL	CPL					
		10 000 ft below (BLW selected).										
(13)		Explain the principle of 'reduced surveillance'.	X	X	X	X	X	X				
(14)		Explain that in high-density traffic areas the range may automatically be decreased in order to enable detection of the threats in the proximity of the aircraft due to a limitation of the maximum number of possible intruders the system is able to process.	X	X	X	X	X	X				
(15)		Identify the equipment which an intruder must be fitted with in order to be detected by TCAS II.	X	X	X	X	X	X				
(16)		Explain in the anti-collision process: — the criteria used to trigger an alarm (TA or RA) are the time to reach the closest point of approach (CPA) (called TAU) and the difference of altitude; — an intruder will be classified as 'proximate' when being less than 6 NM and 1 200 ft from the TCAS-equipped aircraft; — the time limit to CPA is different depending on aircraft altitude, is linked to a sensitivity level (SL), and state	X	X	X	X	X	X				

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Syllabus reference	BK	Syllabus details and associated Learning Objectives	Aeroplane		Helicopter			IR	CB-IR(A)	BIR Exam	BIR BK	Remarks
			ATPL	CPL	ATPL /IR	ATPL	CPL					
		<p>that the value to trigger an RA is from 15 to 35 seconds;</p> <ul style="list-style-type: none"> <li>— in case of an RA, the intended vertical separation varies from 300 to 600 ft (700 ft above FL420), depending on the SL;</li> <li>— below 1 000 ft above ground, no RA can be generated;</li> <li>— below 1 450 ft (radio-altimeter value) 'increase descent' RA is inhibited;</li> <li>— at high altitude, performances of the type of aircraft are taken into account to inhibit 'climb' and 'increase climb' RA.</li> </ul>										
(17)		<p>List and interpret the following information available from TCAS:</p> <ul style="list-style-type: none"> <li>— the different possible statuses of a detected aircraft: 'other', 'proximate', 'intruder';</li> <li>— the appropriate graphic symbols and their position on the horizontal display;</li> <li>— different aural warnings.</li> </ul>	X	X	X	X	X	X				

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Syllabus reference	BK	Syllabus details and associated Learning Objectives	Aeroplane		Helicopter			IR	CB-IR(A)	BIR Exam	BIR BK	Remarks
			ATPL	CPL	ATPL /IR	ATPL	CPL					
(18)		Explain the indications of a TA and an RA and how an RA will generate a red area on the VSI. Some variants will also include a green area. To manoeuvre the aircraft to comply with the RA, the pilot should 'avoid the red' or 'fly the green'.	X	X	X	X	X	X				
(19)		Explain that the pilot must not interpret the horizontal track of an intruder upon the display.	X	X	X	X	X	X				
<b>022 12 11 00</b>		<b>Rotor/engine overspeed alert system</b>										
<b>022 12 11 01</b>		<b>Design, operation, displays, alarms</b>										
(01)		Describe the basic design principles, operation, displays and warning/alarm systems fitted to different helicopters.			X	X	X					
<b>022 13 00 00</b>		<b>INTEGRATED INSTRUMENTS — ELECTRONIC DISPLAYS</b>										
<b>022 13 01 00</b>		<b>Electronic display units</b>										
<b>022 13 01 01</b>		<b>Design, limitations</b>										
(01)		List the different technologies used, e.g. CRT and LCD, and the associated limitations: — cockpit temperature; — glare; — resolution.	X	X	X	X	X	X	X	1		
<b>022 13 02 00</b>		<b>Mechanical integrated instruments</b>										
<b>022 13 02 01</b>		<b>Attitude and director indicator (ADI)/ horizontal situation indicator (HSI)</b>										



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Syllabus reference	BK	Syllabus details and associated Learning Objectives	Aeroplane		Helicopter			IR	CB-IR(A)	BIR Exam	BIR BK	Remarks
			ATPL	CPL	ATPL /IR	ATPL	CPL					
(01)		Describe an ADI and an HSI.	X	X	X	X	X	X	X	1		
(02)		List all the information that can be displayed on either instrument.	X	X	X	X	X	X	X	1		
<b>022 13 03 00</b>		<b>Electronic flight instrument systems (EFISs)</b>										
<b>022 13 03 01</b>		<b>Design, operation</b>										
(01)		List the following parts of an EFIS: — control panel; — display units; — symbol generator; — remote light sensor.	X	X	X	X	X	X		1		
(02)		Describe the typical layout of the EFIS display units and how there may be a facility to transfer the information from one display unit on to another if a display unit fails.	X	X	X	X	X	X				
(03)		Explain the need for standby instruments to supplement the EFIS in the event of all the display units failing and the challenge of using these standby instruments, namely their size and position on the flight deck.	X	X	X	X	X	X		1		
(04)		Explain the difference between a symbol generator failing and a display unit failing, and the implications if there are redundant symbol generators available.	X	X	X	X	X	X		1		
(05)		Describe the purpose of an EFIS control panel and typical selections that may be available:	X	X	X	X	X	X		1		

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Syllabus reference	BK	Syllabus details and associated Learning Objectives	Aeroplane		Helicopter			IR	CB-IR(A)	BIR Exam	BIR BK	Remarks
			ATPL	CPL	ATPL /IR	ATPL	CPL					
		<ul style="list-style-type: none"> <li>— altimeter pressure setting;</li> <li>— navigation display (ND) mode selector;</li> <li>— ND range selector;</li> <li>— ND data selector (waypoints, facilities, constraints, data, etc.);</li> <li>— radio-navigation aids selector (VOR 1/2 or ADF 1/2);</li> <li>— decision altitude (DA)/decision height (DH) selection.</li> </ul>										
<b>022 13 03 02</b>		<b>Primary flight display (PFD), electronic attitude director indicator (EADI)</b>										
(01)		<p>Describe that a PFD (or an EADI) presents a dynamic colour display of all the parameters necessary to control the aircraft, and that the main layout conforms with the 'basic T' principle:</p> <ul style="list-style-type: none"> <li>— attitude information in the centre;</li> <li>— airspeed information on the left;</li> <li>— altitude information on the right;</li> <li>— heading/track indication lower centre;</li> <li>— flight mode annunciation;</li> <li>— basic T;</li> </ul>	X	X	X	X	X	X	X	1		

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Syllabus reference	BK	Syllabus details and associated Learning Objectives	Aeroplane		Helicopter			IR	CB-IR(A)	BIR Exam	BIR BK	Remarks
			ATPL	CPL	ATPL /IR	ATPL	CPL					
		<ul style="list-style-type: none"> <li>— take-off and landing reference speeds;</li> <li>— minimum airspeed;</li> <li>— lower selectable airspeed;</li> <li>— Mach number.</li> </ul>										
(02)		Describe the typical design of the attitude information: <ul style="list-style-type: none"> <li>— artificial horizon with aircraft symbol;</li> <li>— superimposed flight director command bars.</li> </ul>	X	X	X	X	X	X	X	1		
(03)		Describe the typical design of the speed tape: <ul style="list-style-type: none"> <li>— rolling speed scale with numerical read-out of current speed;</li> <li>— limiting airspeeds according to configuration;</li> <li>— speed trend vector;</li> <li>— bug/indication for selected airspeed.</li> </ul>	X	X	X	X	X	X	X	1		
(04)		Explain the Mach number indications and how a selected Mach number is presented with the speed bug on a corresponding IAS on the speed tape with the Mach number shown as a numerical indication outside the speed tape.	X									
(05)		Describe the typical design of the attitude information:	X	X	X	X	X	X	X	1		

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Syllabus reference	BK	Syllabus details and associated Learning Objectives	Aeroplane		Helicopter			IR	CB-IR(A)	BIR Exam	BIR BK	Remarks
			ATPL	CPL	ATPL /IR	ATPL	CPL					
		<ul style="list-style-type: none"> <li>— rolling altitude scale with numerical read-out of current altitude;</li> <li>— altimeter pressure setting;</li> <li>— bug/indication for selected altitude;</li> <li>— means of highlighting the altitude if certain criteria are met.</li> </ul>										
(06)		Describe the typical design of the heading/track information: <ul style="list-style-type: none"> <li>— rolling compass scale/rose with numerical read-out of current heading/track;</li> <li>— bug/indication for selected heading/track.</li> </ul>	X	X	X	X	X	X	X	1		
(07)		Describe the typical design and location of the following information: <ul style="list-style-type: none"> <li>— flight mode annunciators (FMAs);</li> <li>— vertical speed indicator including TCAS RA command indications;</li> <li>— radio altitude;</li> <li>— ILS localiser/glideslope and RNP/PBN, GBAS or SBAS horizontal/vertical flight path deviation indicator;</li> <li>— decision altitude/height (DA/H).</li> </ul>	X	X	X	X	X	X	X	1	3	

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Syllabus reference	BK	Syllabus details and associated Learning Objectives	Aeroplane		Helicopter			IR	CB-IR(A)	BIR Exam	BIR BK	Remarks
			ATPL	CPL	ATPL /IR	ATPL	CPL					
<b>022 13 03 03</b>		<b><i>Navigation display (ND), electronic horizontal situation indicator (EHSI)</i></b>										
(01)		Describe that an ND (or an EHSI) provides a mode-selectable colour flight ND.	X	X	X	X	X	X	X	1		
(02)		List the following four modes typically available to be displayed on an ND unit: — MAP (or ARC); — VOR (or ROSE VOR); — APP (or ROSE LS); — PLAN.	X	X	X	X	X	X		1		
(03)		List and explain the following information that can be displayed with the MAP (or ARC) mode selected on an ND unit: — aircraft symbol, compass scale and range markers; — current heading and track (either one may be 'up' depending on selection), true or magnetic; — selected heading and track; — TAS/GS; — wind direction and speed (W/V); — raw data radio magnetic indicator (RMI) needles/point-	X	X	X	X	X	X		1		

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Syllabus reference	BK	Syllabus details and associated Learning Objectives	Aeroplane		Helicopter			IR	CB-IR(A)	BIR Exam	BIR BK	Remarks
			ATPL	CPL	ATPL /IR	ATPL	CPL					
		<p>ers for VOR/automatic direction-finding equipment (ADF), if selected, including the frequency or ident of the selected navigation facility;</p> <ul style="list-style-type: none"> <li>— route/flight plan data from the FMS;</li> <li>— TO/next waypoint data from the FMS;</li> <li>— data from the navigation database such as airports, waypoints or navigation facilities as selected;</li> <li>— weather radar information;</li> <li>— TCAS traffic information (no TCAS commands);</li> <li>— TAWS (EGPWS) terrain information;</li> <li>— failure flags and messages.</li> </ul>										
(04)		<p>List and explain the following information that can be displayed with the VOR or APP (or ROSE VOR or ROSE LS) mode selected on an ND unit:</p> <ul style="list-style-type: none"> <li>— aircraft symbol and compass scale;</li> <li>— current heading and track (either one may be 'up' depending on selection), true or magnetic;</li> </ul>	X	X	X	X	X	X				

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Syllabus reference	BK	Syllabus details and associated Learning Objectives	Aeroplane		Helicopter			IR	CB-IR(A)	BIR Exam	BIR BK	Remarks
			ATPL	CPL	ATPL /IR	ATPL	CPL					
		<ul style="list-style-type: none"> <li>— selected heading and track;</li> <li>— TAS/ground speed (GS);</li> <li>— wind direction and speed (W/V);</li> <li>— VOR or ILS frequency and identification of the selected navigation aid;</li> <li>— VOR selected course, deviation indicator and a TO/FROM indicator in a HSI-type display format when in VOR mode;</li> <li>— localiser selected course, deviation indicator and glideslope indicator in a HSI-type display format when in APP mode.</li> <li>— weather radar information;</li> <li>— TCAS traffic information (no TCAS commands);</li> <li>— TAWS (EGPWS) terrain information;</li> <li>— failure flags and messages.</li> </ul>										
(05)		<p>List and explain the following information that can be displayed with the PLAN mode selected on an ND unit:</p> <ul style="list-style-type: none"> <li>— north-up compass rose and range markers;</li> <li>— aircraft symbol oriented according to aircraft heading;</li> </ul>	X	X	X	X	X	X				

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Syllabus reference	BK	Syllabus details and associated Learning Objectives	Aeroplane		Helicopter			IR	CB-IR(A)	BIR Exam	BIR BK	Remarks
			ATPL	CPL	ATPL /IR	ATPL	CPL					
		<ul style="list-style-type: none"> <li>— TAS/GS;</li> <li>— wind direction and speed (W/V);</li> <li>— route/flight plan data from the FMS;</li> <li>— TO/next waypoint data from the FMS;</li> <li>— data from the navigation database such as airports, waypoints or navigation facilities as selected;</li> <li>— failure flags and messages.</li> </ul>										
(06)		<p>Explain the purpose of PLAN mode and its characteristics such as:</p> <ul style="list-style-type: none"> <li>— no compass information;</li> <li>— north is up on the display unit at all times;</li> <li>— the centre waypoint is the selected waypoint on the FMS CDU;</li> <li>— scrolling through the flight plan on the FMS CDU will shift the map view along the flight path;</li> <li>— the aircraft symbol will be positioned in the appropriate place along the flight path;</li> <li>— using PLAN mode as the primary mode during flight may</li> </ul>	X	X	X	X	X	X				



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Syllabus reference	BK	Syllabus details and associated Learning Objectives	Aeroplane		Helicopter			IR	CB-IR(A)	BIR Exam	BIR BK	Remarks
			ATPL	CPL	ATPL /IR	ATPL	CPL					
		lead to disorientation and loss of situational awareness.										
(07)		Distinguish the difference between the appearance of an EXPANDED or FULL/ROSE mode and how the displayed range differs between them.	X	X	X	X	X	X				
(08)		Explain the combination of mode and range selection including how selecting the appropriate range and displayed data can improve situational awareness for a given phase of flight.	X	X	X	X	X	X				
<b>022 13 04 00</b>		<b>Engine parameters, crew warnings, aircraft systems, procedure and mission display systems</b>										
<b>022 13 04 01</b>		<b>Purposes of systems, display systems, checklists</b>										
(01)		State the purpose of the following systems: — engine instruments centralised display unit; — crew alerting system/aircraft display unit; — facility for appropriate on-screen checklists; — that the aircraft systems display unit enables the display of normal and degraded modes of operation of the aircraft systems;	X		X	X						

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Syllabus reference	BK	Syllabus details and associated Learning Objectives	Aeroplane		Helicopter			IR	CB-IR(A)	BIR Exam	BIR BK	Remarks
			ATPL	CPL	ATPL /IR	ATPL	CPL					
		— that the systems/aircraft display unit is able to show pictorial systems diagrams/schematics and associated parameters.										
(02)		Describe the similarities to EFIS with regard to basic system architecture.	X		X	X						
(03)		Give the following different names by which engine parameters, crew warnings, aircraft systems and procedures display systems are known: — multifunction display unit (MFDU); — engine indication and crew alerting systems (EICASs); — engine and warning display (EWD); — electronic centralised aircraft monitor (ECAM); — systems display (S/D).	X									
(04)		Give the names of the following different display systems and describe their main functions: — vehicle engine monitoring display (VEMD); — integrated instruments display system (IIDS).			X	X						
(05)		State the purpose of a mission display unit.			X	X						

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			ATPL	CPL	ATPL /IR	ATPL	CPL					
(06)		Describe the architecture of each system and give examples of display.			X	X						
(07)		Explain why awareness of the consequences of the actions commanded by the automatic checklist is required.	X		X	X						
(08)		Explain the limited ability of the computer to assess a situation other than using the exceedance of certain thresholds to trigger the main and subsequent events and programmed actions.	X		X	X						
(09)		Describe an appropriate procedure for following an on-screen checklist associated with a failure scenario including the following: <ul style="list-style-type: none"> <li>— confirm the failure with the other flight crew member prior to performing any of the actions;</li> <li>— seek confirmation prior to manipulating any guarded switches or thrust levers;</li> <li>— follow the checklist slowly and methodically;</li> <li>— assess the possible implications of making certain selections, such as opening the fuel cross-feed if there is a fuel leak even though the electronic checklist may ask for the action.</li> </ul>	X		X	X						

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Syllabus reference	BK	Syllabus details and associated Learning Objectives	Aeroplane		Helicopter			IR	CB-IR(A)	BIR Exam	BIR BK	Remarks
			ATPL	CPL	ATPL /IR	ATPL	CPL					
<b>022 13 05 00</b>		<b>Engine first limit indicator</b>										
<b>022 13 05 01</b>		<b><i>Design, operation, information on display</i></b>										
(01)		Describe the principles of design and operation, and compare the different indications and displays available.			X	X	X					
(02)		Describe what information can be displayed on the screen, when the screen is in the limited composite mode.			X	X	X					
<b>022 13 06 00</b>		<b>Electronic flight bag (EFB)</b>										
<b>022 13 06 01</b>		<b><i>Purpose, certification, malfunctions</i></b>										
(01)		Explain the purpose of the EFB and list typical equipment: — computer laptop; — tablet device; — integrated avionics suite in the aircraft.	X	X	X	X	X	X		1		
(02)		Describe the 'class' hardware certification: — portable: portable electronic device (PED) that can be used inside or outside the aircraft, is not part of the certified aircraft configuration and does not require tools to remove it from the flight-deck cradle, if one exists;	X		X	X						

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			ATPL	CPL	ATPL /IR	ATPL	CPL					
		— installed: an electronic device that is considered an aircraft part covered by the aircraft airworthiness approval, thus is a minimum equipment list (MEL) item in the event of failure.										
(03)		Describe the 'type' software certification: — type A: applications whose misuse or malfunctions have no adverse effect on flight safety; — type B: applications for which evaluation of the hazards presented by misuse or malfunctions is required.	X		X	X						
(04)		Explain implications of malfunctions with the EFB installation in a fully electronic flight-deck environment: — mass and balance calculations; — performance calculations; — access to charts; — access to manuals.	X		X	X						
<b>022 13 07 00</b>		<b>Head-up display (HUD), synthetic vision system (SVS) and enhanced visual system (EVS)</b>										
<b>022 13 07 01</b>		<b>Components, benefits, modes of operation</b>										

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Syllabus reference	BK	Syllabus details and associated Learning Objectives	Aeroplane		Helicopter			IR	CB-IR(A)	BIR Exam	BIR BK	Remarks
			ATPL	CPL	ATPL /IR	ATPL	CPL					
		State the components of a typical HUD installation: — HUD projector and stowable combiner; — HUD controls such as de-clutter and dimmer; — HUD computer.	X		X	X						
		Explain the reasons and benefits of having an HUD: — increased situational awareness due to reduced need to look inside to view primary flight information; — lower minima for both departure and landing; — improved accuracy of flying thus reduced susceptibility to enter a state of aircraft upset.	X		X	X						
		Describe how the HUD replicates the information on the primary flight display (PFD) by showing the following data: — altitude; — speed, including speed trend; — heading; — flight path vector (track and vertical flight path);	X		X	X						

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Syllabus reference	BK	Syllabus details and associated Learning Objectives	Aeroplane		Helicopter			IR	CB-IR(A)	BIR Exam	BIR BK	Remarks
			ATPL	CPL	ATPL /IR	ATPL	CPL					
		<ul style="list-style-type: none"> <li>— flight mode annunciator (FMA);</li> <li>— CAS, TAWS and wind shear command annunciations.</li> </ul>										
		Describe the following modes of operation of an HUD: <ul style="list-style-type: none"> <li>— normal display mode that may automatically adapt the information based on the phase of flight;</li> <li>— declutter function.</li> </ul>	X		X	X						
		Describe the principle of SVS: <ul style="list-style-type: none"> <li>— an enhanced database used as reference to provide terrain and ground features to be shown on the PFD;</li> <li>— limitations due to being a synthetic image not based on actual sensory information thus not lowering landing minima;</li> <li>— implications if aircraft position accuracy becomes reduced.</li> </ul>	X		X	X						
		Describe the principle of EVS: <ul style="list-style-type: none"> <li>— includes external sensors such as infrared cameras to generate a real-time image on the PFD or on the HUD;</li> </ul>	X		X	X						

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Syllabus reference	BK	Syllabus details and associated Learning Objectives	Aeroplane		Helicopter			IR	CB-IR(A)	BIR Exam	BIR BK	Remarks
			ATPL	CPL	ATPL /IR	ATPL	CPL					
		<ul style="list-style-type: none"> <li>— limitation of the fact that an infrared camera uses temperature and temperature difference in order to produce an image;</li> <li>— enables lower minima because of the real-time image, thus enhancing the visibility as experienced by the pilot.</li> </ul>										
<b>022 14 00 00</b>		<b>MAINTENANCE, MONITORING AND RECORDING SYSTEMS</b>										
<b>022 14 01 00</b>		<b>Cockpit voice recorder (CVR)</b>										
<b>022 14 01 01</b>		<b><i>Purpose, components, parameters</i></b>										
(01)		Describe the purpose of a CVR, its typical location, and explain the implications of knowingly erasing or tampering with any information or equipment.	X	X	X	X	X					
(02)		List the main components of a CVR: <ul style="list-style-type: none"> <li>— a shock-resistant tape recorder or digital storage associated with an underwater locating beacon (ULB);</li> <li>— a cockpit area microphone (CAM);</li> <li>— a control unit with the following controls: auto/on, test and erase, and a headset jack;</li> </ul>	X	X	X	X	X					



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Syllabus reference	BK	Syllabus details and associated Learning Objectives	Aeroplane		Helicopter			IR	CB-IR(A)	BIR Exam	BIR BK	Remarks
			ATPL	CPL	ATPL /IR	ATPL	CPL					
		— limited flight-deck controls such as erase and test switches.										
(023)		List the following main parameters recorded on the CVR: — voice communications transmitted from or received on the flight deck; — the aural environment of the flight deck; — voice communication of flight crew members using the aeroplane's interphone system; — voice or audio signals introduced into a headset or speaker; — voice communication of flight crew members using the public address system, if installed.	X	X	X	X	X					
<b>022 14 02 00</b>		<b>Flight data recorder (FDR)</b>										
<b>022 14 02 01</b>		<b>Purpose, components, parameters</b>										
(02)		Describe the purpose of an FDR and its typical location.	X	X								
(02)		List the main components of an FDR: — a shock-resistant data recorder associated with a ULB;	X	X								

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Syllabus reference	BK	Syllabus details and associated Learning Objectives	Aeroplane		Helicopter			IR	CB-IR(A)	BIR Exam	BIR BK	Remarks
			ATPL	CPL	ATPL /IR	ATPL	CPL					
		<ul style="list-style-type: none"> <li>— a data interface and acquisition unit;</li> <li>— a recording system (digital flight data recorder);</li> <li>— two control units (start sequence, event mark setting);</li> <li>— limited flight-deck controls, but includes an event switch.</li> </ul>										
(02)		List the following main parameters recorded on the FDR: <ul style="list-style-type: none"> <li>— time or relative time count;</li> <li>— attitude (pitch and roll);</li> <li>— airspeed;</li> <li>— pressure altitude;</li> <li>— heading;</li> <li>— normal acceleration;</li> <li>— propulsive/thrust power on each engine and flight-deck thrust/power lever position, if applicable;</li> <li>— flaps/slats configuration or flight-deck selection;</li> <li>— ground spoilers or speed brake selection.</li> </ul>	X	X								
(02)		State that additional parameters can be recorded according to FDR capacity and applicable operational requirements.	X									
<b>022 14 03 00</b>		<b>Maintenance and monitoring systems</b>										

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Syllabus reference	BK	Syllabus details and associated Learning Objectives	Aeroplane		Helicopter			IR	CB-IR(A)	BIR Exam	BIR BK	Remarks
			ATPL	CPL	ATPL /IR	ATPL	CPL					
<b>022 14 03 01</b>		<b>Helicopter operations monitoring program (HOMP): design, operation, performance</b>										
(01)		Describe the HOMP as a helicopter version of the aeroplane flight data monitoring (FDM) program.			X	X						
(02)		State that the HOMP software consists of three integrated modules: — flight data events (FDEs); — flight data measurements (FDMs); — flight data traces (FDTs).			X	X						
(03)		Describe and explain the information flow of an HOMP.			X	X						
(04)		Describe HOMP operation and management processes.			X	X						
<b>022 14 03 02</b>		<b>Integrated health and usage monitoring system (IHUMS): design, operation, performance</b>										
(01)		Describe the main features of an IHUMS: — rotor system health; — cockpit voice recorder (CVR)/flight data recorder (FDR); — gearbox system health; — engine health; — exceedance monitoring; — usage monitoring; — transparent operation;			X	X						

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			ATPL	CPL	ATPL /IR	ATPL	CPL					
		<ul style="list-style-type: none"> <li>— ground station features;</li> <li>— monitoring;</li> <li>— rotor track and balance;</li> <li>— engine performance trending;</li> <li>— quality controlled to level 2.</li> </ul>										
(02)		Describe the ground station features of an IHUMS.			X	X						
(03)		Summarise the benefits of an IHUMS including: <ul style="list-style-type: none"> <li>— reduced risk of catastrophic failure of rotor or gearbox;</li> <li>— improved rotor track and balance giving lower vibration levels;</li> <li>— accurate recording of flight exceedances;</li> <li>— CVR/FDR allows accurate accident/incident investigation and HOMP;</li> <li>— maintenance cost savings.</li> </ul>			X	X						
(04)		State the benefits of an IHUMS and an HOMP.			X	X						
<b>022 14 03 03</b>		<b><i>Aeroplane condition monitoring system (ACMS): general, design, operation</i></b>										
(01)		State the purpose of an ACMS.	X									
(02)		Describe the structure of an ACMS including:	X									

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			ATPL	CPL	ATPL /IR	ATPL	CPL					
		<ul style="list-style-type: none"> <li>inputs: aircraft systems (such as air conditioning, autof-light, flight controls, fuel, landing gear, navigation, pneumatic, APU, engine), MCDU;</li> <li>data management unit;</li> <li>recording unit: digital recorder;</li> <li>outputs: printer, ACARS or ATSU.</li> </ul>										
(03)		State that maintenance messages sent by an ACMS can be transmitted without crew notification.	X									
(05)		Explain that data from the ACMS can be used as part of an FDM and safety programme.	X									
(05)		Explain that the FDM program collects data anonymously; however, grave exceedance of parameters may warrant a further investigation of the event by the operator.	X									
(06)		Explain the purpose of FDM as a system for identifying adverse safety trends and tailoring training programmes in order to enhance the overall safety of the operation.	X									
<b>022 15 00 00</b>		<b>DIGITAL CIRCUITS AND COMPUTERS</b>										
<b>022 15 01 00</b>		<b>Digital circuits and computers</b>										

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Syllabus reference	BK	Syllabus details and associated Learning Objectives	Aeroplane		Helicopter			IR	CB-IR(A)	BIR Exam	BIR BK	Remarks
			ATPL	CPL	ATPL /IR	ATPL	CPL					
<b>022 15 01 01</b>		<b>General, definitions and design</b>										
(01)		Define a 'computer' as a machine for manipulating data according to a list of instructions.	X		X	X		X	X		1	
(02)		Explain the term 'bus' being used as a term for a facility (wiring, optical fibre, etc.) transferring data between different parts of a computer, both internally and externally.	X		X	X		X	X		1	
(03)		Define the terms 'hardware' and 'software'.	X		X	X		X	X		1	
(04)	X	With the help of the relevant 022 references, give examples of airborne computers and list the possible peripheral equipment for each system, such as: — ADC with pitot probe(s), static port(s) and indicators; — FMS with GPS, CDU/MCDU and ND; — GPWS with radio altimeter, ADC and ND.	X		X	X		X	X		1	

**SUBJECT 031 – FLIGHT PERFORMANCE AND PLANNING: MASS AND BALANCE –  
AEROPLANES/HELICOPTERS**

Note that the term ‘mass’ is used to describe a quantity of matter, and ‘weight’ when describing the force. However, the term ‘weight’ is normally used in aviation to colloquially describe mass. The professional pilot should always note the units to determine whether the term ‘weight’ is being used to describe a force (e.g. unit newton) or quantity of matter (e.g. unit kilogram).

(1) DEFINITIONS OF MASSES, LOADS AND INDEXES

*Allowed take-off mass*

The mass taking into consideration all possible limitations for take-off including restrictions caused by regulated take-off mass and regulated landing mass.

*Area load or floor load*

The load (or mass) distributed over a defined area. Example units:

- SI: N/m<sup>2</sup>, kg/m<sup>2</sup>;
- Non-SI: psi, lb/ft<sup>2</sup>.

*Basic empty mass (BEM)*

The mass of an aircraft plus standard items such as: unusable fuel; full operating fluids; fire extinguishers; emergency oxygen equipment. (The lowest mass that is used in FCL exams.)

*Dry operating mass (DOM)*

The total mass of an aircraft ready for a specific type of operation excluding all usable fuel and traffic load. This mass includes items such as:

- crew and crew baggage;
- catering and removable passenger service equipment (food, beverages, potable water, lavatory chemicals, etc.);
- special operational equipment (e.g. stretchers, rescue hoist, cargo sling).

*Dry operating index (DOI)*

The aircraft index at dry operating mass.

*Index*

An index is a moment reduced in a numerical value by an index formula.

*In-flight mass/gross mass*

The mass of an aircraft in flight at a specified time.

*Landing mass*

The mass of an aircraft at landing.

*Maximum structural in-flight mass with external loads (applicable to helicopters only)*

The maximum permissible total mass of the helicopter with external loads.



*Maximum structural landing mass*

The maximum permissible total mass of an aircraft at landing under normal circumstances.

*Maximum structural mass*

The maximum permissible total mass of an aircraft at any time. It will be given only if there is no difference between maximum structural taxi mass, maximum structural take-off mass and maximum structural landing mass.

*Maximum structural take-off mass*

The maximum permissible total mass of an aircraft at commencement of take-off.

*Maximum (structural) taxi mass or maximum (structural) ramp mass*

The maximum permissible total mass of an aircraft at commencement of taxiing.

*Maximum zero fuel mass*

The maximum permissible mass of an aircraft with no usable fuel.

*Minimum mass (applicable to helicopters only)*

The minimum permissible total mass for specific helicopter operations.

*Operating mass*

The dry operating mass plus take-off fuel.

*Payload*

The total mass of passengers, baggage and cargo but excluding any non-revenue load.

*Performance-limited landing mass*

The mass subject to the destination airfield limitations.

*Performance-limited take-off mass*

The take-off mass subject to departure airfield limitations.

*Ramp mass*

See 'taxi mass'.

*Regulated landing mass*

The lower of performance-limited landing mass and maximum structural landing mass.

*Regulated take-off mass*

The lower of performance-limited take-off mass and maximum structural take-off mass.

*Running (or linear) load*

The load (or mass) distributed over a defined length of a cargo compartment irrespective of load width. Example units:

- SI: N/m, kg/m;
- Non-SI: lb/in, lb/ft.

*Take-off fuel*

The total amount of usable fuel at take-off.

*Take-off mass*

The mass of an aircraft including everything and everyone carried at the commencement of the take-off for helicopters and take-off run for aeroplanes.

*Taxi mass or ramp mass*

The mass of an aircraft at the commencement of taxiing.

*Traffic load*

The total mass of passengers, baggage and cargo, including any non-revenue load.

*Zero fuel mass*

The dry operating mass plus traffic load.

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			ATPL	CP L	ATPL/IR	ATPL	CPL					
030 00 00 00		<b>FLIGHT PERFORMANCE AND PLANNING</b>										
031 00 00 00		<b>MASS AND BALANCE — AEROPLANES/HELICOPTERS</b>										
031 01 00 00		<b>PURPOSE OF MASS-AND-BALANCE CONSIDERATIONS</b>										
031 01 01 00		<b>Mass limitations</b>										
031 01 01 01		<b>Importance with regard to structural limitations</b>										
(01)	X	Describe the relationship between aircraft mass and structural stress. <i>Remark: See also Subject 021 01 01 00.</i>	X	X	X	X	X					
(02)	X	Describe why mass must be limited to ensure adequate margins of strength.	X	X	X	X	X					
031 01 01 02		<b>Importance with regard to performance</b> <i>Remark: See also Subjects 032/034 and 081/082.</i>										
(01)		Describe the relationship between aircraft mass and aircraft performance.	X	X	X	X	X					
(02)	X	Describe why aircraft mass must be limited to ensure adequate aircraft performance.	X	X	X	X	X					
031 01 02 00		<b>Centre-of-gravity (CG) limitations</b>										

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			ATPL	CPL	ATPL/IR	ATPL	CPL					
<b>031 01 02 01</b>		<b>Importance with regard to stability and controllability</b> <i>Remark: See also Subjects 081/082.</i>										
(01)	X	Describe the relationship between CG position and stability/control-lability of the aircraft.	X	X	X	X	X					
(02)		Describe the consequences if CG is in front of the forward limit.	X	X	X	X	X					
(03)		Describe the consequences if CG is behind the aft limit.	X	X	X	X	X					
<b>031 01 02 02</b>		<b>Importance with regard to performance</b> <i>Remark: See also Subjects 032/034 and 081/082.</i>										
(01)	X	Describe the relationship between CG position and aircraft performance.	X	X	X	X	X					
(02)		Describe the effects of CG position on performance parameters (speeds, altitude, endurance and range).	X	X	X	X	X					
<b>031 02 00 00</b>		<b>LOADING</b>										
<b>031 02 01 00</b>		<b>Terminology</b>										
<b>031 02 01 01</b>		<b>Mass terms</b>										

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Syllabus reference	BK	Syllabus details and associated Learning Objectives	Aeroplane		Helicopter			IR	CB-IR(A)	BIR Exam	BIR BK	Remarks
			ATPL	CPL	ATPL/IR	ATPL	CPL					
(01)	X	Define the following mass terms: — basic empty mass; — dry operating mass; — operating mass; — take-off mass; — landing mass; — ramp/taxi mass; — in-flight mass (gross mass); — zero fuel mass.	X	X	X	X	X					
<b>031 02 01 02</b>		<b>Load terms (including fuel terms)</b> <i>Remark: See also Subject 033.</i>										
(01)	X	Define the following load terms: — payload/traffic load; — block fuel; — taxi fuel; — take-off fuel; — trip fuel; — reserve fuel (contingency, alternate, final reserve and additional fuel); — extra fuel.	X	X	X	X	X					
(02)		Explain the relationship between the various load-and-mass components listed in 031 02 01 01 and 031 02 01 02.	X	X	X	X	X					

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			ATPL	CPL	ATPL/IR	ATPL	CPL					
(03)		Calculate the mass of particular components from other given components.	X	X	X	X	X					
(04)		Convert fuel mass, fuel volume and fuel density given in different units used in aviation.	X	X	X	X	X					
<b>031 02 02 00</b>		<b>Mass limits</b>										
<b>031 02 02 01</b>		<b>Structural limitations</b>										
(01)	X	Define the maximum zero fuel mass.	X	X								
(02)	X	Define the maximum ramp/taxi mass.	X									
(03)	X	Define the maximum take-off mass.	X	X	X	X	X					
(04)	X	Define the maximum in-flight (gross) mass with external load.			X	X	X					
(05)	X	Define the maximum landing mass.	X	X	X	X	X					
<b>031 02 02 02</b>		<b>Performance and regulated limitations</b>										
(01)		Describe the following performance and regulated mass limitations: — performance-limited take-off mass; — performance-limited landing mass; — regulated take-off mass; — regulated landing mass.	X	X	X	X	X					
<b>031 02 02 03</b>		<b>Cargo compartment limitations</b>										

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			ATPL	CP L	ATPL/IR	ATPL	CPL					
(01)	X	Describe the maximum floor load (maximum load per unit of area).	X	X	X	X	X					
(02)	X	Describe the maximum running load (maximum load per unit of fuselage length).	X	X	X	X	X					
<b>031 02 03 00</b>		<b>Mass calculations</b>										
<b>031 02 03 01</b>		<b>Maximum masses for take-off and landing</b>										
(01)		Calculate the maximum mass for take-off (regulated take-off mass) given mass-and-load components and structural/ performance limits.	X	X	X	X	X					
(02)		Calculate the maximum mass for landing (regulated landing mass) given mass-and-load components and structural/ performance limits.	X	X	X	X	X					
(03)		Calculate the allowed mass for take-off.	X	X	X	X	X					
<b>031 02 03 02</b>		<b>Allowed traffic load and fuel load</b>										
(01)		Calculate the maximum allowed traffic load and fuel load in order not to exceed the given allowed take-off mass.	X	X	X	X	X					
(02)		Calculate 'under load'/'over load' given the allowed mass for take-off, operating mass and actual traffic load.	X	X	X	X	X					
<b>031 02 03 03</b>		<b>Use of standard masses for passengers, baggage and crew</b>										



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			ATPL	CPL	ATPL/IR	ATPL	CPL					
(01)	X	Extract the appropriate standard masses for passengers, baggage and crew from relevant documents or operator requirements.	X	X	X	X	X					
(02)		Calculate the traffic load by using standard masses.	X	X	X	X	X					
<b>031 03 00 00</b>		<b>INTENTIONALLY LEFT BLANK</b>										
<b>031 04 00 00</b>		<b>MASS-AND-BALANCE DETAILS OF AIRCRAFT</b>										
<b>031 04 01 00</b>		<b>Contents of mass-and-balance documentation</b>										
<b>031 04 01 01</b>		<b><i>Datum, moment arm</i></b>										
(01)	X	State where the datum and moment arms for aircraft can be found.	X	X	X	X	X					
(02)	X	Extract the appropriate data from given documents.	X	X	X	X	X					
(03)	X	Define 'datum' (reference point), 'moment arm' and 'moment'.	X	X	X	X	X					
<b>031 04 01 02</b>		<b><i>CG position as distance from datum</i></b>										
(01)	X	State where the CG position for an aircraft at basic empty mass can be found.	X	X	X	X	X					
(02)	X	State where the CG limits for an aircraft can be found.	X	X	X	X	X					
(03)		Describe the different forms in presenting CG position as distance from datum or other references.	X	X	X	X	X					

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			ATPL	CP L	ATPL/IR	ATPL	CPL					
(04)		Explain the meaning of centre of gravity (CG).	X	X	X	X	X					
<b>031 04 01 03</b>		<b>CG position as percentage of mean aerodynamic chord (% MAC)</b> <i>Remark: Knowledge of the definition of MAC is covered under Subject 081 01 01 05.</i>										
(01)		Extract MAC information from aircraft documents.	X	X								
(02)		Explain the principle of using % MAC for the description of the CG position.	X	X								
(03)		Calculate the CG position as % MAC.	X	X								
<b>031 04 01 04</b>		<b>Longitudinal CG limits</b>										
(01)		Extract the appropriate data from given sample documents.	X	X	X	X	X					
<b>031 04 01 05</b>		<b>Lateral CG limits</b>										
(01)		Extract the appropriate data from given sample documents.			X	X	X					
<b>031 04 01 06</b>		<b>Details of passenger and cargo compartments</b>										
(01)		Extract the appropriate data (e.g. seating schemes, compartment dimensions and limitations) from given sample documents.	X	X	X	X	X					
<b>031 04 01 07</b>		<b>Details of fuel system relevant to</b>										

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			ATPL	CPL	ATPL/IR	ATPL	CPL					
		<b><i>mass-and-balance considerations</i></b>										
(01)	X	Extract the appropriate data (e.g. fuel-tank capacities and fuel-tank positions) from given sample documents.	X	X	X	X	X					
(02)		Explain aircraft CG movement as flight progresses given location of fuel tank (inner wing, outer wing, central, additional aft central, horizontal stabiliser) and mass of fuel consumed from that tank and aeroplane's previous CG.	X									
(03)		Explain advantages and risks associated with fuel tanks in the aeroplane's fin or horizontal stabiliser.	X									
<b>031 04 02 00</b>		<b>Determination of aircraft empty mass and CG position by weighing</b>										
<b>031 04 02 01</b>		<b><i>Weighing of aircraft (general aspects)</i></b>										
(01)		Describe the general procedure and regulations relating to when an aircraft should be weighed, re-weighed or data recalculated. <i>Remark: See the applicable operational requirements.</i>	X	X	X	X	X					
(02)	X	Extract and interpret entries from/in 'mass (weight) report' of an aircraft.	X	X	X	X	X					

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			ATPL	CP L	ATPL/IR	ATPL	CPL					
<b>031 04 02 02</b>		<b>Calculation of mass and CG position of an aircraft using weighing data</b>										
(01)		Calculate the mass and CG position of an aircraft from given reaction forces on jacking points.	X	X	X	X	X					
<b>031 04 03 00</b>		<b>Extraction of basic empty mass (BEM) and CG data from aircraft documentation</b>										
<b>031 04 03 01</b>		<b>BEM or dry operating mass (DOM)</b>										
(01)	X	Extract values for BEM or DOM from given documents.	X	X	X	X	X					
<b>031 04 03 02</b>		<b>CG position or moment at BEM/DOM</b>										
(01)		Extract values for CG position and moment at BEM or DOM from given documents.	X	X	X	X	X					
<b>031 04 03 03</b>		<b>Deviations from standard configuration</b>										
(01)		Extract values from given documents for deviation from standard configuration as a result of varying crew, optional equipment, optional fuel tanks, etc.	X	X	X	X	X					
<b>031 05 00 00</b>		<b>DETERMINATION OF CG POSITION</b>										
<b>031 05 01 00</b>		<b>Methods</b>										
<b>031 05 01 01</b>		<b>Arithmetic method</b>										

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			ATPL	CPL	ATPL/IR	ATPL	CPL					
(01)		Calculate the CG position of an aircraft by using the formula: — CG position = sum of moments / total mass.	X	X	X	X	X					
<b>031 05 01 02</b>		<b>Graphic method</b>										
(01)		Determine the CG position of an aircraft by using the loading graphs given in sample documents.	X	X	X	X	X					
<b>031 05 01 03</b>		<b>Index method</b>										
(01)	X	Explain the principle of the index method.	X	X	X	X	X					
(02)		Define the terms 'index' and 'dry operating index' (DOI), and calculate the DOI given the relevant formula and data.	X	X	X	X	X					
(03)		Explain the advantage(s) of the index method.	X	X	X	X	X					
<b>031 05 02 00</b>		<b>Load and trim sheet</b>										
<b>031 05 02 01</b>		<b>General considerations</b>										
(01)	X	Explain the principle and the purpose of load sheets.	X	X								
(02)	X	Explain the principle and the purpose of trim sheets.	X									
<b>031 05 02 02</b>		<b>Load sheet/balance schedule and CG envelope for light aeroplanes and for helicopters</b>										
(01)		Add loading data and calculate masses in a sample load sheet/balance schedule.	X	X	X	X	X					

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			ATPL	CP L	ATPL/IR	ATPL	CPL					
(02)		Calculate moments and CG positions.	X	X	X	X	X					
(03)		Check CG position at zero fuel mass and take-off mass to be within the CG envelope including last-minute changes, if applicable.	X	X	X	X	X					
<b>031 05 02 03</b>		<b>Load sheet for large aeroplanes</b>										
(01)		Complete a sample load sheet to determine the 'allowed mass for take-off', 'allowed traffic load' and 'under load'.	X									
(02)		Explain the purpose of each load sheet section.	X									
(03)		Explain that the purpose of boxed maximum figures in load sheet sections is to cross-check the actual and limiting mass values.	X									
(04)		Complete and cross-check a sample load sheet.	X									
<b>031 05 02 04</b>		<b>Trim sheet for large aeroplanes</b>										
(01)		Explain the purpose of the trim sheet and the methods to determine the CG position.	X									
(02)		Check if the zero fuel mass CG or index is within the limits.	X									
(03)		Determine the fuel index by using the 'fuel index correction table' and determine the CG position as % MAC.	X									

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			ATPL	CPL	ATPL/IR	ATPL	CPL					
(04)		Check that the take-off mass CG or index are within the limits.	X									
(05)		Determine 'stabiliser trim units' for take-off.	X									
(06)		Explain the difference between certified and operational CG limits.	X									
(07)		Determine the zero fuel mass CG or index.	X									
(08)		Explain the relationship between pitch control and CG position and the operational significance.	X									
<b>031 05 02 05</b>		<b><i>Intentionally left blank</i></b>										
<b>031 05 02 06</b>		<b><i>Other methods to present load and trim information</i></b>										
(01)	X	Describe information from other methods of presenting load and balance information, e.g. aircraft communications addressing and reporting system (ACARS), electronic flight bags (EFBs), and the 'less paper in the cockpit' (LPC) software.	X									
<b>031 05 03 00</b>		<b>Repositioning of CG</b>										
<b>031 05 03 01</b>		<b><i>Repositioning of CG by shifting the load</i></b>										
(01)		Calculate the mass to be moved over a given distance, or to/from given compartments, to establish a defined CG position.	X	X	X	X	X					

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Syllabus reference	BK	Syllabus details and associated Learning Objectives	Aeroplane		Helicopter			IR	CB-IR(A)	BIR Exam	BIR BK	Remarks
			ATPL	CP L	ATPL/IR	ATPL	CPL					
(02)		Calculate the distance to move a given mass to establish a defined CG position.	X	X	X	X	X					
(03)	X	Describe the methods to check that cargo has been loaded in correct position in relation to the loading manifest, including identifying hazard of cargo loaded in reverse order (visual inspection of one or more unit load devices (ULDs).	X	X								
(04)		Determine whether CG remains within limits if cargo has been loaded in incorrect order or at incorrect location.	X	X								
<b>031 05 03 02</b>		<b><i>Repositioning of CG by additional load or ballast or by load or ballast removal</i></b>										
(01)		Calculate the amount of additional load or ballast to be loaded at or removed from a given position or compartment to establish a defined CG position.	X	X	X	X	X					
(02)		Calculate the loading position or compartment for a given amount of additional load or ballast to establish a defined CG position.	X	X	X	X	X					
<b>031 06 00 00</b>		<b>CARGO HANDLING</b>										
<b>031 06 01 00</b>		<b>Types of cargo</b>										
<b>031 06 01 01</b>		<b><i>Types of cargo (general aspects)</i></b>										



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Syllabus reference	BK	Syllabus details and associated Learning Objectives	Aeroplane		Helicopter			IR	CB-IR(A)	BIR Exam	BIR BK	Remarks
			ATPL	CP L	ATPL/IR	ATPL	CPL					
(01)		Describe the typical types of cargo, e.g. containerised cargo, palletised cargo, bulk cargo, and the advantages of containerised and palletised cargo.	X	X	X	X	X					
<b>031 06 02 00</b>		<b>Floor-area load and running-load limitations</b>										
<b>031 06 02 01</b>		<b><i>Floor-area load and running-load limitations in cargo compartments</i></b>										
(01)		Calculate the required floor-contact area for a given load to avoid exceeding the maximum permissible floor load of a cargo compartment.	X	X	X	X	X					
(02)		Calculate the maximum mass of a container with given floor-contact area to avoid exceeding the maximum permissible floor load of a cargo compartment.	X	X	X	X	X					
(03)		Calculate the linear load distribution of a container to avoid exceeding the maximum permissible running load.	X	X	X	X	X					
<b>031 06 03 00</b>		<b>Securement of load</b>										
<b>031 06 03 01</b>		<b><i>Securement of load (reasons and methods)</i></b>										
(01)		Explain the reasons to restrain or secure cargo and baggage.	X	X	X	X	X					
(02)		Describe the basic methods to restrain or secure loads (unit load	X	X	X	X	X					

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Syllabus reference	BK	Syllabus details and associated Learning Objectives	Aeroplane		Helicopter			IR	CB-IR(A)	BIR Exam	BIR BK	Remarks
			ATPL	CP L	ATPL/IR	ATPL	CPL					
		devices secured by latches on roller tracks or to tie down points by straps; bulk cargo restrained by restraining nets attached to attachment points and tie-down points).										

**SUBJECT 032 – FLIGHT PERFORMANCE AND PLANNING – PERFORMANCE – AEROPLANES**

Note that the term ‘mass’ is used to describe a quantity of matter, and ‘weight’ when describing the force. However, the term ‘weight’ is normally used in aviation to colloquially describe mass. The professional pilot should always note the units to determine whether the term ‘weight’ is being used to describe a force (e.g. unit newton) or quantity of matter (e.g. unit kilogram).

For theoretical knowledge examination purposes:

‘climb angle’ is assumed to be air-mass-related;

‘flight-path angle’ is assumed to be ground-related;

‘screen height for take-off’ is the vertical distance between the take-off surface and the take-off flight path at the end of the take-off distance;

‘screen height for landing’ is the vertical distance between the landing surface and the landing flight path from which the landing distance begins.

Syllabus	BK	Syllabus details and associated Learning Objectives	Aeroplane		Helicopter			IR	CB-IR(A)	BIR Exam	BIR BK	Remarks
			ATPL	CPL	ATPL/IR	ATPL	CPL					
030 00 00 00		<b>FLIGHT PERFORMANCE AND PLANNING</b>										
032 00 00 00		<b>PERFORMANCE — AEROPLANES</b>										
032 01 00 00		<b>GENERAL</b>										
032 01 01 00		Performance legislation										
032 01 01 01		<i>Applicability of airworthiness requirements of CS-23 and CS-25</i>										

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Syllabus	BK	Syllabus details and associated Learning Objectives	Aeroplane		Helicopter			IR	CB-IR(A)	BIR Exam	BIR BK	Remarks
			ATPL	CPL	ATPL/IR	ATPL	CPL					
(01)	X	Describe the application of certification specification (CSs) with regard to the different kinds of aeroplanes.	X	X								
(02)	X	Describe the general differences between aeroplanes certified according to CS-23 and CS-25.	X									
<b>032 01 01 02</b>		<b>Operational regulations and safety</b>										
(01)	X	Describe the basic concept that the applicable operational requirements differ depending on aeroplane performance.	X	X								
(02)		Describe the performance classes for commercial air transport according to the applicable operational requirements.	X	X								
<b>032 01 01 03</b>		<b>Performance and safety</b>										
(01)	X	State that aeroplane performance required for commercial air transport may limit the weight of a dispatched aeroplane in order to achieve a sufficient level of safety.	X	X								
(02)	X	Describe that the minimum level of safety required for commercial air transport is ensured through the combination of airworthiness requirements and operational limitations, i.e. the more stringent airworthiness requirements of CS-25 enable a wider range of operating conditions for these aeroplanes.	X	X								
<b>032 01 01 04</b>		<b>Performance definitions and safety factors</b>										
(01)	X	Describe measured performance and explain how it is determined.	X	X								

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Syllabus	BK	Syllabus details and associated Learning Objectives	Aeroplane		Helicopter			IR	CB-IR(A)	BIR Exam	BIR BK	Remarks
			ATPL	CPL	ATPL/IR	ATPL	CPL					
(02)		Describe gross performance.	X	X								
(03)		Describe net performance and safety factors.	X	X								
(04)	X	Describe that the size of a safety factor depends on the likelihood of the event and the range of the measured performance data.	X	X								
(05)		Describe the relationship between net and gross take-off and landing distances, and net and gross climb and descent gradients.	X	X								
<b>032 01 02 00</b>		<b>General performance theory</b>										
<b>032 01 02 01</b>		<b><i>Intentionally left blank</i></b>										
<b>032 01 02 02</b>		<b><i>Definitions and terms</i></b>										
(01)	X	Define the terms 'climb angle' and 'climb gradient'.	X	X								
(02)	X	Define the terms 'flight-path angle' and 'flight-path gradient'.	X	X								
(03)	X	Define the terms 'descent angle' and 'descent gradient'.	X	X								
(04)	X	Explain the difference between climb/descent angle and flight-path angle.	X	X								
(05)	X	Define 'absolute ceiling'.	X	X								
(06)		Describe 'clearway' and 'stopway' according to CS-Definitions.	X	X								
(07)		Describe: — take-off run available (TORA); — take-off distance available (TODA);	X	X								

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Syllabus	BK	Syllabus details and associated Learning Objectives	Aeroplane		Helicopter			IR	CB-IR(A)	BIR Exam	BIR BK	Remarks
			ATPL	CPL	ATPL/IR	ATPL	CPL					
		— accelerate-stop distance available (ASDA); and determine each from given data or appropriate aerodrome charts.										
(08)		Describe 'screen height' including its various values.	X	X								
(09)	X	Define the terms 'range' and 'endurance'.	X	X								
(10)		Define an aeroplane's 'specific range' (SR) in terms of nautical air miles (NAM) per unit of fuel, and 'specific range over the ground' (SRG) in terms of nautical ground miles (NGM) per unit of fuel.	X	X								
(11)		Define the power available and power required.	X	X								
<b>032 01 02 03</b>		<b>Variables influencing performance</b>										
(01)	X	Name the following factors that affect aeroplane performance: pressure altitude and temperature, wind, aeroplane weight, aeroplane configuration, aeroplane anti-skid status, aeroplane centre of gravity (CG), aerodrome runway surface, and aerodrome runway slope.	X	X								
(02)	X	Describe how, for different density altitudes, the thrust and power available vary with speed for a propeller-driven aeroplane.	X	X								

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Syllabus	BK	Syllabus details and associated Learning Objectives	Aeroplane		Helicopter			IR	CB-IR(A)	BIR Exam	BIR BK	Remarks
			ATPL	CPL	ATPL/IR	ATPL	CPL					
(03)	X	Describe how, for different density altitudes, the thrust and power available vary with speed for a turbojet aeroplane.	X									
(04)		Describe how, for different density altitudes, the drag and power required vary with indicated airspeeds (IAS) and true airspeeds (TAS).	X	X								
(05)		Describe how, for different aeroplane weights and configurations, the drag and power required vary with IAS and TAS.	X	X								
<b>032 01 03 00</b>		<b>Level flight, range and endurance</b>										
<b>032 01 03 01</b>		<b>Steady level flight</b>										
(01)	X	Explain how drag (thrust) and power required vary with speed in straight and level flight.	X	X								
(02)	X	Explain the effect of excess thrust and power on speed in level flight.	X	X								
(03)		Interpret the 'thrust/power required' and 'thrust/power available' curves in straight and level flight.	X	X								
(04)		Describe how the maximum achievable straight and level flight IAS and TAS vary with altitude.	X	X								
(05)		Describe situations in which a pilot may elect to fly for 'maximum endurance' or 'maximum range'.	X	X								
<b>032 01 03 02</b>		<b>Range</b>										
(01)		Define a turbojet aeroplane's specific fuel consumption (SFC) and describe	X									

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Syllabus	BK	Syllabus details and associated Learning Objectives	Aeroplane		Helicopter			IR	CB-IR(A)	BIR Exam	BIR BK	Remarks
			ATPL	CPL	ATPL/IR	ATPL	CPL					
		how it affects fuel flow and specific range.										
(02)		Define a propeller-driven aeroplane's SFC and describe how it affects fuel flow and specific range.	X	X								
(03)		Explain the optimum speed for maximum SR for a turbojet aeroplane in relation to the drag curve.	X									
(04)		Explain the optimum speed to achieve maximum SR for a propeller-driven aeroplane in relation to the power required and drag graphs.	X	X								
(05)		Explain the effect of aeroplane weight and CG position on fuel consumption, range and the optimum speed for maximum SR.	X	X								
(06)		State how a turbojet engine's SFC varies with temperature and thrust setting.	X									
(07)		Explain how SR for a turbojet aeroplane varies with altitude and under different meteorological conditions.	X									
(08)		Explain how SRG for a propeller-driven aeroplane varies with altitude and under different meteorological conditions.	X	X								
(09)		Explain the effect of weight on the optimum altitude for maximum range.	X	X								
(10)		Describe the effect of wind on SRG and the optimum speed for SRG, when compared to SR, and the optimum speed for SR.	X	X								
<b>032 01 03 03</b>		<b>Maximum endurance</b>										



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Syllabus	BK	Syllabus details and associated Learning Objectives	Aeroplane		Helicopter			IR	CB-IR(A)	BIR Exam	BIR BK	Remarks
			ATPL	CPL	ATPL/IR	ATPL	CPL					
(01)		Explain fuel flow in relation to TAS and thrust for a turbojet aeroplane.	X									
(02)		State the speed for maximum endurance for a turbojet aeroplane.	X									
(03)		Explain fuel flow in relation to TAS and thrust for a propeller-driven aeroplane.	X	X								
(04)		State the speed for maximum endurance for a propeller-driven aeroplane and the disadvantages of holding at this speed (e.g. high angle of attack (AoA) and lack of speed stability).	X	X								
(05)		Explain the effect of wind and altitude on endurance, and the maximum endurance speed for a turbojet aeroplane.	X									
(06)		Explain the effect of wind and altitude on endurance, and the maximum endurance speed for a propeller-driven aeroplane.	X	X								
(07)		Describe the benefits of managing your en-route airspeed to reduce or avoid holding time, and the operational situations when it could be used (commanded by the pilot or air traffic control (ATC), when delays at arrival airport occur).	X	X								
<b>032 01 04 00</b>		<b>Climbing</b>										
<b>032 01 04 01</b>		<b><i>Climbing (climb performance)</i></b>										
(01)		Resolve the forces during a steady climb.	X	X								
(02)		Define and explain the following terms:	X	X								

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Syllabus	BK	Syllabus details and associated Learning Objectives	Aeroplane		Helicopter			IR	CB-IR(A)	BIR Exam	BIR BK	Remarks
			ATPL	CPL	ATPL/IR	ATPL	CPL					
		<ul style="list-style-type: none"> <li>critical engine;</li> <li>speed for best angle of climb (<math>V_x</math>);</li> <li>speed for best rate of climb (<math>V_Y</math>).</li> </ul>										
(03)		Explain climb performance in relation to the thrust available and thrust required (angle of climb), and power available and power required (rate of climb).	X	X								
(04)		Explain the meaning and effect of 'excess thrust' and 'excess power' in a steady climb.	X	X								
(05)		Interpret the 'thrust/power required' and 'thrust/power available' curves in a steady climb.	X	X								
(06)		State the difference between climb angle and gradient.	X	X								
(07)		Explain the effect of weight on the climb angle and rate of climb, and the speed for best angle and best rate of climb.	X	X								
(08)		Explain the effects of pressure altitude and temperature, including an inversion on climb performance (angle and rate of climb).	X	X								
(09)		Explain the effect of configuration on climb performance (angle and rate of climb, and $V_x$ and $V_Y$ ).	X	X								
(10)		Describe the effect of engine failure on climb performance (angle and rate of climb, and $V_x$ and $V_Y$ ).	X	X								

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Syllabus	BK	Syllabus details and associated Learning Objectives	Aeroplane		Helicopter			IR	CB-IR(A)	BIR Exam	BIR BK	Remarks
			ATPL	CPL	ATPL/IR	ATPL	CPL					
(11)		Calculate the all-engine and one-engine-out climb gradient from given values of engine thrust and aeroplane drag and weight.	X	X								
<b>032 01 05 00</b>		<b>Descending</b>										
<b>032 01 05 01</b>		<b>Descending (descent performance)</b>										
(01)		Resolve the forces during steady descent and in the glide.	X	X								
(02)		Explain descent performance in relation to thrust available and thrust required (drag), and power available and power required.	X	X								
(03)		Explain the meaning of 'excess thrust required' (excess drag) and 'excess power required' in a steady descent.	X	X								
(04)		Interpret the 'thrust/power required' and 'thrust/power available' curves in a steady descent.	X	X								
(05)		Explain the effect of mass, altitude, wind, speed and configuration on the glide descent.	X	X								
(06)		Explain the effect of mass, altitude, wind, speed and configuration on the powered descent.	X	X								
<b>032 02 00 00</b>		<b>CS-23/APPLICABLE OPERATIONAL REQUIREMENTS PERFORMANCE CLASS B — THEORY</b>										
<b>032 02 01 00</b>		<b>Airworthiness requirements</b>										
<b>032 02 01 01</b>		<b>Airworthiness requirements and definitions</b>										

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Syllabus	BK	Syllabus details and associated Learning Objectives	Aeroplane		Helicopter			IR	CB-IR(A)	BIR Exam	BIR BK	Remarks
			ATPL	CPL	ATPL/IR	ATPL	CPL					
(01)	X	Define the following speeds: — stall speeds $V_S$ , $V_{S0}$ and $V_{S1}$ ; — rotation speed $V_R$ ; — speed at 50 ft above the take-off surface level; — reference landing speed $V_{REF}$ .	X	X								
(02)		Describe the limitations on $V_R$ , on the speed at 50 ft above the take-off surface and on $V_{REF}$ , and given the appropriate stall speed, estimate the values based on these limitations for a single-engine, class B aeroplane.	X	X								
(03)		Describe the limitations on $V_R$ , on the speed at 50 ft above the take-off surface and on $V_{REF}$ , and given the appropriate stall speed, estimate the values based on these limitations for a multi-engine, class B aeroplane.	X	X								
(04)	X	Describe the European Union airworthiness requirements according to CS-23 relating to aeroplane performance (stall, take-off, climb, landing).	X	X								
(05)		Define and identify the critical engine of a multi-engine propeller aeroplane.	X	X								
(06)		Explain the effect of an engine failure on the power required, the total drag (thrust required) and climb performance of a multi-engine aeroplane.	X	X								
(07)		Explain the effect of engine failure on the minimum control speed of a multi-	X	X								

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Syllabus	BK	Syllabus details and associated Learning Objectives	Aeroplane		Helicopter			IR	CB-IR(A)	BIR Exam	BIR BK	Remarks
			ATPL	CPL	ATPL/IR	ATPL	CPL					
		engine aeroplane under given conditions (temperature and pressure altitude).										
<b>032 02 02 00</b>		<b>Intentionally left blank</b>										
<b>032 02 03 00</b>		<b>Take-off and landing</b>										
<b>032 02 03 01</b>		<b>Take-off and landing (definitions and effects)</b>										
(01)	X	Define the following distances and masses: — take-off distance; — landing distance; — ground-roll distance; — maximum allowed take-off mass; — maximum allowed landing mass.	X	X								
(02)		Explain the effect of flap-setting on the take-off, landing and ground-roll distances.	X	X								
(03)		Explain the effects of the following runway (RWY) variables on take-off distances: — RWY slope; — RWY surface conditions: dry, wet and contaminated; — RWY elevation.	X	X								
(04)		For both fixed-pitch and constant-speed propeller aeroplanes, explain the effect of airspeed on thrust during the take-off run.	X	X								

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Syllabus	BK	Syllabus details and associated Learning Objectives	Aeroplane		Helicopter			IR	CB-IR(A)	BIR Exam	BIR BK	Remarks
			ATPL	CPL	ATPL/IR	ATPL	CPL					
(05)		Describe the effects of brake release before take-off power is set on the TOD and ASD.	X	X								
(06)		Explain the effect of wind on take-off and landing distances, and determine the actual headwind/tailwind component given the runway direction, wind speed and direction, by use of wind component graphs, mathematical calculations, and rule of thumb.	X	X								
(07)		Explain why an aeroplane has maximum crosswind limit(s) and determine the crosswind component given the runway direction, wind speed and direction, by use of wind component graphs, mathematical calculations, and rule of thumb.	X	X								
(08)		Explain the percentage of accountability for headwind and tailwind components during take-off and landing calculations.	X	X								
(09)		Explain the effect of runway conditions on the landing distance.	X	X								
(10)		Explain the effects of pressure altitude and temperature on the take-off distance, take-off climb, landing distance and approach climb.	X	X								
(11)		Describe the landing airborne distance and ground-roll distance and estimate the effect on the landing distance when the aeroplane is too fast or too high at the screen.	X	X								

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Syllabus	BK	Syllabus details and associated Learning Objectives	Aeroplane		Helicopter			IR	CB-IR(A)	BIR Exam	BIR BK	Remarks
			ATPL	CPL	ATPL/IR	ATPL	CPL					
(12)		Describe the take-off flight path for a multi-engine, class B aeroplane.	X	X								
(13)		Describe the dimensions of the take off flight path accountability area (domain).	X	X								
<b>032 02 04 00</b>		<b>Climb, cruise and descent</b>										
<b>032 02 04 01</b>		<b><i>Climb, cruise and descent (requirements and calculations)</i></b>										
(01)		Describe the climb and en-route requirements according to the applicable operational requirements.	X	X								
(02)		For a single-engine aeroplane, calculate the expected obstacle clearance (in visual meteorological conditions (VMC)) given gross climb performance, obstacle height and distance from reference zero.	X	X								
(03)		For a single-engine aeroplane, calculate the net glide gradient and net glide distance, given aeroplane altitude, terrain elevation, gross gradient or lift/drag ratio (L/D ratio), and headwind or tailwind component.	X	X								
<b>032 03 00 00</b>		<b>CS-23/APPLICABLE OPERATIONAL REQUIREMENTS PERFORMANCE CLASS B — USE OF AEROPLANE PERFORMANCE DATA FOR SINGLE- AND MULTI-ENGINE AEROPLANES</b>										
<b>032 03 01 00</b>		<b>Intentionally left blank</b>										
<b>032 03 02 00</b>		<b>Intentionally left blank</b>										
<b>032 03 03 00</b>		<b>Use of aeroplane performance data</b>										

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Syllabus	BK	Syllabus details and associated Learning Objectives	Aeroplane		Helicopter			IR	CB-IR(A)	BIR Exam	BIR BK	Remarks
			ATPL	CPL	ATPL/IR	ATPL	CPL					
<b>032 03 03 01</b>		<b>Take-off</b>										
(01)		Determine the field-length-limited take-off mass and take-off speeds given defactored distance, configuration, pressure altitude, temperature and headwind/tailwind component.	X	X								
(02)		Determine the accelerate-go distance and accelerate-stop distance data.	X	X								
(03)		Determine the ground-roll distance and take-off distance from graphs.	X	X								
(04)		Determine the all-engine-out and critical-engine-out take-off climb data.	X	X								
(05)		Determine take off flight path for a MEP aeroplane of given mass and given airfield conditions, and calculate the obstacle clearance based on the take off flight path.	X	X								
(06)		Determine the minimum headwind or maximum tailwind component required for take-off for a given mass and given airfield conditions.	X	X								
(07)		Given take-off run available (TORA), TODA and ASDA, slope and surface conditions, calculate the defactored distance to be used for commercial air transport using the appropriate take-off graphs.	X	X								
(08)		Calculate the minimum TORA or TODA for commercial air transport given the defactored take-off distance or run, runway surface and slope.	X	X								



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Syllabus	BK	Syllabus details and associated Learning Objectives	Aeroplane		Helicopter			IR	CB-IR(A)	BIR Exam	BIR BK	Remarks
			ATPL	CPL	ATPL/IR	ATPL	CPL					
<b>032 03 03 02</b>		<b>Climb</b>										
(01)		Determine rate of climb.	X	X								
(02)		Calculate obstacle clearance climb data.	X	X								
(03)		Determine the still-air and flight-path gradients for given IAS, altitude, temperature, aeroplane weight and, if relevant, wind component.	X	X								
<b>032 03 03 03</b>		<b>Intentionally left blank</b>										
<b>032 03 03 04</b>		<b>Landing</b>										
(01)		Determine the field-length-limited landing mass and landing speeds given defactored distance, configuration, pressure altitude, temperature and headwind or tailwind component.	X	X								
(02)		Determine landing climb data in the event of balked landing.	X	X								
(03)		Determine landing distance and ground-roll distance for given flap position, aeroplane weight and airfield data.	X	X								
(04)		Calculate, given the landing distance available (LDA), slope and surface type and condition, the defactored distance to be used for commercial air transport using the appropriate landing graphs.	X	X								
(05)		Calculate the minimum landing distance (LD) that must be available for commercial air transport given the defactored landing distance, runway surface and slope.	X	X								

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Syllabus	BK	Syllabus details and associated Learning Objectives	Aeroplane		Helicopter			IR	CB-IR(A)	BIR Exam	BIR BK	Remarks
			ATPL	CPL	ATPL/IR	ATPL	CPL					
<b>032 04 00 00</b>		<b>CS-25/APPLICABLE OPERATIONAL REQUIREMENTS PERFORMANCE CLASS A — THEORY</b>										
<b>032 04 01 00</b>		<b>Take-off</b>										
<b>032 04 01 01</b>		<b><i>Take-off performance, definitions of and relationships between terms</i></b>										
(01)	X	Explain the forces affecting the aeroplane during the take-off run.	X									
(02)	X	State the effects of thrust-to-weight ratio and flap-setting on ground roll.	X									
(03)		Describe the European Union airworthiness requirements according to CS-25 relating to large aeroplane performance (General and Take-off).	X									
(04)		Describe the terms 'aircraft classification number' (ACN) and 'pavement classification number' (PCN), and the requirements and hazards of operating on aerodrome surfaces with PCNs smaller than the ACNs.	X									
(05)		Define and explain the following speeds in accordance with CS-25 or CS-Definitions: — reference stall speed ( $V_{SR}$ ); — reference stall speed in a specific configuration ( $V_{SR1}$ ); — 1-g stall speed at which the aeroplane can develop a lift force (normal to the flight path) equal to its weight ( $V_{S1g}$ );	X									

**DEPARTMENT OF CIVIL AVIATION**  
**MCAR-PART-FCL**

Syllabus	BK	Syllabus details and associated Learning Objectives	Aeroplane		Helicopter			IR	CB-IR(A)	BIR Exam	BIR BK	Remarks
			ATPL	CPL	ATPL/IR	ATPL	CPL					
		<ul style="list-style-type: none"> <li>— minimum control speed with critical engine inoperative (<math>V_{MC}</math>);</li> <li>— minimum control speed on or near the ground (<math>V_{MCG}</math>);</li> <li>— minimum control speed at take-off climb (<math>V_{MCA}</math>);</li> <li>— engine failure speed (<math>V_{EF}</math>);</li> <li>— take-off decision speed (<math>V_1</math>);</li> <li>— rotation speed (<math>V_R</math>);</li> <li>— take-off safety speed (<math>V_2</math>);</li> <li>— minimum take-off safety speed (<math>V_{2MIN}</math>);</li> <li>— minimum unstick speed (<math>V_{MU}</math>);</li> <li>— lift-off speed (<math>V_{LOF}</math>);</li> <li>— maximum brake energy speed (<math>V_{MBE}</math>);</li> <li>— maximum tyre speed (<math>V_{Max Tyre}</math>).</li> </ul>										
(06)		Explain the interdependence between the above-mentioned speeds where relevant.	X									
(07)		Define the following distances in accordance with CS-25: <ul style="list-style-type: none"> <li>— take-off run with all engines operating and one-engine-inoperative;</li> <li>— take-off distance with all engines operating and one-engine-inoperative;</li> <li>— accelerate-stop distance with all engines operating and one-engine-inoperative.</li> </ul>	X									

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Syllabus	BK	Syllabus details and associated Learning Objectives	Aeroplane		Helicopter			IR	CB-IR(A)	BIR Exam	BIR BK	Remarks
			ATPL	CPL	ATPL/IR	ATPL	CPL					
(08)		Explain how loss of TORA due to alignment is accounted for.	X									
(09)		Explain the effect of the interdependency of relevant speeds in 032 04 01 01 (05) and the situations in which these interdependencies can cause speed and performance restrictions.	X									
<b>032 04 01 02</b>		<b>Take-off distances</b>										
(01)		Explain the effects of the following runway (RWY) variables on take-off distances: — RWY slope; — RWY surface conditions: dry, wet and contaminated; — RWY elevation.	X									
(02)		Explain the effects of the following aeroplane variables on take-off distance: — aeroplane mass; — take-off configuration; — bleed-air configurations.	X									
(03)		Explain the effects of the following meteorological variables on take-off distances: — wind; — temperature; — pressure altitude.	X									
(04)		Explain the consequence of errors in rotation technique on take-off distance: — early and late rotation;	X									

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Syllabus	BK	Syllabus details and associated Learning Objectives	Aeroplane		Helicopter			IR	CB-IR(A)	BIR Exam	BIR BK	Remarks
			ATPL	CPL	ATPL/IR	ATPL	CPL					
		<ul style="list-style-type: none"> <li>— too high and too low rotation angle;</li> <li>— too high and too low rotation rate.</li> </ul>										
(05)		Compare the take-off distance for specified conditions and configuration for all engines operating and one-engine-inoperative.	X									
(06)		Explain the effect of using clearway on the field-length-limited take-off mass.	X									
(07)		Explain the influence of aeroplane mass, air density and flap settings on $V_1$ , $V_2$ and $V_{2MIN}$ and thereby on take-off distance.	X									
(08)		Explain the effect of an error in $V_1$ on the resulting one-engine-out take-off distance.	X									
<b>032 04 01 03</b>		<b>Accelerate-stop distance</b>										
(01)		Explain how the accelerate-stop distance is affected by given conditions and configuration for all engines operating and one-engine-inoperative.	X									
(02)		Explain the effect of using a stopway on the field-length-limited take-off mass.	X									
(03)		Explain the effect of an error in $V_1$ on the resulting accelerate-stop distance.	X									

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Syllabus	BK	Syllabus details and associated Learning Objectives	Aeroplane		Helicopter			IR	CB-IR(A)	BIR Exam	BIR BK	Remarks
			ATPL	CPL	ATPL/IR	ATPL	CPL					
(04)		Explain the effect of runway slope or wind component on the accelerate-stop distance.	X									
(05)		Explain how the accelerate-stop distance is determined and discuss the deceleration procedure.	X									
(06)		Explain how the accelerate-stop distance is affected by the use of brakes, anti-skid, reverse thrust, ground spoilers (lift dumpers) and by brake energy absorption limits, delayed temperature rise and brake temperature indication.	X									
(07)	X	Explain the hazards of rejecting a take-off from high ground speed or high take-off mass, and how to manage these hazards.	X									
<b>032 04 01 04</b>		<b>Balanced field length concept</b>										
(01)	X	Define the term 'balanced field length'.	X									
(02)		Describe the relationship between take-off distance and accelerate-stop distance, and identify on a diagram the balanced field length and balanced $V_1$ .	X									
(03)	X	Describe the applicability of a balanced field length.	X									
<b>032 04 01 05</b>		<b>Unbalanced field length concept</b>										
(01)	X	Describe the applicability of an unbalanced field length.	X									
(02)		Explain the effect of additional stopway on the allowed take-off mass and appropriate $V_1$ when using an unbalanced field.	X									

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Syllabus	BK	Syllabus details and associated Learning Objectives	Aeroplane		Helicopter			IR	CB-IR(A)	BIR Exam	BIR BK	Remarks
			ATPL	CPL	ATPL/IR	ATPL	CPL					
(03)		Explain the effect of additional clearway on the allowed take-off mass and appropriate $V_1$ when using an unbalanced field.	X									
<b>032 04 01 06</b>		<b>Field-length-limited take-off mass (FLLTOM)</b>										
(01)		Explain the factors that affect the FLLTOM.	X									
(02)		Explain the concept of a 'range of $V_1$ ' and explain reasons for the placement of the designated $V_1$ towards the faster or slower end of the range.	X									
<b>032 04 01 07</b>		<b>Contaminated runways</b> <i>Remark: See 010 09 02 04 and 071 02 13 02</i>										
(01)		Define a 'contaminated runway', 'wet runway', and a 'dry runway'.	X	X								
(02)		Describe the different types of contamination: wet or water patches, frost-covered, dry snow, wet snow, slush, ice, compacted or rolled snow, frozen ruts or ridges.	X	X								
(03)		<i>Intentionally left blank</i>										
(04)		<i>Intentionally left blank</i>										
(05)		Define the different types of hydroplaning.	X	X								
(06)		Explain the difference between the two dynamic hydroplaning speeds and state which of them is the most limiting for an aircraft operating on a wet runway.	X	X								

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Syllabus	BK	Syllabus details and associated Learning Objectives	Aeroplane		Helicopter			IR	CB-IR(A)	BIR Exam	BIR BK	Remarks
			ATPL	CPL	ATPL/IR	ATPL	CPL					
(07)		State that some wind limitations may apply in case of contaminated runways. Those limitations are to be found in Part B of the Operations Manual — Limitations.	X	X								
(08)		State that the procedures associated with take-off and landing on contaminated runways are to be found in Part B of the Operations Manual — Normal procedures.	X	X								
(09)		State that the performance associated with contaminated runways is to be found in Part B of the Operations Manual — Performance.	X	X								
<b>032 04 01 08</b>		<b>Take-off climb</b>										
(01)		Explain the difference between the flat-rated and non-flat-rated part in performance charts.	X									
(02)		State the differences in climb-gradient requirements for two-, three- and four-engined aeroplanes.	X									
(03)		Explain the effects of aeroplane configuration and meteorological conditions on the take-off climb.	X									
(04)		Determine the climb-limited take-off mass.	X									
<b>032 04 01 09</b>		<b>Obstacle-limited take-off</b>										
(01)		Describe the operational regulations for obstacle clearance in the net take-off flight path (NTOFP).	X									



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Syllabus	BK	Syllabus details and associated Learning Objectives	Aeroplane		Helicopter			IR	CB-IR(A)	BIR Exam	BIR BK	Remarks
			ATPL	CPL	ATPL/IR	ATPL	CPL					
(02)		Define the actual and NTOFP with one-engine-inoperative in accordance with CS-25.	X									
(03)		Explain the effects of aeroplane configuration and meteorological conditions on the obstacle-limited take-off mass.	X									
(04)		Describe the segments of the actual take-off flight path.	X									
(05)		Describe the changes in the configuration, power, thrust and speed in the NTOFP climb segments.	X									
(06)		State the standard maximum bank angle(s) in the first and second segment, and determine the effect on the stall speed and implication on $V_2$ .	X									
(07)		Explain the influence of airspeed selection, acceleration and turns on the climb gradient.	X									
(08)		Describe the European Union airworthiness requirements according to CS-25 relating to aeroplane performance take-off climb and flight path.	X									
<b>032 04 01 10</b>		<b>Performance-limited take-off mass (PLTOM) and regulated take-off mass (RTOM) tables</b>										
(01)		Define PLTOM and RTOM.	X									
(02)	X	Describe the use of RTOM tables or similar to find PLTOM and how this can also be done using an EFB.	X									
(03)		Interpret what take-off limitation (field length, obstacle, climb, structural, etc.)	X									

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Syllabus	BK	Syllabus details and associated Learning Objectives	Aeroplane		Helicopter			IR	CB-IR(A)	BIR Exam	BIR BK	Remarks
			ATPL	CPL	ATPL/IR	ATPL	CPL					
		is restricting a particular RTOM as it is presented in RTOM tables or similar.										
(04)		Describe why data from an EFB can differ from data derived from RTOM tables or similar.	X									
<b>032 04 01 11</b>		<b>Take-off performance on wet and contaminated runways</b>										
(01)		Explain the differences between the take-off performance determination on a wet or contaminated runway and on a dry runway.	X									
(02)		Describe a wet V <sub>1</sub> and explain the consequences of using a wet V <sub>1</sub> .	X									
(03)		Describe the hazards, effects and management of operating from a contaminated runway.	X									
(04)		Describe displacement drag, impingement drag, and the methods to monitor acceleration.	X									
(05)		Explain the benefits and implications of using a derated take-off on a contaminated runway.	X									
<b>032 04 01 12</b>		<b>Use of reduced (flexible or flex) and derated thrust</b>										
(01)		Explain the advantages and disadvantages of using reduced (flex) and derated thrust.	X									
(02)		Explain the difference between and principles behind reduced (flex) and derated thrust.	X									

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Syllabus	BK	Syllabus details and associated Learning Objectives	Aeroplane		Helicopter			IR	CB-IR(A)	BIR Exam	BIR BK	Remarks
			ATPL	CPL	ATPL/IR	ATPL	CPL					
(03)		Explain when reduced (flex) and derated thrust may and may not be used.	X									
(04)		Explain the effect of using reduced (flex) and derated thrust on take-off performance including take-off speeds, take-off distance, climb performance and obstacle clearance.	X									
(05)		Explain the assumed temperature method for determining reduced (flex) thrust performance.	X									
<b>032 04 01 13</b>		<b>Take-off performance using different take-off flap settings</b>										
(01)		Explain the advantages and disadvantages of using different take-off flap settings to optimise the performance-limited take-off mass (PLTOM).	X									
(02)		Determine the optimum flap position and PLTOM from given figures.	X									
<b>032 04 01 14</b>		<b>Take-off performance using increased <math>V_2</math> speeds ('improved climb performance')</b>										
(01)		Explain the advantages and disadvantages of the increased $V_2$ procedure.	X									
(02)		Explain under what circumstances this procedure can be used.	X									
(03)		Explain the hazards of the fast $V_1$ and $V_{LOF}$ speeds associated with the increased $V_2$ procedure and how they can be managed.	X									
<b>032 04 01 15</b>		<b>Brake-energy and tyre-speed limit</b>										

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Syllabus	BK	Syllabus details and associated Learning Objectives	Aeroplane		Helicopter			IR	CB-IR(A)	BIR Exam	BIR BK	Remarks
			ATPL	CPL	ATPL/IR	ATPL	CPL					
(01)		Explain the effects on take-off performance of brake-energy and tyre-speed limits.	X									
(02)		Explain under what conditions they are more likely to become limiting.	X									
<b>032 04 02 00</b>		<b>Climb</b>										
<b>032 04 02 01</b>		<b>Climb techniques</b>										
(01)		Explain the effect of climbing at constant IAS on: — TAS; — Mach number; — climb gradient; — rate of climb.	X									
(02)		Explain the effect of climbing at constant Mach number on: — TAS; — IAS; — climb gradient; — rate of climb.	X									
(03)		Explain the correct sequence of climb speeds for turbojet transport aeroplanes.	X									
(04)		Determine the effect on TAS when climbing in and above the troposphere at constant Mach number.	X									
<b>032 04 02 02</b>		<b>Influence of variables on climb performance</b>										
(01)		Explain the effect on the operational speed limit when climbing at constant IAS and at constant Mach number.	X									

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Syllabus	BK	Syllabus details and associated Learning Objectives	Aeroplane		Helicopter			IR	CB-IR(A)	BIR Exam	BIR BK	Remarks
			ATPL	CPL	ATPL/IR	ATPL	CPL					
(02)		Explain the term 'crossover altitude' which occurs during the climb speed schedule (IAS–Mach number).	X									
<b>032 04 03 00</b>		<b>Cruise</b>										
<b>032 04 03 01</b>		<b>Intentionally left blank</b>										
<b>032 04 03 02</b>		<b>Intentionally left blank</b>										
<b>032 04 03 03</b>		<b>Intentionally left blank</b>										
<b>032 04 03 04</b>		<b>Long-range cruise</b>										
(01)		Define the term 'long-range cruise'.	X									
(02)		Explain the differences between flying at long-range speed and maximum-range speed with regard to fuel-flow and speed stability.	X									
<b>032 04 03 05</b>		<b>Intentionally left blank</b>										
<b>032 04 03 06</b>		<b>Cruise altitudes</b>										
(01)	X	Define the term 'optimum cruise altitude'.	X									
(02)		Explain the factors that affect optimum cruise altitude.	X									
(03)		Explain the factors that can affect or limit the maximum operating cruise altitude.	X									
(04)		Explain the purpose of, and operational reasons for, a step climb and when such a climb would be initiated for optimum range.	X									
(05)		Describe the buffet onset boundary (BOB) and determine the high- and low-speed buffet (speed/Mach number only).	X									

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Syllabus	BK	Syllabus details and associated Learning Objectives	Aeroplane		Helicopter			IR	CB-IR(A)	BIR Exam	BIR BK	Remarks
			ATPL	CPL	ATPL/IR	ATPL	CPL					
(06)		Analyse the influence of bank angle, mass and the 1.3g buffet margin on a step climb.	X									
(07)		Describe that the high-speed buffet can occur at speeds slower or faster than $M_{MO}$ .	X									
(08)		Explain the reasons why a step climb may not be used (e.g. for short sectors, advantageous winds, avoiding turbulence, and due to air traffic restrictions).	X									
<b>032 04 03 07</b>		<b>Cost index (CI)</b>										
(01)		Describe 'cost index'.	X									
(02)		Describe the reason for economical cruise speed.	X									
(03)		Describe the effect of cost index on climb, cruise and descent speeds.	X									
<b>032 04 04 00</b>		<b>En-route one-engine-inoperative</b>										
<b>032 04 04 01</b>		<b>Drift-down</b>										
(01)		Describe the determination of en-route flight-path data with one-engine-inoperative in accordance with the CS-25 provision on en-route flight paths.	X									
(02)		Describe the minimum obstacle-clearance height prescribed in the applicable operational requirements.	X									
(03)		Describe the optimum speed that the pilot should select during drift-down.	X									
(04)		Explain the influence of deceleration on the drift-down profiles.	X									

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Syllabus	BK	Syllabus details and associated Learning Objectives	Aeroplane		Helicopter			IR	CB-IR(A)	BIR Exam	BIR BK	Remarks
			ATPL	CPL	ATPL/IR	ATPL	CPL					
<b>032 04 04 02</b>		<b><i>Influence of variables on the en-route one-engine-inoperative performance</i></b>										
(01)		Describe and explain the factors which affect the en-route net drift-down flight path.	X									
<b>032 04 05 00</b>		<b>Descent</b>										
<b>032 04 05 01</b>		<b><i>Descent techniques</i></b>										
(01)		Explain the effect of descending at constant Mach number.	X									
(02)		Explain the effect of descending at constant IAS.	X									
(03)		Explain the correct sequence of descent speeds for turbojet transport aeroplanes.	X									
(04)		Determine the effect on TAS when descending in and above the troposphere at constant Mach number.	X									
(05)		Describe the following limiting speeds for descent: — maximum operating speed ( $V_{MO}$ ); — maximum Mach number ( $M_{MO}$ ).	X									
(06)		Explain the effect of a descent at constant Mach number on the margin to low- and high-speed buffet.	X									
<b>032 04 05 02</b>		<b><i>Energy management in the descent</i></b>										
(01)		Explain the advantages and principle of a continuous descent.	X									

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Syllabus	BK	Syllabus details and associated Learning Objectives	Aeroplane		Helicopter			IR	CB-IR(A)	BIR Exam	BIR BK	Remarks
			ATPL	CPL	ATPL/IR	ATPL	CPL					
(02)	X	Describe energy management in terms of chemical, potential and kinetic energy.	X									
(03)		Describe the effect of increasing/decreasing headwind and tailwind on profile management.	X									
(04)		Describe the effect of the Mach number to IAS transition (speed conversion) on profile management.	X									
(05)		Describe situations during the descent and approach in which a pilot could find that an aeroplane flies high or fast, and explain how the pilot can manage descent angle/excess energy.	X									
<b>032 04 06 00</b>		<b>Approach and landing</b>										
<b>032 04 06 01</b>		<b>Approach requirements</b>										
(01)		Describe the CS-25 requirements for the approach climb (one-engine-inoperative).	X									
(02)		Describe the CS-25 requirements for the landing climb.	X									
(03)		Explain the effect of temperature and pressure altitude on approach and landing-climb performance.	X									
<b>032 04 06 02</b>		<b>Landing-field-length and landing-speed requirements</b>										
(01)	X	Describe the landing distance determined according to CS 25 ('demonstrated' landing distance).	X									



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Syllabus	BK	Syllabus details and associated Learning Objectives	Aeroplane		Helicopter			IR	CB-IR(A)	BIR Exam	BIR BK	Remarks
			ATPL	CPL	ATPL/IR	ATPL	CPL					
(02)		Describe the landing-field-length requirements for dry, wet and contaminated runways and the applicable operational requirements.	X									
(03)	X	Define the 'landing distance available' (LDA).	X									
(04)		Define and explain the following speeds in accordance with CS-25 or CS-Definitions: — reference stall speed in the landing configuration ( $V_{SR0}$ ); — reference landing speed ( $V_{REF}$ ); — minimum control speed, approach and landing ( $V_{MCL}$ ).	X									
<b>032 04 06 03</b>		<b><i>Influence of variables on landing performance</i></b>										
(01)		Explain the effect of runway slope, surface conditions and wind on the maximum landing mass for a given landing distance available in accordance with the applicable operational requirements.	X									
(02)		Explain the effect on landing distance and maximum allowable landing mass of the following devices affecting deceleration: — reverse; — anti-skid; — ground spoilers or lift dumpers;	X									

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Syllabus	BK	Syllabus details and associated Learning Objectives	Aeroplane		Helicopter			IR	CB-IR(A)	BIR Exam	BIR BK	Remarks
			ATPL	CPL	ATPL/IR	ATPL	CPL					
		— autobrakes.										
(03)		Explain the effect of temperature and pressure altitude on the maximum landing mass for a given landing distance available.	X									
(04)		Explain the effect of hydroplaning on landing distance required and methods of managing landing on contaminated or wet runways.	X									
<b>032 04 06 04</b>		<b>Quick turnaround limit</b>										
(01)		Describe how brake temperature limits the turnaround times.	X									
<b>032 05 00 00</b>		<b>CS-25/APPLICABLE OPERATIONAL REQUIREMENTS PERFORMANCE CLASS A — USE OF AEROPLANE PERFORMANCE DATA</b>	X									
<b>032 05 01 00</b>		<b>Take-off</b>										
<b>032 05 01 01</b>		<b>Take-off (performance data)</b>										
(01)		Determine from given graphs the field-length-limited take-off mass (FLLTOM) and describe situations in which this limitation could be most restrictive for take-off.	X									
(02)		Determine from given graphs the climb-limited take-off mass and describe situations in which this limitation could be most restrictive for take-off.	X									
(03)		Determine from given graphs the obstacle-limited mass and describe situations	X									

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Syllabus	BK	Syllabus details and associated Learning Objectives	Aeroplane		Helicopter			IR	CB-IR(A)	BIR Exam	BIR BK	Remarks
			ATPL	CPL	ATPL/IR	ATPL	CPL					
		in which this limitation could be most restrictive for take-off.										
(04)		Determine from given graphs the tyre-speed-limited take-off mass.	X									
(05)		Determine from given graphs the maximum brake-energy-limited take-off mass.	X									
(06)		Determine the take-off V speeds for the actual take-off mass.	X									
(07)		Determine the maximum take-off mass using given RTOM tables.	X									
(08)		Using RTOM tables, determine the take-off V speeds for the actual take-off weight using appropriate corrections.	X									
(09)		Determine the assumed/flex temperature and take-off V speeds using the RTOM tables.	X									
(10)		Calculate the break cooling time following a rejected take-off given appropriate data.	X									
<b>032 05 02 00</b>		<b>Drift-down and stabilising altitude</b>										
<b>032 05 02 01</b>		<b>Drift-down and stabilising altitude (performance data)</b>										
(01)		Determine the one-engine-out net stabilising altitude (level-off altitude) from given graphs/tables.	X									
(02)		Determine the maximum mass at which the net stabilising altitude with one-engine-out clears the highest relevant obstacle by the required clearance margin.	X									

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Syllabus	BK	Syllabus details and associated Learning Objectives	Aeroplane		Helicopter			IR	CB-IR(A)	BIR Exam	BIR BK	Remarks
			ATPL	CPL	ATPL/IR	ATPL	CPL					
(03)		Determine, using drift-down graphs, fuel used, time and distance travelled in a descent from a cruise flight level to a given altitude.	X									
<b>032 05 03 00</b>		<b>Landing</b>										
<b>032 05 03 01</b>		<b>Landing (performance data)</b>										
(01)		Determine the field length required for landing with a given landing mass from the aeroplane performance data sheets.	X									
(02)		Determine the landing and approach climb-limited landing mass from the aeroplane performance data sheets.	X									
(03)		Calculate the maximum allowable landing mass as the lowest of: — approach-climb- and landing-climb-limited landing mass; — landing-field-length-limited landing mass; — structural-limited landing mass.	X									
(04)		Determine the brake cooling time for different landing masses using the aeroplane performance data sheets.	X									

**SUBJECT 033 – FLIGHT PERFORMANCE AND PLANNING – FLIGHT PLANNING AND MONITORING**

General Student Pilot Route Manual (GSPRM)

This document shall be referred to as the General Student Pilot Route Manual (GSPRM) and should contain as a minimum:

1. a table of contents and a list of effective pages;
2. introduction with the instrument flight rules (IFR) charts' legends;
3. 1:500 000 visual flight rule (VFR) aeronautical chart of Germany;
4. en-route low- and high-altitude IFR charts to cover the airspace above all EU Member States plus Norway, Switzerland, Liechtenstein and the Balkans;
5. en-route high-altitude chart of the North Pole (a polar stereographic projection) to illustrate current polar routes;
6. a plotting chart of the North Atlantic (with information on extended range operations with two-engined aeroplanes (ETOPS));
7. area, aerodrome/heliport, aerodrome ground movement, standard instrument departure (SID), standard instrument arrival (STAR) and instrument approach charts (IACs) for Alicante Elche, Amsterdam Schiphol, Dubrovnik Čilipi, London Heathrow, Nantes/Atlantique, Santorini and Stuttgart for aeroplane operations, and Aberdeen, De Kooy and Tromsø for helicopter operations;
8. microwave landing system (MLS) approach chart for Galbraith Lake Alaska;
9. an example of a completed air traffic service (ATS) flight plan (with instructions on how to complete it), including the ICAO model flight plan form;

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10. introduction with the VFR charts' legends, aerodrome directories for Croatia, France, Germany, Spain and United Kingdom, and area, aerodrome/heliport and visual approach charts (VACs) for Aberdeen Dyce, Alicante Elche, Dubrovnik Čilipi, Friedrichshafen, Gloucestershire and Nantes/Atlantique.

The charts should have a frozen date (e.g. 01.01.2017), and be reissued on a regular basis (e.g. every 4–5 years).

The charts listed above will form the basis for the questions in licensing examinations.

There will be no obligation for any student or approved training organisation (ATO) to buy, use or issue the GSPRM (nor will it have any other subject-matter material in it), but the content will be the basis for charts which may appear in MCAR-Part-FCL exams. Any chart provider (Lido, Jeppesen, Navtech, etc.) may provide the GSPRM, but the students will not be expected to learn non-ICAO standard symbology or chart requirements.

Note that the term 'mass' is used to describe a quantity of matter, and 'weight' when describing the force. However, the term 'weight' is normally used in aviation to colloquially describe mass. The professional pilot should always note the units to determine whether the term 'weight' is being used to describe a force (e.g. unit newton) or quantity of matter (e.g. unit kilogram).

Syllabus reference	BK	Syllabus details and associated Learning Objectives	Aeroplane		Helicopter			IR	CB-IR(A)	BIR Exam	BIR BK	Remarks
			ATPL	CPL	ATPL/IR	ATPL	CPL					
030 00 00 00		<b>FLIGHT PERFORMANCE AND PLANNING</b>										
033 00 00 00		<b>FLIGHT PLANNING AND MONITORING</b>										
033 01 00 00		<b>FLIGHT PLANNING FOR VFR FLIGHTS</b> <i>Remark: Using the GSPRM VFR charts.</i>										
033 01 01 00		<b>VFR navigation plan</b>										

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Syllabus reference	BK	Syllabus details and associated Learning Objectives	Aeroplane		Helicopter		IR	CB-IR(A)	BIR Exam	BIR BK	Remarks
			ATPL	CPL	ATPL/IR	ATPL	CPL				
<b>033 01 01 01</b>		<b><i>Airspace, communication, visual and radio-navigation data from VFR charts</i></b>									
(01)		Select routes taking the following criteria into account: — classification of airspace; — restricted areas; — VFR semicircular rules; — visually conspicuous points; — radio-navigation aids.	X	X	X	X	X				
(02)		Find the frequencies or identifiers of radio-navigation aids from charts.	X	X	X	X	X				
(03)		Find the communication frequencies and call signs for the following: — control agencies and service facilities; — flight information service (FIS); — weather information stations; — automatic terminal information service (ATIS).	X	X	X	X	X				
<b>033 01 01 02</b>		<b><i>Planning courses, distances and cruising levels with VFR charts</i></b>									
(01)		Choose visual waypoints in accordance with specified criteria (large, unique, contrast, vertical extent, etc.).	X	X	X	X	X				
(02)		Measure courses and distances from a VFR chart.	X	X	X	X	X				

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			ATPL	CPL	ATPL/IR	ATPL	CPL					
(03)		Find the highest obstacle within a given distance on either side of the course.	X	X	X	X	X					
(04)		Find the following data from a VFR chart and transfer them to a navigation plan: — waypoints or turning points; — distances; — true/magnetic courses.	X	X	X	X	X					
(05)		Calculate the minimum pressure altitude with a given obstacle clearance or true altitude from a given altitude or pressure altitude from minimum grid-area altitude using outside air temperature (OAT) and QNH.	X	X	X	X	X					
(06)		Calculate the vertical or horizontal distance and time to climb or descend to/from a given level or altitude with given data.	X	X	X	X	X					
(07)		Explain how to determine the position of a significant VFR point for insertion into a global navigation satellite system (GNSS) flight plan, using the distance and bearing from an existing significant point and using coordinates.	X	X	X	X	X					
<b>033 01 01 03</b>		<b><i>Aerodrome charts and aerodrome directory</i></b>										
(01)	X	Explain the reasons for studying the visual departure procedures and the available approach procedures.	X	X	X	X	X					



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			ATPL	CPL	ATPL/IR	ATPL	CPL					
(02)		Find all visual procedures which can be expected at the departure, destination and alternate aerodromes.	X	X	X	X	X					
(03)		Find all relevant aeronautical and regulatory information required for VFR flight planning from the aerodrome charts or aerodrome directory.	X	X	X	X	X					
<b>033 01 01 04</b>		<b><i>Intentionally left blank</i></b>										
<b>033 01 01 05</b>		<b><i>Completion of navigation plan</i></b>										
(01)		Calculate the true airspeed (TAS) from given aircraft performance data, altitude and OAT.	X	X	X	X	X					
(02)		Calculate wind correction angles (WCAs), drift and ground speeds (GS).	X	X	X	X	X					
(03)		Calculate individual and accumulated times for each leg to destination and alternate aerodromes.	X	X	X	X	X					
<b>033 02 00 00</b>		<b>FLIGHT PLANNING FOR IFR FLIGHTS</b> <i>Remark: Using the GSPRM IFR charts.</i>										
<b>033 02 01 00</b>		<b>IFR navigation plan</b>										
<b>033 02 01 01</b>		<b><i>Air traffic service (ATS) routes</i></b>										
(01)		Identify suitable routings by identifying all relevant aeronautical and regulatory information (including information published in the national aeronautical information publication (AIP)) required for IFR flight planning.	X		X			X	X	2	3	

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			ATPL	CPL	ATPL/IR	ATPL	CPL					
(02)		Identify and describe ATS routes (conventional, area navigation (RNAV), required navigation performance (RNP), conditional routes (CDRs), and direct routes).	X		X			X	X			
<b>033 02 01 02</b>		<b>Courses and distances from en-route charts</b>										
(01)		Determine courses and distances.	X		X			X	X	2	3	
(02)		Determine bearings and distances of waypoints from radio-navigation aids.	X		X			X	X	2	3	
<b>033 02 01 03</b>		<b>Altitudes</b>										
(01)		Define the following altitudes: — minimum en-route altitude (MEA); — minimum obstacle clearance altitude (MOCA); — minimum sector altitude (MSA); — minimum off-route altitude (MORA); — grid minimum off-route altitude (Grid MORA); — maximum authorised altitude (MAA); — minimum crossing altitude (MCA); — minimum holding altitude (MHA).	X		X			X	X	2	3	
(02)		Extract the following altitudes from the chart(s):	X		X			X	X	2	3	

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			ATPL	CPL	ATPL/IR	ATPL	CPL					
		<ul style="list-style-type: none"> <li>— MEA;</li> <li>— MOCA;</li> <li>— MSA;</li> <li>— MORA;</li> <li>— Grid MORA;</li> <li>— MAA;</li> <li>— MCA;</li> <li>— MHA.</li> </ul>										
(03)		State who is responsible for terrain separation during IFR flight inside and outside controlled airspace.	X		X			X	X			
(04)		State the minimum obstacle clearance requirements for en-route IFR flight inside and outside controlled airspace.	X		X			X	X			
(05)		State when a temperature error correction must be applied by either the pilot or ATC.	X		X			X	X			
(06)		Identify and explain the use of minimum radar vectoring altitudes.	X		X			X	X			
(07)		Calculate the minimum pressure altitude required with a given obstacle clearance, magnetic track, OAT, QNH and reduced vertical separation minimum (RVSM)/non-RVSM information.	X		X			X	X			
(08)		Calculate true altitude above a given datum using a given pressure altitude, OAT and QNH.	X		X			X	X			

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			ATPL	CPL	ATPL/IR	ATPL	CPL					
<b>033 02 01 04</b>		<b>Standard instrument departure (SID) and standard instrument arrival (STAR) routes</b>										
(01)	X	State the reasons for studying SID and STAR charts.	X		X			X	X			
(02)	X	State that SID and STAR charts show procedures only in a pictorial presentation style which may not be true to scale.	X		X			X	X			
(03)		Interpret all data and information represented on SID and STAR charts, particularly: — routings; — distances; — courses; — radials; — altitudes/levels; — frequencies; — restrictions; — RNAV waypoints and non-RNAV intersection; — fly-over and fly-by waypoints.	X		X			X	X	2		
(04)		Identify SID and STAR charts which might be relevant for a planned flight.	X		X			X	X	2		
(05)		Define SID and STAR for RNAV only.	X		X			X	X			
(06)		Describe the difference between SID/STAR, RNAV SID/STAR and RNAV SID/STAR overlay.	X		X			X	X			
<b>033 02 01 05</b>		<b>Instrument-approach charts</b>										

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			ATPL	CPL	ATPL/IR	ATPL	CPL					
(01)	X	State the reasons for being familiar with instrument-approach procedures (IAPs) and appropriate data for departure, destination and alternate aerodromes.	X		X			X	X			
(02)		Select IAPs appropriate for departure, destination and alternate aerodromes.	X		X			X	X	2		
(03)		Interpret all procedures, data and information represented on instrument-approach charts, particularly: — courses and radials; — distances; — altitudes/levels/heights; — restrictions; — obstructions; — frequencies; — speeds and times; — decision altitudes/heights (DAs/Hs); — (DA/H) and minimum descent altitudes/heights (MDAs/Hs); — visibility and runway visual ranges (RVRs); — approach-light systems.	X		X			X	X	2		
(04)		Explain the following IAP terms: — type A and B; — 2D and 3D; — CAT I, II and III;	X		X			X	X			

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			ATPL	CPL	ATPL/IR	ATPL	CPL					
		<ul style="list-style-type: none"> <li>— precision approach (conventional and ground-based augmentation system (GBAS));</li> <li>— non-precision approach (conventional and required navigation performance approach (RNP APCH) (lateral navigation (LNAV), LNAV/vertical navigation (VNAV), localiser performance (LP), localiser performance with vertical guidance (LPV), and required navigation performance authorisation required approach (RNP AR APCH));</li> <li>— approach procedure with vertical guidance (APV) (APV Baro and APV satellite-based augmentation system (SBAS)).</li> </ul>										
<b>033 02 01 06</b>		<b><i>Communications and radio-navigation planning data</i></b>										
(01)		Find the communication frequencies and call signs for aeronautical services for IFR flights from en-route charts.	X		X			X	X	2	3	

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			ATPL	CPL	ATPL/IR	ATPL	CPL					
(02)		Find the frequency or identifiers of radio-navigation aids for IFR flights from en-route charts.	X		X			X	X	2	3	
<b>033 02 01 07</b>		<b>Completion of a manual navigation plan</b>										
(01)		Complete a navigation plan with the courses, distances and frequencies taken from charts.	X		X			X	X		3	
(02)		Find the SID and STAR routes to be flown or to be expected.	X		X			X	X	2	3	
(03)		Determine the position of top of climb (TOC) and top of descent (TOD) from given appropriate data.	X		X			X	X	2	3	
(04)		Determine variation and calculate magnetic/true courses.	X		X			X	X		3	
(05)		Calculate TAS from given aircraft performance data, altitude and OAT.	X		X			X	X		3	
(06)		Calculate wind correction angles (WCAs)/drift and ground speeds (GSs).	X		X			X	X		3	
(07)		Calculate individual and accumulated times for each leg to destination and alternate aerodromes.	X		X			X	X			
(08)		Describe the advantages of global navigation satellite system/flight management computer (GNSS/FMC) equipment regarding: — automatic calculation and display of tracks and leg distances;	X		X			X	X			

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			ATPL	CPL	ATPL/IR	ATPL	CPL					
		<ul style="list-style-type: none"> <li>— additional route information in the database (minimum altitudes, approach procedures);</li> <li>— time and fuel estimates over waypoints;</li> <li>— ability to adjust speed to arrive over a waypoint at a defined time;</li> <li>— time and fuel revisions based on predicted and actual wind.</li> </ul>										
(09)		Describe the limitations of using GNSS/FMC equipment: <ul style="list-style-type: none"> <li>— pilot-inputted errors (flight levels, wind, temperature, fuel);</li> <li>— the effect of other than predicted wind on fuel and time estimates;</li> <li>— the effect of aircraft's non-standard configuration on flight management system (FMS) predictions.</li> </ul>	X		X			X	X			
<b>033 03 00 00</b>		<b>FUEL PLANNING — OPERATIONAL REQUIREMENTS</b>										
<b>033 03 01 00</b>		<b>General</b>										
<b>033 03 01 01</b>		<b><i>Fuel planning (general)</i></b>										



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			ATPL	CPL	ATPL/IR	ATPL	CPL					
(01)		Convert to volume, mass and density given in different units which are commonly used in aviation.	X	X	X	X	X	X	X		3	
(02)		Determine relevant data, such as fuel capacity, fuel flow/ consumption at different power/thrust settings, altitudes and atmospheric conditions, from the flight manual.	X	X	X	X	X	X	X		3	
(03)		Calculate the attainable flight time/range from given average fuel flow/consumption and available amount of fuel.	X	X	X	X	X	X	X	3		
(04)		Calculate the required fuel from given average fuel flow/ consumption and required time/range to be flown.	X	X	X	X	X	X	X	3		
(05)		Calculate the required fuel for a VFR flight from given forecast meteorological conditions.	X	X	X	X	X	X	X	3		
(06)		State the minimum amount of remaining fuel required on arrival at the destination and alternate aerodromes/ heliports.	X	X	X	X	X	X	X			
(07)		Explain and describe how to calculate nautical air miles (NAM) from nautical ground miles (NGM).	X	X	X	X	X	X	X			
(08)		Calculate the required fuel for an IFR flight from given forecast meteorological conditions.	X		X			X	X	3		
<b>033 03 02 00</b>		<b>Pre-flight fuel planning for commercial flights</b>										
<b>033 03 02 01</b>		<b>Taxi fuel</b>										

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			ATPL	CPL	ATPL/IR	ATPL	CPL					
(01)		Determine the fuel required for engine start and taxiing by consulting the fuel-usage tables or graphs from the flight manual taking into account all the relevant conditions.	X	X	X	X	X					
<b>033 03 02 02</b>		<b>Trip fuel</b>										
(01)		Define trip fuel and name the segments of flight for which the trip fuel is relevant.	X	X	X	X	X					
(02)		Determine the trip fuel for the flight by using data from the fuel tables or graphs from the flight manual.	X	X	X	X	X					
<b>033 03 02 03</b>		<b>Reserve fuel and its components</b>										
		<b>Contingency fuel</b>										
(01)		Explain the reasons for having contingency fuel.	X	X	X	X	X					
(02)		Calculate the contingency fuel according to the applicable operational requirements.	X	X	X	X	X					
		<b>Alternate fuel</b>										
(03)		Explain the reasons and regulations for having alternate fuel and name the segments of flight for which the alternate fuel is relevant.	X	X	X	X	X					
(04)		Calculate the alternate fuel in accordance with the applicable operational requirements and relevant data from the navigation plan and the flight manual.	X	X	X	X	X					
		<b>Final reserve fuel</b>										

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			ATPL	CPL	ATPL/IR	ATPL	CPL					
(05)		Explain the reasons and regulations for having final reserve fuel.	X	X	X	X	X					
(06)		Calculate the final reserve fuel for an aircraft in accordance with the applicable operational requirements and by using relevant data from the flight manual.	X	X	X	X	X					
		<b>Additional fuel</b>										
(07)		Explain the reasons and regulations for having additional fuel.	X	X	X	X	X					
(08)		Calculate the additional fuel for a flight in accordance with the applicable operational requirements.	X	X	X	X	X					
<b>033 03 02 04</b>		<b>Extra fuel</b>										
(01)		Explain the reasons and regulations for having extra fuel in accordance with the applicable operational requirements.	X	X	X	X	X					
(02)		Calculate the possible extra fuel under given conditions.	X	X	X	X	X					
(03)		Explain the fuel penalty incurred when loading extra fuel (i.e. the additional fuel consumption due to increased mass).	X	X	X	X	X					
<b>033 03 02 05</b>		<b>Calculation of total fuel and completion of the fuel section of the navigation plan (fuel plan)</b>										
(01)		Calculate the total fuel required for a given flight.	X	X	X	X	X					
(02)		Complete the fuel plan.	X	X	X	X	X					

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			ATPL	CPL	ATPL/IR	ATPL	CPL					
<b>033 03 03 00</b>		<b>Specific fuel-calculation procedures</b>										
<b>033 03 03 01</b>		<b>Reduced contingency fuel procedure</b>										
(01)	X	Explain the reasons and regulations for reduced contingency fuel as stated in the applicable operational requirements.	X									
(02)		Calculate the contingency fuel and trip fuel required in accordance with the reduced contingency fuel procedure.	X									
<b>033 03 03 02</b>		<b>Isolated aerodrome or heliport procedure</b>										
(01)	X	Explain the basic procedures for an isolated aerodrome or heliport as stated in the applicable operational requirements.	X		X	X						
(02)		Calculate the additional fuel for aeroplanes or helicopters according to the isolated aerodrome or heliport procedures.	X		X	X						
<b>033 03 03 03</b>		<b>Predetermined-point procedure</b>										
(01)	X	Explain the basic idea of the predetermined-point procedure as stated in the applicable operational requirements.	X									
<b>033 03 03 04</b>		<b>Fuel-tankering</b>										
(01)		Explain the basic idea of fuel-tankering procedures.	X									

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			ATPL	CPL	ATPL/IR	ATPL	CPL					
(02)		Calculate how much fuel to tank by using given appropriate graphs, tables or data.	X									
<b>033 03 03 05</b>		<b><i>Intentionally left blank</i></b>										
<b>033 04 00 00</b>		<b>PRE-FLIGHT PREPARATION</b>										
<b>033 04 01 00</b>		<b>Notice to airmen (NOTAM) briefing</b>										
<b>033 04 01 01</b>		<b><i>Ground- and satellite-based facilities and services</i></b>										
(01)		Check that the ground- and satellite-based facilities and services required for the planned flight are available and adequate.	X	X	X	X	X	X	X		3	
<b>033 04 01 02</b>		<b><i>Departure, destination and alternate aerodromes</i></b>										
(01)		Find and analyse the latest state at the departure, destination and alternate aerodromes, in particular for: — opening hours; — work in progress (WIP); — special procedures due to WIP; — obstructions; — changes of frequencies for communications, navigation aids and facilities.	X	X	X	X	X	X	X	3		
(02)		Check that satellite-based facilities are available during the expected time of use.	X	X	X	X	X	X	X			
(03)		Check that GBAS/SBAS augmentation is available during the expected time of use.	X	X	X	X	X	X	X			

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			ATPL	CPL	ATPL/IR	ATPL	CPL					
<b>033 04 01 03</b>		<b><i>Airway routings and airspace structure</i></b>										
(01)		Find and analyse the latest en-route state for: — airway(s) or route(s); — restricted, danger and prohibited areas; — changes of frequencies for communications, navigation aids and facilities.	X	X	X	X	X	X	X	3		
<b>033 04 01 04</b>		<b><i>Pre-flight preparation of GNSS achievability</i></b>										
(01)		Define why it is important to check GNSS achievability.	X									
(02)		Define receiver autonomous integrity monitoring (RAIM), NOTAM and notice advisory to NavStar users (NANU) messages.	X									
(03)		Explain the difference in use of augmented and non-augmented GNSS in connection with the achievability check.	X									
(04)		Explain the difference in planned and unplanned outage of GNSS or SBAS.	X									
<b>033 04 02 00</b>		<b><i>Meteorological briefing</i></b>										
<b>033 04 02 01</b>		<b><i>Intentionally left blank</i></b>										
<b>033 04 02 02</b>		<b><i>Update of navigation plan using the latest meteorological information</i></b>										

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			ATPL	CPL	ATPL/IR	ATPL	CPL					
(01)		Confirm the most fuel-efficient altitude from given wind, temperature and aircraft data.	X	X					X	3		
(02)		Confirm true altitudes from given atmospheric data to ensure that statutory minimum clearance is attained.	X	X	X	X	X	X				
(03)		Confirm magnetic headings and GSs.	X	X	X	X	X	X	X		3	
(04)		Confirm the individual leg times and the total time en route.	X	X	X	X	X	X	X		3	
(05)		Confirm the total time en route for the trip to the destination.	X	X	X	X	X	X	X			
(06)		Confirm the total time from destination to the alternate aerodrome.	X	X	X	X	X	X	X		3	
<b>033 04 02 03</b>		<b><i>Intentionally left blank</i></b>										
<b>033 04 02 04</b>		<b><i>Intentionally left blank</i></b>										
<b>033 04 02 05</b>		<b><i>Update of fuel plan</i></b>										
(01)		Calculate the revised fuel data in accordance with the changed conditions.	X	X	X	X	X	X			3	
<b>033 04 03 00</b>		<b>Point of equal time (PET) and point of safe return (PSR)</b>										
<b>033 04 03 01</b>		<b><i>Point of equal time (PET)</i></b>										
(01)		Define 'PET'.	X	X	X	X	X					
(02)		Calculate the position of a PET and the estimated time of arrival (ETA) at the PET from given relevant data.	X	X	X	X	X					
<b>033 04 03 02</b>		<b><i>Point of safe return (PSR)</i></b>										
(01)		Define 'PSR'.	X	X	X	X	X					

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Syllabus reference	BK	Syllabus details and associated Learning Objectives	Aeroplane		Helicopter			IR	CB-IR(A)	BIR Exam	BIR BK	Remarks
			ATPL	CPL	ATPL/IR	ATPL	CPL					
(02)		Calculate the position of a PSR and the ETA at the PSR from given relevant data.	X	X	X	X	X					
<b>033 05 00 00</b>		<b>ICAO FLIGHT PLAN (ATS flight plan (FPL))</b>										
<b>033 05 01 00</b>		<b>Individual FPL</b>										
<b>033 05 01 01</b>		<b>Format of FPL</b>										
(01)	X	State the reasons for a fixed format of an ICAO ATS FPL.	X	X	X	X	X	X	X			
(02)		Determine the correct entries to complete an ATS FPL plus decode and interpret the entries in a completed ATS FPL, particularly for the following: — aircraft identification (Item 7); — flight rules and type of flight (Item 8); — number and type of aircraft and wake-turbulence category (Item 9); — equipment (Item 10); — departure aerodrome and time (Item 13); — route (Item 15); — destination aerodrome, total estimated elapsed time and alternate aerodrome (Item 16); — other information (Item 18);	X	X	X	X	X	X	X	3		



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Syllabus reference	BK	Syllabus details and associated Learning Objectives	Aeroplane		Helicopter			IR	CB-IR(A)	BIR Exam	BIR BK	Remarks
			ATPL	CPL	ATPL/IR	ATPL	CPL					
		— supplementary information (Item 19).										
<b>033 05 01 02</b>		<b><i>Intentionally left blank</i></b>										
<b>033 05 02 00</b>		<b>Repetitive flight plan (RPL)</b>										
<b>033 05 02 01</b>		<b><i>Repetitive flight plan (RPL)</i></b>										
(01)	X	Explain the difference between an individual FPL and an RPL.	X		X	X						
<b>033 06 00 00</b>		<b>FLIGHT MONITORING AND IN-FLIGHT REPLANNING</b>										
<b>033 06 01 00</b>		<b>Flight monitoring</b>										
<b>033 06 01 01</b>		<b><i>Monitoring of track and time</i></b>										
(01)		State the reasons for possible deviations from the planned track and planned timings.	X	X	X	X	X	X				
(02)		Calculate GS by using actual in-flight parameters.	X	X	X	X	X	X				
(03)		Calculate the expected leg times by using actual in-flight parameters.	X	X	X	X	X	X				
(04)		Enter, in the progress of flight, at the checkpoint or turning point, the 'actual time-over' and the 'estimated time-over' for the next checkpoint into the flight plan.	X	X	X	X	X					
(05)		State that it is necessary to determine the position of the aircraft accurately before commencing descent in order to ensure safe ground clearance.	X	X	X	X	X					
(06)		Calculate revised ETA based on changes to the pre-flight plan, including changes of W/V, cruise level,	X	X	X	X	X					

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Syllabus reference	BK	Syllabus details and associated Learning Objectives	Aeroplane		Helicopter			IR	CB-IR(A)	BIR Exam	BIR BK	Remarks
			ATPL	CPL	ATPL/IR	ATPL	CPL					
		OAT, distances, Mach number and calibrated airspeed (CAS).										
<b>033 06 01 02</b>		<b><i>In-flight fuel management</i></b>										
(01)		Explain why fuel checks must be carried out in flight at regular intervals and why relevant fuel data must be recorded.	X	X	X	X	X	X				
(02)		Assess deviations of actual fuel consumption from planned consumption.	X	X	X	X	X	X				
(03)		Calculate fuel quantity used, fuel consumption, and fuel remaining at navigation checkpoints/waypoints.	X	X	X	X	X	X				
(04)		Compare the actual with the planned fuel consumption by means of calculation.	X	X	X	X	X	X				
(05)		Determine the remaining range and endurance by means of calculation.	X	X	X	X	X	X				
(06)		Calculate the revised fuel consumption based on changes to the pre-flight plan, including changes of W/V, cruise level, OAT, distances, Mach number and CAS.	X	X	X	X	X	X				
<b>033 06 02 00</b>		<b><i>In-flight replanning</i></b>										
<b>033 06 02 01</b>		<b><i>Deviation from planned data</i></b>										
(01)		State that the commander is responsible for ensuring that, even in case of diversion, the remaining fuel is not less than the fuel required to proceed to an aerodrome where a safe landing can be made, with final reserve fuel remaining.	X	X	X	X	X					

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Syllabus reference	BK	Syllabus details and associated Learning Objectives	Aeroplane		Helicopter			IR	CB-IR(A)	BIR Exam	BIR BK	Remarks
			ATPL	CPL	ATPL/IR	ATPL	CPL					
(02)		<p>Explain that, in the case of an in-flight update, the commander has to check the following:</p> <ul style="list-style-type: none"> <li>— the suitability of the new destination or alternate aerodrome;</li> <li>— meteorological conditions on revised routing and at revised destination or alternate aerodrome;</li> <li>— the aircraft must be able to land with the prescribed final reserve fuel.</li> </ul>	X	X	X	X	X					
(03)		Calculate the revised destination/alternate aerodrome landing mass from given latest data.	X	X	X	X	X					

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**SUBJECT 034 – FLIGHT PERFORMANCE AND PLANNING – PERFORMANCE – HELICOPTERS**

Note that the term ‘mass’ is used to describe a quantity of matter, and ‘weight’ when describing the force. However, the term ‘weight’ is normally used in aviation to colloquially describe mass. The professional pilot should always note the units to determine whether the term ‘weight’ is being used to describe a force (e.g. unit newton) or quantity of matter (e.g. unit kilogram).

Syllabus reference	BK	Syllabus details and associated Learning Objectives	Aeroplane		Helicopter			IR	CB-IR(A)	BIR Exam	BIR BK	Remarks
			ATPL	CPL	ATPL/IR	ATPL	CPL					
<b>030 00 00 00</b>		<b>FLIGHT PERFORMANCE AND PLANNING</b>										
<b>034 00 00 00</b>		<b>PERFORMANCE — HELICOPTERS</b>										
<b>034 01 00 00</b>		<b>GENERAL</b>										
<b>034 01 01 00</b>		<b>Performance legislation</b>										
<b>034 01 01 01</b>		<b><i>Airworthiness requirements</i></b>										
(01)		Interpret the airworthiness requirements of CS-27 and CS-29.			X	X	X					
(02)		Name the general differences between helicopters certified according to CS-27 and CS-29.			X	X	X					
<b>034 01 01 02</b>		<b>Operational regulations</b>										
(01)		State that the person responsible for complying with operational procedures is the commander.			X	X	X					
(02)		Use and interpret diagrams and tables associated with CAT A and CAT B procedures in order to select and develop Class 1, 2 and 3 performance profiles according to available heliport size and location (surface or elevated).			X	X						

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Syllabus reference	BK	Syllabus details and associated Learning Objectives	Aeroplane		Helicopter			IR	CB-IR(A)	BIR Exam	BIR BK	Remarks
			ATPL	CPL	ATPL/IR	ATPL	CPL					
(03)		Interpret the charts showing minimum clearances associated with CAT A and CAT B procedures.			X	X						
<b>034 01 02 00</b>		<b>General performance theory</b>										
<b>034 01 02 01</b>		<b>Phases of flight</b>										
(01)		Explain the following phases of flight: — take-off; — climb; — level flight; — descent; — approach and landing.			X	X	X					
(02)		Describe the necessity for different take-off and landing procedures.			X	X	X					
<b>034 01 02 02</b>		<b>Definitions and terms</b>										
(01)		Define the following terms: — CAT A; — CAT B; — Performance Class 1, 2 and 3; — congested area; — elevated heliport; — helideck; — heliport; — hostile environment; — maximum operational passenger seating configuration (MOPSC); — non-hostile environment; — obstacle; — rotor radius (R); — take-off mass; — touchdown and lift-off area (TLOF);			X	X	X					

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Syllabus reference	BK	Syllabus details and associated Learning Objectives	Aeroplane		Helicopter			IR	CB-IR(A)	BIR Exam	BIR BK	Remarks
			ATPL	CPL	ATPL/IR	ATPL	CPL					
		<ul style="list-style-type: none"> <li>— safe forced landing;</li> <li>— speed for best rate of climb (<math>V_y</math>);</li> <li>— never exceed speed (<math>V_{NE}</math>);</li> <li>— velocity landing gear extended (<math>V_{LE}</math>);</li> <li>— velocity landing gear operation (<math>V_{LO}</math>);</li> <li>— cruising speed and maximum cruising speed.</li> </ul>										
(02)		Define the following terms: <ul style="list-style-type: none"> <li>— reported headwind component;</li> <li>— take-off decision point (TDP);</li> <li>— defined point after take-off (DPATO);</li> <li>— take-off distance required helicopter (TODRH);</li> <li>— take-off distance available helicopter (TODAH);</li> <li>— distance required (DR);</li> <li>— rejected take-off distance required helicopter (RTODRH);</li> <li>— rotation point (RP);</li> <li>— committal point (CP);</li> <li>— defined point before landing (DPBL);</li> <li>— landing decision point (LDP);</li> <li>— landing distance available helicopter (LDAH);</li> </ul>			X	X						

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Syllabus reference	BK	Syllabus details and associated Learning Objectives	Aeroplane		Helicopter			IR	CB-IR(A)	BIR Exam	BIR BK	Remarks
			ATPL	CPL	ATPL/IR	ATPL	CPL					
		— landing distance required helicopter (LDRH); — ditching (see operations).										
(03)		Understand the meaning and significance of the acronyms AEO and OEI.			X	X						
(04)		Define the terms 'climb angle' and 'climb gradient'.			X	X						
(05)		Define the terms 'flight-path angle' and 'flight-path gradient'.			X	X						
(06)		Define 'V <sub>maxRange</sub> ' (speed for maximum range) and V <sub>maxEnd</sub> (speed for maximum endurance).			X	X	X					
(07)		Define and calculate the gradient by using power, wind, and helicopter mass.			X	X						
(08)		Explain the terms 'operational ceiling' and 'absolute ceiling'.			X	X	X					
(09)		Explain the term 'service ceiling OEI'.			X	X	X					
(10)		Explain the difference between hovering in ground effect (HIGE) and hovering out of ground effect (HOGE).			X	X	X					
<b>034 01 02 03</b>		<b>Power required/power available curves</b>										
(01)		Understand and interpret the power required/power available versus TAS graphs.			X	X	X					
<b>034 01 02 04</b>		<b>Height-velocity graphs</b>										
(01)		Understand and interpret height-velocity graphs.			X	X	X					
<b>034 01 02 05</b>		<b>Influencing variables on performance</b>										

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Syllabus reference	BK	Syllabus details and associated Learning Objectives	Aeroplane		Helicopter			IR	CB-IR(A)	BIR Exam	BIR BK	Remarks
			ATPL	CPL	ATPL/IR	ATPL	CPL					
(01)		Explain how the following factors affect helicopter performance: — pressure altitude; — humidity; — temperature; — wind; — helicopter mass; — helicopter configuration; — helicopter centre of gravity (CG).			X	X	X					
<b>034 02 00 00</b>		<b>PERFORMANCE CLASS 3 — SINGLE-ENGINE HELICOPTERS</b>										
<b>034 02 01 00</b>		<b>Effect of variables on single-engine (SE) helicopter performance</b>										
<b>034 02 01 01</b>		<b>Effect of variables on SE helicopter performance</b>										
(01)		Determine the wind component, altitude and temperature for hovering, take-off and landing.			X	X	X					
(02)		Explain that operations are to be conducted only from/to heliports and over such routes, areas and diversions contained in a non-hostile environment where a safe forced landing can be carried out (point CAT.OP.MPA.137 of the EU Regulation on air operations, except when the helicopter is approved to operate in accordance with point CAT.POL.H.420).			X	X	X					



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Syllabus reference	BK	Syllabus details and associated Learning Objectives	Aeroplane		Helicopter			IR	CB-IR(A)	BIR Exam	BIR BK	Remarks
			ATPL	CPL	ATPL/IR	ATPL	CPL					
		(Consider the exception: Operations may be conducted in a hostile environment. Ground level exposure — and exposure for elevated final approach and take-off areas (FATOs) or heli-decks in non-hostile environments — is allowed for operations approved under CAT.POL.H.305, during the take-off and landing phases.)										
(03)		Explain the effect of temperature, wind and altitude on climb, cruise and descent performance.			X	X	X					
<b>034 02 02 00</b>		<b>Take-off and landing</b>										
<b>034 02 02 01</b>		<b>Take-off and landing (including hover)</b>										
(01)		Explain the take-off and landing requirements.			X	X	X					
(02)		Explain the maximum allowed take-off and landing mass.			X	X	X					
(03)		Explain that mass has to be restricted to HIGE.			X	X	X					
(04)		Explain that if HIGE is unlikely to be achieved (for example, blocked by an obstruction), then mass must be restricted to HOGE.			X	X	X					
<b>034 02 03 00</b>		<b>Climb, cruise and descent</b>										
<b>034 02 03 01</b>		<b>Climb, cruise and descent (capabilities)</b>										
(01)		State that the helicopter must be capable of flying its intended track without flying below the appropriate minimum			X	X	X					

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Syllabus reference	BK	Syllabus details and associated Learning Objectives	Aeroplane		Helicopter			IR	CB-IR(A)	BIR Exam	BIR BK	Remarks
			ATPL	CPL	ATPL/IR	ATPL	CPL					
		flight altitude and be able to perform a safe forced landing.										
(02)		Explain the effect of altitude on the maximum endurance speed.			X	X	X					
<b>034 02 04 00</b>		<b>Use of helicopter performance data</b>										
<b>034 02 04 01</b>		<b>Take-off (including hover)</b>										
(01)		Find the maximum wind component.			X	X	X					
(02)		Find the maximum allowed take-off mass for certain conditions.			X	X	X					
(03)		Find the height–velocity parameters.			X	X	X					
<b>034 02 04 02</b>		<b>Climb</b>										
(01)		Find the time, distance and fuel required to climb for certain conditions.			X	X	X					
(02)		Find the rate of climb under given conditions and the best rate-of-climb speed $V_Y$ .			X	X	X					
<b>034 02 04 03</b>		<b>Cruise</b>										
(01)		Find the cruising speed and fuel consumption for certain conditions.			X	X	X					
(02)		Calculate the range and endurance under given conditions.			X	X	X					
<b>034 02 04 04</b>		<b>Landing (including hover)</b>										
(01)		Find the maximum wind component.			X	X	X					
(02)		Find the maximum allowed landing mass for certain conditions.			X	X	X					
(03)		Find the height–velocity parameters.			X	X	X					
<b>034 03 00 00</b>		<b>PERFORMANCE CLASS 2</b>										

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Syllabus reference	BK	Syllabus details and associated Learning Objectives	Aeroplane		Helicopter			IR	CB-IR(A)	BIR Exam	BIR BK	Remarks
			ATPL	CPL	ATPL/IR	ATPL	CPL					
		<i>General remark: The Learning Objectives for Performance Class 2 are principally identical with those for Performance Class 1. (See 034 04 00 00) Additional Learning Objectives are shown below.</i>										
<b>034 03 01 00</b>		<b>Operations without an assured safe forced landing capability</b>										
<b>034 03 01 01</b>		<b>Responsibility for operations without an assured safe forced landing capability</b>										
(01)		State the responsibility of the operator for assuring safe forced landings (point CAT.POL.H.305 of the EU Regulation on air operations).			X	X						
<b>034 03 02 00</b>		<b>Take-off</b>										
<b>034 03 02 01</b>		<b>Take-off requirements</b>										
(01)		State the climb and other requirements for take-off.			X	X						
<b>034 03 03 00</b>		<b>Take-off flight path</b>										
<b>034 03 03 01</b>		<b>Take-off flight path requirements</b>										
(01)		State the height above the take-off surface at which at least the requirements for the take-off flight path for Performance Class 1 are to be met.			X	X						
<b>034 03 04 00</b>		<b>Landing</b>										
<b>034 03 04 01</b>		<b>Landing requirements</b>										
(01)		State the requirements for the climb capability when OEI.			X	X						

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Syllabus reference	BK	Syllabus details and associated Learning Objectives	Aeroplane		Helicopter			IR	CB-IR(A)	BIR Exam	BIR BK	Remarks
			ATPL	CPL	ATPL/IR	ATPL	CPL					
(02)		State the options for a Performance Class 2 operation in the case of a critical power-unit failure at any point in the approach path.			X	X						
(03)		State the limitations for operations to/from a helideck.			X	X						
<b>034 04 00 00</b>		<b>PERFORMANCE CLASS 1 — HELICOPTERS CERTIFIED ACCORDING TO CS-29 ONLY</b>										
<b>034 04 01 00</b>		<b>Take-off</b>										
<b>034 04 01 01</b>		<b>Take-off distances</b>										
(01)		Explain the effects of the following variables on the flight-path and take-off distances: — take-off with HIGE or HOGGE; — take-off procedure; — obstacle clearances both laterally and vertically; — take-off from non-elevated heliports; — take-off from elevated heliports or helidecks; — take-off from a TLOF.			X	X						
(02)		Explain the effects of the following variables on take-off distances: — mass; — take-off configuration; — bleed-air configurations.			X	X						

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Syllabus reference	BK	Syllabus details and associated Learning Objectives	Aeroplane		Helicopter			IR	CB-IR(A)	BIR Exam	BIR BK	Remarks
			ATPL	CPL	ATPL/IR	ATPL	CPL					
(03)		Explain the effects of the following meteorological conditions on take-off distances: — wind; — temperature; — pressure altitude.			X	X						
(04)		Explain the take-off distances for specified conditions and configuration for AEO and OEI.			X	X						
(05)		Explain the effect of obstacles on the take-off distance required.			X	X						
(06)		State the assumed reaction time between engine failure and recognition.			X	X						
(07)		Explain that the flight must be carried out visually up to TDP.			X	X						
<b>034 04 01 02</b>		<b>Rejected take-off distance required (helicopter) (RTODR(H))</b>										
(01)		Explain RTODR(H) for specified conditions and configuration for AEO and OEI.			X	X						
(02)		Explain the time-to-decide allowance (decision time) and deceleration procedure.			X	X						
<b>034 04 01 03</b>		<b>Intentionally left blank</b>										
<b>034 04 01 04</b>		<b>Take-off climb</b>										
(01)		Define the segments of the take-off flight path.			X	X						
(02)		Explain the effect of changes in the configuration on power and speed in the segments.			X	X						

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Syllabus reference	BK	Syllabus details and associated Learning Objectives	Aeroplane		Helicopter			IR	CB-IR(A)	BIR Exam	BIR BK	Remarks
			ATPL	CPL	ATPL/IR	ATPL	CPL					
(03)		Explain the climb-gradient requirements for OEI.			X	X						
(04)		State the minimum altitude over the take-off path when flying at the take-off safety speed in a Category A helicopter ( $V_{TOSS}$ ).			X	X						
(05)		Describe the influence of airspeed selection, acceleration and turns on the climb gradient and best rate-of-climb speed.			X	X						
<b>034 04 01 05</b>		<b>Obstacle-limited take-off</b>										
(01)		Describe the operational regulations for obstacle clearance of the take-off flight path in the departure sector with OEI.			X	X						
<b>034 04 01 06</b>		<b>Use of helicopter performance data</b>										
(01)		Determine from helicopter performance data sheets the maximum mass that satisfies the operational regulations for take-off in terms of regulated take-off mass, TODRH and minimum gradients for climb and obstacle clearance.			X	X						
<b>034 04 02 00</b>		<b>Climb</b>										
<b>034 04 02 01</b>		<b>Climb techniques</b>										
(01)		Explain the effect of climbing with best rate-of-climb speed ( $V_Y$ ).			X	X						
(02)		Explain the influence of altitude on $V_Y$ .			X	X						
<b>034 04 02 02</b>		<b>Use of helicopter flight data</b>										
(01)		Find the rate of climb and calculate the time to climb to a given altitude.			X	X						
<b>034 04 03 00</b>		<b>Cruise</b>										

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Syllabus reference	BK	Syllabus details and associated Learning Objectives	Aeroplane		Helicopter			IR	CB-IR(A)	BIR Exam	BIR BK	Remarks
			ATPL	CPL	ATPL/IR	ATPL	CPL					
<b>034 04 03 01</b>		<b><i>Cruise techniques</i></b>										
(01)		Explain the cruise procedures for 'maximum endurance' and 'maximum range'.			X	X						
<b>034 04 03 02</b>		<b><i>Maximum endurance</i></b>										
(01)		Explain fuel flow in relation to true air-speed (TAS).			X	X						
(02)		Explain the speed for maximum endurance.			X	X						
<b>034 04 03 03</b>		<b><i>Maximum range</i></b>										
(01)		Explain the speed for maximum range.			X	X						
<b>034 04 03 04</b>		<b><i>Maximum cruise</i></b>										
(01)		Explain the speed for maximum cruise.			X	X						
<b>034 04 03 05</b>		<b><i>Cruise altitudes</i></b>										
(01)		Explain the factors which might affect or limit the operating altitude.			X	X						
(02)		Understand the relation between power setting, fuel consumption, cruising speed and altitude.			X	X						
<b>034 04 03 06</b>		<b><i>Use of helicopter performance data</i></b>										
(01)		Determine the fuel consumption from the helicopter performance data sheets in accordance with altitude and helicopter mass.			X	X						
<b>034 04 04 00</b>		<b><i>En-route one-engine-inoperative (OEI)</i></b>										
<b>034 04 04 01</b>		<b><i>Requirements for en-route flights with OEI</i></b>										
(01)		State the flight-path clearance requirements.			X	X						

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Syllabus reference	BK	Syllabus details and associated Learning Objectives	Aeroplane		Helicopter			IR	CB-IR(A)	BIR Exam	BIR BK	Remarks
			ATPL	CPL	ATPL/IR	ATPL	CPL					
(02)		Explain drift-down techniques.			X	X						
(03)		State the reduction in the flight-path width when navigational accuracy can be achieved.			X	X						
<b>034 04 04 02</b>		<b>Use of helicopter flight data</b>										
(01)		Find the single-engine service ceiling, range and endurance from given engine-inoperative charts.			X	X						
(02)		Find OEI operating data from suitable charts.			X	X						
(03)		Find the amount of fuel to be jettisoned in order to reduce helicopter mass.			X	X						
(04)		Calculate the relevant parameters for drift-down procedures.			X	X						
<b>034 04 05 00</b>		<b>Descent</b>										
<b>034 04 05 01</b>		<b>Use of helicopter flight data</b>										
(01)		Find the rate of descent and calculate the time to descend to a given altitude.			X	X						
<b>034 04 06 00</b>		<b>Landing</b>										
<b>034 04 06 01</b>		<b>Landing requirements</b>										
(01)		State the requirements for landing.			X	X						
<b>034 04 06 02</b>		<b>Landing procedures</b>										
(01)		Explain the procedure for critical power-unit failure before and after the landing decision point.			X	X						
(02)		Explain that the portion of flight after the landing decision point must be carried out visually.			X	X						



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Syllabus reference	BK	Syllabus details and associated Learning Objectives	Aeroplane		Helicopter			IR	CB-IR(A)	BIR Exam	BIR BK	Remarks
			ATPL	CPL	ATPL/IR	ATPL	CPL					
(03)		Explain the procedures and required obstacle clearances for landings on different heliports/helidecks.			X	X						
<b>034 04 06 03</b>		<b><i>Use of helicopter performance data</i></b>										
(01)		Determine from helicopter performance data sheets the maximum mass that satisfies the operational regulations for landing in terms of regulated landing mass, LDRH and minimum gradients for climb and obstacle clearance.			X	X						

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**SUBJECT 040 – HUMAN PERFORMANCE AND LIMITATIONS**

Syllabus reference	BK	Syllabus details and associated Learning Objectives	Aeroplane		Helicopter			IR	CB-IR(A)	BIR Exam	BIR BK	Remarks
			ATPL	CPL	ATPL/IR	ATPL	CPL					
<b>040 00 00 00</b>		<b>HUMAN PERFORMANCE AND LIMITATIONS</b>										
<b>040 01 00 00</b>		<b>HUMAN FACTORS: BASIC CONCEPTS</b>										
<b>040 01 01 00</b>		<b>Human factors in aviation</b>										
<b>040 01 01 01</b>		<b><i>Becoming a competent pilot</i></b>										
(01)		State that competence is based on knowledge, skills and attitudes of the individual pilot, and list the ICAO eight core competencies: — application of procedures; — communication; — aircraft flight path management, automation; — aircraft flight path management, manual control; — leadership and teamwork; — problem-solving and decision-making; — situation awareness; — workload management.	X	X	X	X	X	X				
<b>040 01 02 00</b>		<b>Intentionally left blank</b>										
<b>040 01 03 00</b>		<b>Flight safety concepts</b>										
<b>040 01 03 01</b>		<b><i>Threat and error management (TEM) model and SHELL model</i></b>										

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Syllabus reference	BK	Syllabus details and associated Learning Objectives	Aeroplane		Helicopter			IR	CB-IR(A)	BIR Exam	BIR BK	Remarks
			ATPL	CPL	ATPL/IR	ATPL	CPL					
(01)		Explain the three components of the TEM model.	X	X	X	X	X	X	X			
(02)		Explain and give examples of latent threats.	X	X	X	X	X	X	X	1		
(03)		Explain and give examples of environmental threats.	X	X	X	X	X	X	X	1		
(04)		Explain and give examples of organisational threats.	X	X	X	X	X	X	X	1		
(05)		Explain and give a definition of 'error' according to the TEM model of ICAO Doc 9683 (Part II, Chapter 2).	X	X	X	X	X	X	X	1		
(06)		Give examples of different counter-measures which may be used in order to manage threats, errors, and undesired aircraft states.	X	X	X	X	X	X	X	1		
(07)		Explain and give examples of procedural error, communication errors, and aircraft handling errors.	X	X	X	X	X	X	X	1		
(08)		Explain and give examples of 'undesired aircraft states'.	X	X	X	X	X	X				
(09)		State the components of the SHELL model.	X	X	X	X	X	X				
(10)		State the relevance of the SHELL model to the work in the cockpit.	X	X	X	X	X	X				
<b>040 01 04 00</b>		<b>Safety culture</b>										
<b>040 01 04 01</b>		<b>Safety culture and safety management</b>										
(01)		Distinguish between 'open cultures' and 'closed cultures'.	X	X	X	X	X	X	X		1	

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Syllabus reference	BK	Syllabus details and associated Learning Objectives	Aeroplane		Helicopter			IR	CB-IR(A)	BIR Exam	BIR BK	Remarks
			ATPL	CPL	ATPL/IR	ATPL	CPL					
(02)		Illustrate how safety culture is reflected in national culture.	X	X	X	X	X	X	X		1	
(03)		Discuss the established expression 'safety first' in a commercial entity.	X	X	X	X	X	X				
(04)		Explain James Reason's 'Swiss Cheese Model'.	X	X	X	X	X	X	X	1		
(05)		State the important factors that promote a good safety culture.	X	X	X	X	X	X	X		1	
(06)		Distinguish between 'just culture' and 'non-punitive culture'.	X	X	X	X	X	X	X		1	
(07)		Name the five components which form safety culture (according to James Reason: informed culture, reporting culture, learning culture, just culture, flexible culture).	X	X	X	X	X	X	X		1	
(08)		Name the basic concepts of safety management system (SMS) (including hazard identification and risk management) and its relationship with safety culture in order to: <ul style="list-style-type: none"> <li>— define how the organisation is set up to manage risks;</li> <li>— identify workplace risk and implement suitable controls;</li> <li>— implement effective communication across all levels of the organisation.</li> </ul>	X	X	X	X	X	X	X			
<b>040 02 00 00</b>		<b>BASICS OF AVIATION PHYSIOLOGY AND HEALTH MAINTENANCE</b>										
<b>040 02 01 00</b>		<b>Basics of flight physiology</b>										
<b>040 02 01 01</b>		<b><i>The atmosphere</i></b>										

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Syllabus reference	BK	Syllabus details and associated Learning Objectives	Aeroplane		Helicopter			IR	CB-IR(A)	BIR Exam	BIR BK	Remarks
			ATPL	CPL	ATPL/IR	ATPL	CPL					
(01)		State that the volume percentage of the gases in ambient air will remain constant at all altitudes at which conventional aircraft operate.	X	X	X	X	X	X				
<b>040 02 01 02</b>		<b>Respiratory and circulatory system</b>										
(01)		List the main components of the respiratory system and their function.	X	X	X	X	X	X				
(02)		Identify the different volumes of air in the lungs and state the normal respiratory rate.	X	X	X	X	X	X			1	
(03)		Explain the role of carbon dioxide in the control and regulation of respiration.	X	X	X	X	X	X			1	
(04)		Describe the basic processes of external respiration and internal respiration.	X	X	X	X	X	X				
(05)		List the factors that determine pulse rate.	X	X	X	X	X	X				
(06)		Name the major components of the circulatory system and describe their function.	X	X	X	X	X	X				
(07)		State the values for a normal pulse rate and the average cardiac output (heart rate × stroke volume) of an adult at rest.	X	X	X	X	X	X				
(08)		Define 'systolic' and 'diastolic' blood pressure.	X	X	X	X	X	X				
(09)		State the normal blood pressure ranges and units of measurement.	X	X	X	X	X	X				
(10)		List the main constituents of blood and describe their functions.	X	X	X	X	X	X				

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Syllabus reference	BK	Syllabus details and associated Learning Objectives	Aeroplane		Helicopter			IR	CB-IR(A)	BIR Exam	BIR BK	Remarks
			ATPL	CPL	ATPL/IR	ATPL	CPL					
(11)		Stress the function of haemoglobin in the circulatory system.	X	X	X	X	X	X				
(12)		Define 'anaemia' and state its common causes.	X	X	X	X	X	X				
(13)		Indicate the effect of increasing altitude on haemoglobin oxygen saturation.	X	X	X	X	X	X			1	
		<b>Hypertension and hypotension</b>										
(14)		Define 'hypertension' and 'hypotension'.	X	X	X	X	X	X				
(15)		List the effects that high and low blood pressure will have on some normal functions of the human body.	X	X	X	X	X	X				
(16)		State that both hypotension and hypertension may disqualify a pilot from obtaining medical clearance to fly.	X	X	X	X	X	X				
(17)		List the factors which can lead to hypertension for an individual.	X	X	X	X	X	X				
(18)		State the corrective actions that may be taken to reduce high blood pressure.	X	X	X	X	X	X				
(19)		Stress that hypertension is the major factor of strokes in the general population.	X	X	X	X	X	X				
		<b>Coronary artery disease</b>										
(20)		Differentiate between 'angina' and 'heart attack'.	X	X	X	X	X	X				
(21)		Explain the major risk factors for coronary disease.	X	X	X	X	X	X				
(22)		State the role physical exercise plays in reducing the chances of developing coronary disease.	X	X	X	X	X	X				

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Syllabus reference	BK	Syllabus details and associated Learning Objectives	Aeroplane		Helicopter			IR	CB-IR(A)	BIR Exam	BIR BK	Remarks
			ATPL	CPL	ATPL/IR	ATPL	CPL					
		<b>Hypoxia</b>										
(23)		Define the two major forms of hypoxia (hypoxic and anaemic), and the common causes of both.	X	X	X	X	X	X				
(24)		State the symptoms of hypoxia.	X	X	X	X	X	X			1	
(25)		State that healthy people are able to compensate for altitudes up to approximately 10 000–12 000 ft.	X	X	X	X	X	X				
(26)		Name the three physiological thresholds and allocate the corresponding altitudes for each of them: — reaction threshold (7 000 ft); — disturbance threshold (10–12 000 ft); and — critical threshold (22 000 ft).	X	X	X	X	X	X				
(27)		State the altitude at which short-term memory begins to be affected by hypoxia.	X	X	X	X	X	X			1	
(28)		Define the terms ‘time of useful consciousness’ (TUC) and ‘effective performance time’ (EPT).	X	X	X	X	X	X				
(29)		State that TUC varies among individuals, but the approximate values for a person seated (at rest) are: — 20 000 ft      30 min — 30 000 ft      1–2 min — 35 000 ft      30–90 s — 40 000 ft      15–20 s	X	X	X	X	X	X				
(30)		List the factors that determine the severity of hypoxia.	X	X	X	X	X	X				

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Syllabus reference	BK	Syllabus details and associated Learning Objectives	Aeroplane		Helicopter			IR	CB-IR(A)	BIR Exam	BIR BK	Remarks
			ATPL	CPL	ATPL/IR	ATPL	CPL					
(31)		State the equivalent altitudes when breathing ambient air and 100 % oxygen at mean sea level (MSL) and at approximately 10 000, 30 000 and 40 000 ft.	X	X	X	X	X	X				
		<b>Hyperventilation</b>										
(32)		Describe the role of carbon dioxide in hyperventilation.	X	X	X	X	X	X				
(33)		Define the term 'hyperventilation'.	X	X	X	X	X	X				
(34)		List the factors that cause hyperventilation.	X	X	X	X	X	X				
(35)		State that hyperventilation may be caused by psychological or physiological reasons.	X	X	X	X	X	X				
(36)		List the signs and symptoms of hyperventilation.	X	X	X	X	X	X				
(37)		List the measures which may be taken to counteract hyperventilation: breath slowly, close one opening of the nose, speak loudly, place a paper bag over nose and mouth.	X	X	X	X	X	X				
		<b>Decompression sickness/illness</b>										
(38)		State the normal range of cabin pressure altitude in pressurised commercial air transport aircraft and describe its protective function for aircrew and passengers.	X	X	X	X	X	X				
(39)		List the vital actions the crew has to perform when cabin pressurisation is lost (oxygen mask on, emergency descent, land as soon as possible, and no	X	X	X	X	X	X				



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Syllabus reference	BK	Syllabus details and associated Learning Objectives	Aeroplane		Helicopter			IR	CB-IR(A)	BIR Exam	BIR BK	Remarks
			ATPL	CPL	ATPL/IR	ATPL	CPL					
		further flight for the next minimum 24 hours). State that decompression sickness symptoms can occur up to 24 hours later.										
(40)		Identify the causes of decompression sickness in flight operation.	X	X	X	X	X	X				
(41)		State how decompression sickness can be prevented.	X	X	X	X	X	X				
(42)		List the symptoms of decompression sickness (bends, creeps, chokes, staggers).	X	X	X	X	X	X				
(43)		Indicate how decompression sickness may be treated.	X	X	X	X	X	X				
(44)		Define the hazards of diving and flying, and give the recommendations associated with these activities.	X	X	X	X	X	X			1	
		<b>Acceleration</b>										
(45)		Define 'linear acceleration' and 'angular acceleration'.	X	X	X	X	X	X	X	1		
(46)		Describe the effects of z-acceleration on the circulation and blood volume distribution.	X	X	X	X	X	X		1		
(47)		List magnitude, duration and onset as factors that determine the effects of acceleration on the human body.	X	X	X	X	X	X	X	1		
(48)		List the effects of positive acceleration with respect to type, sequence and corresponding G-load.	X	X	X	X	X	X		1		
		<b>Carbon monoxide</b>										

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Syllabus reference	BK	Syllabus details and associated Learning Objectives	Aeroplane		Helicopter			IR	CB-IR(A)	BIR Exam	BIR BK	Remarks
			ATPL	CPL	ATPL/IR	ATPL	CPL					
(49)		State how carbon monoxide is produced.	X	X	X	X	X	X		1		
(50)		State how the presence of carbon monoxide in the blood affects the distribution of oxygen.	X	X	X	X	X	X				
(51)		List the signs and symptoms of carbon-monoxide poisoning.	X	X	X	X	X	X		1		
(52)		Explain immediate countermeasures on suspicion of carbon-monoxide poisoning and how poisoning can be treated later on the ground.	X	X	X	X	X	X		1		
<b>040 02 01 03</b>		<b>High-altitude environment</b>										
(01)		State how an increase in altitude may change the proportion of ozone in the atmosphere and that aircraft can be equipped with special ozone removers.	X									
		<b>Radiation</b>										
(02)		State the sources of radiation at high altitude.	X									
(03)		List the effects of excessive exposure to radiation.	X									
		<b>Humidity</b>										
(04)		List the factors that affect the relative humidity of both the atmosphere and cabin air.	X									
(05)		List the effects of low humidity on human body to be spurious thirst, dry eyes, skin and mucous membranes, and indicate measures that can be	X									

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Syllabus reference	BK	Syllabus details and associated Learning Objectives	Aeroplane		Helicopter			IR	CB-IR(A)	BIR Exam	BIR BK	Remarks
			ATPL	CPL	ATPL/IR	ATPL	CPL					
		taken: drinking water, using eye drops and aqueous creams.										
<b>040 02 02 00</b>		<b>People and the environment: the sensory system</b>										
<b>040 02 02 01</b>		<b>The different senses</b>										
(01)		List the different senses.	X	X	X	X	X	X	X		1	
<b>040 02 02 02</b>		<b>Central, peripheral and autonomic nervous system</b>										
(01)		Define the term 'sensory threshold'.	X	X	X	X	X	X				
(02)		Define the term 'sensitivity', especially in the context of vision.	X	X	X	X	X	X				
(03)		Give examples of sensory adaptation.	X	X	X	X	X	X				
(04)		Define the term 'habituation' and state its implication for flight safety.	X	X	X	X	X	X				
<b>040 02 02 03</b>		<b>Vision</b>										
		<b>Functional anatomy</b>										
(01)		Name the most important parts of the eye and the pathway to the visual cortex.	X	X	X	X	X					
(02)		State the basic functions of the parts of the eye.	X	X	X	X	X	X		1		
(03)		Define 'accommodation'.	X	X	X	X	X	X				
(04)		Distinguish between the functions of the rod and cone cells.	X	X	X	X	X	X				
(05)		Describe the distribution of rod and cone cells in the retina and explain their relevance to vision.	X	X	X	X	X	X				
		<b>The fovea (fovea centralis) and peripheral vision</b>										

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Syllabus reference	BK	Syllabus details and associated Learning Objectives	Aeroplane		Helicopter			IR	CB-IR(A)	BIR Exam	BIR BK	Remarks
			ATPL	CPL	ATPL/IR	ATPL	CPL					
(06)		Explain the terms 'visual acuity', 'visual field', 'central vision', 'peripheral vision' and 'the fovea', and explain their function in the process of vision.	X	X	X	X	X	X				
(07)		List the factors that may degrade visual acuity and the importance of 'lookout'.	X	X	X	X	X	X				
(08)		State the limitations of night vision and the different scanning techniques at both night and day.	X	X	X	X	X	X				
(09)		State the time necessary for the eye to adapt both to bright light and the dark.	X	X	X	X	X	X		1		
(10)		State the effect of hypoxia, smoking and altitude in excess of 5 000 ft on night vision.	X	X	X	X	X	X				
(11)		Explain the nature of colour blindness.	X	X	X	X	X	X				
		<b><i>Binocular and monocular vision</i></b>										
(12)		Distinguish between monocular and binocular vision.	X	X	X	X	X	X				
(13)		Explain the basis of depth perception and its relevance to flight performance.	X	X	X	X	X	X				
(14)		List the possible monocular cues for depth perception.	X	X	X	X	X	X				
(15)		State that for high-energy blue light and UV rays, sunglasses can prevent damage to the retina.	X	X	X	X	X	X				
		<b><i>Defective vision</i></b>										
(16)		Explain long-sightedness, short-sightedness and astigmatism.	X	X	X	X	X	X				

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Syllabus reference	BK	Syllabus details and associated Learning Objectives	Aeroplane		Helicopter			IR	CB-IR(A)	BIR Exam	BIR BK	Remarks
			ATPL	CPL	ATPL/IR	ATPL	CPL					
(17)		List the causes of and the precautions that may be taken to reduce the probability of vision loss due to: — presbyopia; — cataract; — glaucoma.	X	X	X	X	X	X				
(18)		List the types of sunglasses that could cause perceptual problems in flight.	X	X	X	X	X	X				
(19)		List the measures that may be taken to protect oneself from flash blindness.	X	X	X	X	X	X				
(20)		State the possible problems associated with contact lenses.	X	X	X	X	X	X				
(21)		State the current rules/regulations governing the wearing of corrective spectacles and contact lenses when operating as a pilot.	X	X	X	X	X	X				
(22)		Explain the significance of the 'blind spot' on the retina in detecting other traffic in flight.	X	X	X	X	X	X				
<b>040 02 02 04</b>		<b>Hearing</b>										
		Descriptive and functional anatomy										
(01)		State the basic parts and functions of the outer, the middle and the inner ear.	X	X	X	X	X	X				
(02)		Differentiate between the functions of the vestibular apparatus and the cochlea in the inner ear.	X	X	X	X	X	X				
		<b>Hearing loss</b>										
(03)		Define the main causes of the following hearing defects/loss: — 'conductive deafness';	X	X	X	X	X	X				

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Syllabus reference	BK	Syllabus details and associated Learning Objectives	Aeroplane		Helicopter			IR	CB-IR(A)	BIR Exam	BIR BK	Remarks
			ATPL	CPL	ATPL/IR	ATPL	CPL					
		— 'noise-induced hearing loss' (NIHL); — 'presbycusis'.										
(04)		Summarise the effects of environmental noise on hearing.	X	X	X	X	X	X				
(05)		State the decibel level of received noise that will cause NIHL.	X	X	X	X	X	X				
(06)		Identify the potential occupational risks that may cause hearing loss.	X	X	X	X	X	X				
(07)		List the main sources of hearing loss in the flying environment.	X	X	X	X	X	X				
(08)		List the precautions that may be taken to reduce the probability of onset of hearing loss.	X	X	X	X	X	X				
<b>040 02 02 05</b>		<b>Equilibrium</b>										
		<b>Functional anatomy</b>										
(01)		List the main elements of the vestibular apparatus.	X	X	X	X	X	X		1		
(02)		State the functions of the vestibular apparatus on the ground and in flight.	X	X	X	X	X	X		1		
(03)		Distinguish between the component parts of the vestibular apparatus in the detection of linear and angular acceleration as well as on gravity.	X	X	X	X	X	X		1		
(04)		Explain how the semicircular canals are stimulated.	X	X	X	X	X	X			1	
		<b>Motion sickness</b>										
(05)		Describe air sickness and its accompanying symptoms.	X	X	X	X	X	X	X	1		

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Syllabus reference	BK	Syllabus details and associated Learning Objectives	Aeroplane		Helicopter			IR	CB-IR(A)	BIR Exam	BIR BK	Remarks
			ATPL	CPL	ATPL/IR	ATPL	CPL					
(06)		List the causes of air sickness.	X	X	X	X	X	X	X	1		
(07)		Describe the necessary actions to be taken to counteract the symptoms of air sickness.	X	X	X	X	X	X		1		
<b>040 02 02 06</b>		<b>Integration of sensory inputs</b>										
(01)		State the interaction between vision, equilibrium, proprioception and hearing to obtain spatial orientation in flight.	X	X	X	X	X	X	X	1		
(02)		Define the term 'illusion'.	X	X	X	X	X	X	X	1		
(03)		Give examples of visual illusions based on shape constancy, size constancy, aerial perspective, atmospheric perspective, the absence of focal or ambient cues, autokinesis, vectional false horizons, field myopia, and surface planes.	X	X	X	X	X	X	X	1		
(04)		Relate these illusions to problems that may be experienced in flight and identify the danger attached to them.	X	X	X	X	X	X	X	1		
(05)		List approach and landing illusions for slope of the runway, black-hole approach, and terrain around runway, and state the danger involved with recommendations to avoid or counteract the problems with high or low approach or flare at the wrong time.	X	X	X	X	X	X	X	1		
(06)		State the problems associated with flickering lights (strobe lights, anti-collision lights, propellers and rotors under certain light conditions, etc.).	X	X	X	X	X	X	X	1		

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Syllabus reference	BK	Syllabus details and associated Learning Objectives	Aeroplane		Helicopter			IR	CB-IR(A)	BIR Exam	BIR BK	Remarks
			ATPL	CPL	ATPL/IR	ATPL	CPL					
(07)		Describe vestibular illusions caused by the angular accelerations (the Leans, Coriolis) and linear accelerations (somatogravic, G-effect).	X	X	X	X	X	X	X	1		
(08)		Relate the above-mentioned vestibular illusions to problems encountered in flight and state the dangers involved.	X	X	X	X	X	X	X	1		
(09)		State that the 'seat-of-the-pants' sense is completely unreliable when visual contact with the ground is lost or when flying in instrument meteorological conditions (IMC) or with a poor visual horizon.	X	X	X	X	X	X	X	1		
(10)		Differentiate between vertigo, Coriolis effect, and spatial disorientation.	X	X	X	X	X	X	X	1		
(11)		List the measures to prevent or overcome spatial disorientation.	X	X	X	X	X	X	X	1		
<b>040 02 03 00</b>		<b>Health and hygiene</b>										
<b>040 02 03 01</b>		<b><i>Intentionally left blank</i></b>										
<b>040 02 03 02</b>		<b><i>Body rhythm and sleep</i></b>										
(01)		Name some internal body rhythms and their relevance to sleep. Explain that the most important of which is body temperature.	X	X	X	X						
(02)		Explain the term 'circadian rhythm'.	X	X	X	X	X					
(03)		State the approximate duration of a 'free-running' rhythm.	X	X	X	X	X					
(04)		Explain the significance of the 'internal clock' in regulating the normal circadian rhythm.	X	X	X	X	X					



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Syllabus reference	BK	Syllabus details and associated Learning Objectives	Aeroplane		Helicopter			IR	CB-IR(A)	BIR Exam	BIR BK	Remarks
			ATPL	CPL	ATPL/IR	ATPL	CPL					
(05)		State the effect of the circadian rhythm of body temperature on an individual's performance standard and on an individual's sleep patterns.	X	X	X	X	X					
(06)		List and describe the stages of a sleep cycle.	X	X	X	X	X					
(07)		Differentiate between rapid eye movement (REM) and non-REM sleep.	X	X	X	X	X					
(08)		Explain the function of sleep and describe the effects of insufficient sleep on performance.	X	X	X	X	X					
(09)		Explain the simple calculations for the sleep/wake credit/debit situation.	X	X	X	X	X					
(10)		Explain how sleep debit can become cumulative.	X	X	X	X	X					
(11)		State the time formula for the adjustment of body rhythms to the new local time scale after crossing time zones.	X	X	X	X	X					
(12)		State the problems caused by circadian dysrhythmia (jet lag) with regard to an individual's performance and sleep.	X	X	X	X	X					
(13)		Differentiate between the effects of westbound and eastbound travel.	X	X	X	X	X					
(14)		Explain the interactive effects of circadian rhythm and vigilance on a pilot's performance during flight as the duty day elapses.	X	X	X	X	X					
(15)		Describe the main effects of lack of sleep on an individual's performance.	X	X	X	X	X					

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Syllabus reference	BK	Syllabus details and associated Learning Objectives	Aeroplane		Helicopter			IR	CB-IR(A)	BIR Exam	BIR BK	Remarks
			ATPL	CPL	ATPL/IR	ATPL	CPL					
(16)		List the possible strategies to cope with jet lag.	X	X	X	X	X					
<b>040 02 03 03</b>		<b>Problem areas for pilots</b>										
		<b>Common minor ailments</b>										
(01)		State the role of the Eustachian tube in equalising pressure between the middle ear and the environment.	X	X	X	X	X	X				
(02)		State that the in-flight environment may increase the severity of symptoms which may be minor while on the ground.	X	X	X	X	X	X				
(03)		List the negative effects of suffering from colds or flu on flight operations especially with regard to the middle ear, the sinuses, and the teeth.	X	X	X	X	X	X				
(04)		State when a pilot should seek medical advice from an aeromedical examiner (AME) or aeromedical centre (AeMC).	X	X	X	X	X	X				
(05)		Describe the measures to prevent or clear problems due to pressure changes during flight.	X	X	X	X	X	X				
		<b>Entrapped gases and barotrauma</b>										
(06)		Define 'barotrauma'.	X	X	X	X	X	X				
(07)		Differentiate between otic, sinus, gastrointestinal and aerodontalgia (of the teeth) barotraumas and explain avoidance strategies.	X	X	X	X	X	X				
(08)		Explain why the effects of otic barotrauma can be worse in the descent.	X	X	X	X	X	X				
		<b>Gastrointestinal upsets</b>										

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			ATPL	CPL	ATPL/IR	ATPL	CPL					
(09)		State the effects of gastrointestinal upsets that may occur during flight.	X	X	X	X	X	X				
(10)		List the precautions that should be observed to reduce the occurrence of gastrointestinal upsets.	X	X	X	X	X	X				
(11)		Indicate the major sources of gastrointestinal upsets.	X	X	X	X	X	X				
		<b>Obesity</b>										
(12)		Define 'obesity'.	X	X	X	X	X	X				
(13)		State the following harmful effects obesity can cause: — possibility of developing coronary problems; — increased chances of developing diabetes; — reduced ability to withstand G-forces; — development of problems with the joints of the limbs; — general circulatory problems; — reduced ability to cope with hypoxia or decompression sickness; — sleep apnoea.	X	X	X	X	X	X				
(14)		Describe the problems associated with Type 2 (mostly adult) diabetes: — risk factors; — insulin resistance; — complications (vascular, neurological) and the consequences for the medical licence;	X	X	X	X	X	X				

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			ATPL	CPL	ATPL/IR	ATPL	CPL					
		— pilots are not protected from Type 2 diabetes more than other people.										
(15)		Describe the typical back problems (un-specific back pain, slipped disc) that pilots have. Explain also the ways of preventing and treating these problems: — good sitting posture; — lumbar support; — good physical condition; — in-flight exercise, if possible; — physiotherapy.	X	X	X	X	X	X				
		<b>Food hygiene</b>										
(16)		Stress the importance of and methods to be adopted by aircrew, especially when travelling abroad, to avoid contaminated food and liquids.	X	X	X	X	X	X				
(17)		List the major contaminating sources in foodstuffs.	X	X	X	X	X	X				
(18)		State the major constituents of a healthy diet.	X	X	X	X	X	X				
(19)		State the measure to avoid hypoglycaemia.	X	X	X	X	X	X				
(20)		State the importance of adequate hydration.	X	X	X	X	X	X				
		<b>Tropical climates</b>										
(21)		List the problems associated with operating in tropical climates.	X	X	X	X	X					

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			ATPL	CPL	ATPL/IR	ATPL	CPL					
(22)		State the possible causes/sources of incapacitation in tropical countries with reference to: — standards of hygiene; — quality of water supply; — insect-borne diseases; — parasitic worms; — rabies or other diseases that may be spread through contact with animals; — sexually transmitted diseases.	X	X	X	X	X					
(23)		State the precautions to be taken to reduce the risks of developing problems in tropical areas.	X	X	X	X	X					
		<b>Infectious diseases</b>										
(24)		State the major infectious diseases that may severely incapacitate or kill individuals.	X	X	X	X	X	X				
(25)		State the precautions that must be taken to ensure that disease-carrying insects are not transported between areas.	X	X	X	X	X	X				
<b>040 02 03 04</b>		<b>Intoxication</b>										
		<b>Tobacco</b>										
(01)		State the harmful effects of tobacco on: — the respiratory system; — the cardiovascular system; — the ability to resist hypoxia; — the ability to withstand G-forces;	X	X	X	X	X	X			1	

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			ATPL	CPL	ATPL/IR	ATPL	CPL					
		— night vision.										
		<b>Caffeine</b>										
(02)		Indicate the level of caffeine dosage at which performance is degraded.	X	X	X	X	X	X				
(03)		Besides coffee, indicate other beverages containing caffeine.	X	X	X	X	X	X				
		<b>Alcohol</b>										
(04)		State the maximum acceptable limit of alcohol for flight crew according to the applicable regulations.	X	X	X	X	X	X				
(05)		State the effects of alcohol consumption on: — the ability to reason; — inhibitions and self-control; — vision; — the sense of balance and sensory illusions; — sleep patterns; — hypoxia.	X	X	X	X	X	X				
(06)		State the effects alcohol may have if consumed together with other drugs.	X	X	X	X	X	X				
(07)		List the signs and symptoms of alcoholism.	X	X	X	X	X	X				
(08)		List the factors that may be associated with the development of alcoholism.	X	X	X	X	X	X				
(09)		Define the 'unit' of alcohol and state the approximate elimination rate from the blood.	X	X	X	X	X	X				

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			ATPL	CPL	ATPL/IR	ATPL	CPL					
(10)		State the maximum daily and weekly intake of units of alcohol which may be consumed without causing damage to the organs and systems of the human body.	X	X	X	X	X	X				
(11)		Discuss the actions that might be taken if a crew member is suspected of being an alcoholic.	X		X	X						
		<b><i>Prescription and non-prescription drugs and self-medication</i></b>										
(12)		State the dangers associated with the use of non-prescription drugs.	X	X	X	X	X	X			1	
(13)		State the side effects of common non-prescription drugs used to treat colds, flu, hay fever and other allergies, especially medicines containing antihistamine preparations.	X	X	X	X	X	X			1	
(14)		Interpret the rules relevant to using (prescription or non-prescription) drugs that the pilot has not used before.	X	X	X	X	X	X			1	
(15)		Interpret the general rule that 'if a pilot is so unwell that they require any medication, then they should consider themselves unfit to fly'.	X	X	X	X	X	X			1	
		<b><i>Toxic materials</i></b>										
(16)		List those materials present in an aircraft which may, when uncontained, cause severe health problems.	X	X	X	X	X	X				
(17)		List those aircraft-component parts which if burnt may give off toxic fumes.	X	X	X	X	X	X				

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			ATPL	CPL	ATPL/IR	ATPL	CPL					
(18)		Describe a fume event and the possible incapacitating effects on those exposed to it.	X	X	X	X	X	X				
<b>040 02 03 05</b>		<b><i>Incapacitation in flight</i></b>										
(01)		State that incapacitation is most dangerous when its onset is insidious.	X	X	X	X	X	X				
(02)		List the major causes of in-flight incapacitation.	X	X	X	X	X	X				
(03)		State the importance of crew to be able to recognise and promptly react upon incapacitation of other crew members, should it occur in flight.	X		X	X						
(04)		Explain methods and procedures to cope with incapacitation in flight.	X	X	X	X	X	X				
<b>040 03 00 00</b>		<b>BASIC AVIATION PSYCHOLOGY</b>										
<b>040 03 01 00</b>		<b>Human information processing</b>										
<b>040 03 01 01</b>		<b><i>Attention and vigilance</i></b>										
(01)		Differentiate between 'attention' and 'vigilance'.	X	X	X	X	X	X				
(02)		Differentiate between 'selective' and 'divided' attention.	X	X	X	X	X	X				
(03)		Define 'hypovigilance'.	X	X	X	X	X	X				
(04)		Identify the factors that may affect the state of vigilance.	X	X	X	X	X	X				
(05)		List the factors that may forestall hypovigilance during flight.	X	X	X	X	X	X				
(06)		Indicate the signs of reduced vigilance.	X	X	X	X	X	X				
(07)		List the factors that affect a person's level of attention.	X	X	X	X	X	X				



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			ATPL	CPL	ATPL/IR	ATPL	CPL					
<b>040 03 01 02</b>		<b>Perception</b>										
(01)		Name the basis of the perceptual process.	X	X	X	X	X	X				
(02)		Describe the mechanism of perception ('bottom-up'/'top-down' process).	X	X	X	X	X	X				
(03)		Illustrate why perception is subjective and state the relevant factors that influence interpretation of perceived information.	X	X	X	X	X	X				
(04)		Describe some basic perceptual illusions.	X	X	X	X	X	X				
(05)		Illustrate some basic perceptual concepts.	X	X	X	X	X	X				
(06)		Give examples where perception plays a decisive role in flight safety.	X	X	X	X	X	X				
(07)		Stress how persuasive and believable mistaken perception can manifest itself both for an individual and a group.	X	X	X	X	X	X				
<b>040 03 01 03</b>		<b>Memory</b>										
(01)		Explain the link between the types of memory (to include sensory, working/short-term and long-term memory).	X	X	X	X	X	X				
(02)		Describe the differences between the types of memory in terms of capacity and retention time.	X	X	X	X	X	X				
(03)		Justify the importance of sensory-store memories in processing information.	X	X	X	X	X	X				
(04)		State the average maximum number of separate items that may be held in working memory ( $5 \pm 2$ ).	X	X	X	X	X	X				

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			ATPL	CPL	ATPL/IR	ATPL	CPL					
(05)		Stress how interruption can affect short-term/working memory.	X	X	X	X	X	X				
(06)		Give examples of items that are important for pilots to hold in working memory during flight.	X	X	X	X	X	X				
(07)		Describe how the capacity of the working-memory store may be increased.	X	X	X	X	X	X				
(08)		State the subdivisions of long-term memory and give examples of their content.	X	X	X	X	X	X				
(09)		Explain that skills are kept primarily in the long-term memory.	X	X	X	X	X	X				
(10)		Describe amnesia and how it affects memory.	X	X	X	X	X	X				
(11)		Name the common problems with both the long- and short-term memories and the best methods to try to counteract them.	X	X	X	X	X	X				
<b>040 03 01 04</b>		<b>Response selection</b>										
		<b>Learning principles and techniques</b>										
(01)		Explain and distinguish between the following basic forms of learning: — classic and operant conditioning (behaviouristic approach); — learning by insight (cognitive approach); — learning by imitating (modelling).	X	X	X	X	X	X				
(02)		Recognise pilot-related examples as behaviouristic, cognitive or modelling forms of learning.	X	X	X	X	X	X				

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			ATPL	CPL	ATPL/IR	ATPL	CPL					
(03)		State the factors that are necessary for and promote the quality of learning: — intrinsic motivation; — good mental health; — rehearsals for improvement of memory; — consciousness; — vigilance; — application in practical exercises.	X	X	X	X	X	X				
(04)		Explain ways to facilitate the memorisation of information with the following learning techniques: — mnemonics; — mental training.	X	X	X	X	X	X			1	
(05)		Describe the advantage of planning and anticipation of future actions: — define the term 'skills'; — state the three phases of learning a skill (Anderson: cognitive, associative and autonomous phase).	X	X	X	X	X	X			1	
(06)		Explain the term 'motor programme' or 'mental schema'.	X	X	X	X	X	X				
(07)		Describe the advantages and disadvantages of mental schemas.	X	X	X	X	X	X				
(08)		Explain the Rasmussen model which describes the guidance of a pilot's behaviour in different situations.	X	X	X	X	X	X				
(09)		State the possible problems or risks associated with skill-, rule- and knowledge-based behaviour.	X	X	X	X	X	X				

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			ATPL	CPL	ATPL/IR	ATPL	CPL					
		<b>Motivation</b>										
(10)		Define 'motivation'.	X	X	X	X	X	X				
(11)		Explain the relationship between motivation and learning.	X	X	X	X	X	X				
(12)		Explain the problems of over-motivation, especially in the context of the extreme need to achieve.	X	X	X	X	X	X				
<b>040 03 02 00</b>		<b>Human error and reliability</b>										
<b>040 03 02 01</b>		<b>Reliability of human behaviour</b>										
(01)		Name and explain the factors that influence human reliability.	X	X	X	X	X	X				
<b>040 03 02 02</b>		<b>Mental models and situation awareness</b>										
(01)		Define the term 'situation awareness'.	X	X	X	X	X	X	X		1	
(02)		List the cues that indicate loss of situation awareness and name the steps to regain it.	X	X	X	X	X	X	X	1		
(03)		List the factors that influence one's situation awareness both positively and negatively, and stress the importance of situation awareness in the context of flight safety.	X	X	X	X	X	X	X	1		
(04)		Define the term 'mental model' in relation to a surrounding complex situation.	X	X	X	X	X	X	X	1		
(05)		Describe the advantages/disadvantages of mental models.	X	X	X	X	X	X	X	1		
(06)		Explain the relationship between personal 'mental models' and the creation of cognitive illusions.	X	X	X	X	X	X	X	1		
<b>040 03 02 03</b>		<b>Theory and model of human error</b>										

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			ATPL	CPL	ATPL/IR	ATPL	CPL					
(01)		Explain the concept of the 'error chain'.	X	X	X	X	X	X	X	1		
(02)		Differentiate between an isolated error and an error chain.	X	X	X	X	X	X	X	1		
(03)		Distinguish between the main forms/types of errors (i.e. slips, faults, omissions and violations).	X	X	X	X	X	X	X	1		
(04)		Discuss the above errors and their relevance in flight.	X	X	X	X	X	X	X	1		
(05)		Distinguish between an active and a latent error, and give examples.	X	X	X	X	X	X	X	1		
<b>040 03 02 04</b>		<b>Error generation</b>										
(01)		Distinguish between internal and external factors in error generation.	X	X	X	X	X	X	X	1		
(02)		Identify possible sources of internal error generation.	X	X	X	X	X	X	X	1		
(03)		Define and discuss the two errors associated with motor programmes (action slip and environmental capture).	X	X	X	X	X	X	X	1		
(04)		List the three main sources of external error generation in the flight crew compartment.	X	X	X	X	X	X	X	1		
(05)		Give examples to illustrate the following factors in external error generation in the flight crew compartment: — ergonomics; — economics; — social environment.	X	X	X	X	X	X	X	1		
(06)		Name the major goals in the design of human-centred human-machine interfaces.	X	X	X	X	X	X	X	1		

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			ATPL	CPL	ATPL/IR	ATPL	CPL					
(07)		Define the term 'error tolerance'.	X	X	X	X	X	X	X	1		
(08)		List and describe the strategies that are used to reduce human error.	X	X	X	X	X	X	X	1		
(09)		Describe the advantage of planning and the anticipation of future actions.	X	X	X	X	X	X	X			
<b>040 03 03 00</b>		<b>Decision-making</b>										
<b>040 03 03 01</b>		<b>Decision-making concepts</b>										
(01)		Define the terms 'deciding' and 'decision-making'.	X	X	X	X	X	X	X		1	
(02)		Describe the major factors on which decision-making should be based during the course of a flight.	X	X	X	X	X	X	X		1	
(03)		Describe the main human attributes with regard to decision-making.	X	X	X	X	X	X	X		1	
(04)		Discuss the nature of bias and its influence on the decision-making process.	X	X	X	X	X	X	X		1	
(05)		Describe the main error sources and limits in an individual's decision-making mechanism.	X	X	X	X	X	X	X		1	
(06)		State the factors upon which an individual's risk assessment is based.	X	X	X	X	X	X	X		1	
(07)		Explain the relationship between risk assessment, commitment and pressure of time in decision-making strategies.	X	X	X	X	X	X	X		1	
(08)		Explain the risks associated with dispersion or channelised attention during the application of procedures requiring a high workload within a short time frame (e.g. a go-around).	X	X	X	X	X	X			1	

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			ATPL	CPL	ATPL/IR	ATPL	CPL					
(09)		Describe the positive and negative influences exerted by other group members on an individual's decision-making process (risky shift).	X	X	X	X	X	X	X		1	
(10)		Explain the general idea behind the creation of a model for decision-making based upon: — definition of the aim; — collection of information; — risk assessment; — development of options; — evaluation of options; — decision; — implementation; — consequences; — review and feedback.	X	X	X	X	X	X	X		1	
<b>040 03 04 00</b>		<b>Avoiding and managing errors: cockpit management</b>										
<b>040 03 04 01</b>		<b>Safety awareness</b>										
(01)		Justify the need for being aware of not only one's own performance but that of others before and during a flight and the possible consequences or risks.	X	X	X	X	X	X	X	1		
<b>040 03 04 02</b>		<b>Coordination (multi-crew concepts)</b>										
(01)		Name the objectives of the multi-crew concept.	X		X	X						
(02)		State and explain the elements of multi-crew concepts.	X		X	X						

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			ATPL	CPL	ATPL/IR	ATPL	CPL					
(03)		Describe the concepts of 'standard operating procedures' (SOPs), checklists and crew briefings.	X	X	X	X	X					
(04)		Describe the purpose of and procedure for crew briefings.	X		X	X						
(05)		Describe the purpose of and procedure for checklists.	X	X	X	X	X					
(06)		Describe the function of communication in a coordinated team.	X		X	X						
(07)		Explain the advantages of SOPs.	X	X	X	X	X					
(08)		Explain how SOPs contribute to avoiding, reducing and managing threats and errors.	X	X	X	X	X					
(09)		Explain potential threats of SOPs, for example during company or type conversion (e.g. motor programmes, company culture, hazardous attitudes, developed habits).	X	X	X	X	X					
<b>040 03 04 03</b>		<b>Cooperation</b>										
(01)		Distinguish between cooperation and coercion.	X	X	X	X	X					
(02)		Define the term 'group'.	X	X	X	X	X					
(03)		Illustrate the influence of interdependence in a group.	X	X	X	X	X					
(04)		List the advantages and disadvantages of teamwork.	X	X	X	X	X					
(05)		Explain the term 'synergy'.	X	X	X	X	X					
(06)		Define the term 'cohesion'.	X	X	X	X	X					
(07)		Define the term 'groupthink'.	X	X	X	X	X					



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Syllabus reference	BK	Syllabus details and associated Learning Objectives	Aeroplane		Helicopter			IR	CB-IR(A)	BIR Exam	BIR BK	Remarks
			ATPL	CPL	ATPL/IR	ATPL	CPL					
(08)		State the essential conditions for good teamwork.	X	X	X	X	X					
(09)		Explain the function of role and norm in a group.	X	X	X	X	X					
(10)		Name the different role patterns which occur in a group situation.	X	X	X	X	X					
(11)		Explain how behaviour can be affected by the following factors: — persuasion; — conformity; — compliance; — obedience.	X	X	X	X	X					
(12)		Distinguish between status and role.	X	X	X	X	X					
(13)		Stress the inherent dangers of a situation where there is a mix of role and status within the flight crew compartment.	X	X	X	X	X					
(14)		Explain the terms 'leadership' and 'followership'.	X	X	X	X	X					
(15)		Describe the trans-cockpit authority gradient and its affiliated leadership styles (i.e. autocratic, laissez-faire and synergistic).	X	X	X	X	X					
(16)		Name the most important attributes of a positive leadership style.	X	X	X	X	X					
<b>040 03 04 04</b>		<b>Communication</b>										
(01)		Define the term 'communication'.	X	X	X	X	X	X				
(02)		List the most basic components of interpersonal communication.	X	X	X	X	X	X				

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			ATPL	CPL	ATPL/IR	ATPL	CPL					
(03)		Explain the advantages of in-person two-way communication as opposed to one-way communication.	X	X	X	X	X	X				
(04)		<i>Intentionally left blank</i>										
(05)		Name the importance of non-verbal communication.	X	X	X	X	X	X				
(06)		Describe the general aspects of non-verbal communication.	X	X	X	X	X	X				
(07)		Describe the advantages/disadvantages of implicit and explicit communication.	X	X	X	X	X	X				
(08)		Describe the advantages and possible problems of using 'social' and 'professional' language in high-and low-work-load situations.	X	X	X	X	X	X				
(09)		Name and explain the major obstacles to effective communication.	X	X	X	X	X	X				
(10)		Explain the difference between intrapersonal and interpersonal conflict.	X	X	X	X	X	X				
(11)		Describe the escalation process in human conflict.	X	X	X	X	X	X				
(12)		List the typical consequences of conflicts between crew members.	X	X	X	X	X	X				
(13)		Explain the following terms as part of the communication practice with regard to preventing or resolving conflicts: — inquiry; — active listening; — advocacy; — feedback;	X	X	X	X	X	X				

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			ATPL	CPL	ATPL/IR	ATPL	CPL					
		— metacommunication; — negotiation.										
(14)		Describe the limitations of communication in situations of high workload in the flight crew compartment in view of listening, verbal, non-verbal and visual effects.	X	X	X	X	X	X				
<b>040 03 05 00</b>		<b>Human behaviour</b>										
<b>040 03 05 01</b>		<b><i>Personality, attitude and behaviour</i></b>										
(01)		Describe the factors that determine an individual's behaviour.	X	X	X	X	X	X				
(02)		Define and distinguish between 'personality', 'attitude' and 'behaviour'.	X	X	X	X	X	X				
(03)		State the origin of personality and attitude.	X	X	X	X	X	X				
(04)		State that with behaviour good and bad habits can be formed.	X	X	X	X	X	X				
(05)		Explain how behaviour is generally a product of personality, attitude and the environment to which one was exposed at significant moments (childhood, schooling and training).	X	X	X	X	X	X				
(06)		State that personality differences and selfish attitude may have effects on flight crew performance.	X	X	X	X	X	X				
<b>040 03 05 02</b>		<b><i>Individual differences in personality and motivation</i></b>										
(01)		Describe the individual differences in personality by means of a common trait	X	X	X	X	X	X				

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			ATPL	CPL	ATPL/IR	ATPL	CPL					
		model (e.g. Eysenck's personality factors) and use it to describe today's ideal pilot.										
		<b>Self-concept</b>										
(02)		Define the term 'self-concept' and the role it plays in any change of personality.	X	X	X	X	X	X				
(03)		Explain how a self-concept of under-confidence may lead to an outward show of aggression and self-assertiveness.	X	X	X	X	X	X				
		<b>Self-discipline</b>										
(04)		Define 'self-discipline' and justify its importance for flight safety.	X	X	X	X	X	X				
<b>040 03 05 03</b>		<b>Identification of hazardous attitudes (error proneness)</b>										
(01)		Explain dangerous attitudes in aviation: — anti-authority; — macho; — impulsivity; — invulnerability; — complacency; — resignation.	X	X	X	X	X				1	
(02)		Describe the personality, attitude and behaviour patterns of an ideal crew member.	X	X	X	X	X					
(03)		Summarise how a person's attitude influences their work in the flight crew compartment.	X	X	X	X	X					
<b>040 03 06 00</b>		<b>Human overload and underload</b>										

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			ATPL	CPL	ATPL/IR	ATPL	CPL					
<b>040 03 06 01</b>		<b>Arousal</b>										
(01)		Explain the term 'arousal'.	X	X	X	X	X	X				
(02)		Describe the relationship between arousal and performance.	X	X	X	X	X	X				
(03)		Explain the circumstances under which underload may occur and its possible dangers.	X	X	X	X	X	X			1	
<b>040 03 06 02</b>		<b>Stress</b>										
(01)		Explain the term 'stress' and why stress is a natural human reaction.	X	X	X	X	X	X				
(02)		State that the physiological response to stress is generated by the 'fight or flight' response.	X	X	X	X	X	X				
(03)		Describe the function of the autonomic nervous system (ANS) in stress response.	X	X	X	X	X	X				
(04)		Explain the relationship between arousal and stress.	X	X	X	X	X	X				
(05)		State the relationship between stress and performance.	X	X	X	X	X	X	X			
(06)		State the basic categories of stressors.	X	X	X	X	X	X	X			
(07)		List and discuss the major environmental sources of stress in the flight crew compartment.	X	X	X	X	X	X	X		1	
(08)		Discuss the concept of 'break point' with regard to stress, overload and performance.	X	X	X	X	X	X	X		1	
(09)		Name the principal causes of domestic stress.	X	X	X	X	X	X				

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			ATPL	CPL	ATPL/IR	ATPL	CPL					
(10)		State that the stress experienced as a result of particular demands varies among individuals.	X	X	X	X	X	X				
(11)		Explain the factors that lead to differences in the levels of stress experienced by individuals.	X	X	X	X	X	X	X			
(12)		List the factors that influence the tolerance of stressors.	X	X	X	X	X	X			1	
(13)		State that stress is a result of perceived demands and perceived ability.	X	X	X	X	X	X				
(14)		Explain the relationship between stress and anxiety.	X	X	X	X	X	X	X			
(15)		Describe the effects of anxiety on human performance.	X	X	X	X	X	X	X			
(16)		State the general effect of acute stress on people.	X	X	X	X	X	X	X			
(17)		Describe the relationship between stress, arousal and vigilance.	X	X	X	X	X	X				
(18)		State the general effect of chronic stress and the biological reaction by means of the three stages of the general adaptation syndrome (Selye): alarm, resistance, and exhaustion.	X	X	X	X	X	X				
(19)		Explain the differences between psychological, psychosomatic and somatic stress reactions.	X	X	X	X	X	X				
(20)		Name the typical common physiological and psychological symptoms of human overload.	X	X	X	X	X	X				

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			ATPL	CPL	ATPL/IR	ATPL	CPL					
(21)		Describe the effects of stress on human behaviour.	X	X	X	X	X	X				
(22)		Explain how stress is cumulative and how stress from one situation can be transferred to a different situation.	X	X	X	X	X	X	X	1		
(23)		Explain how successful completion of a stressful task will reduce the amount of stress experienced when a similar situation arises in the future.	X	X	X	X	X	X	X	1		
(24)		Describe the effect of human underload/overload on effectiveness in the flight crew compartment.	X	X	X	X	X	X	X	1		
(25)		List sources and symptoms of human underload.	X	X	X	X	X	X	X	1		
<b>040 03 06 03</b>		<b><i>Intentionally left blank</i></b>										
<b>040 03 06 04</b>		<b><i>Intentionally left blank</i></b>										
<b>040 03 06 05</b>		<b><i>Fatigue and stress management</i></b>										
(01)		Explain the term 'fatigue' and differentiate between the two types of fatigue (short-term and chronic fatigue).	X	X	X	X	X	X				
(02)		Name the causes of short-term and chronic fatigue.	X	X	X	X	X	X				
(03)		Identify the symptoms and describe the effects of fatigue.	X	X	X	X	X	X			1	
(04)		List the strategies that prevent or delay the onset of fatigue and hypovigilance.	X	X	X	X	X	X				
(05)		List and describe strategies for coping with stress factors and stress reactions.	X	X	X	X	X	X				

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			ATPL	CPL	ATPL/IR	ATPL	CPL					
(06)		Distinguish between short-term and long-term methods of stress management.	X	X	X	X	X	X				
(07)		Give examples of short-term methods of stress management.	X	X	X	X	X	X				
(08)		Give examples of long-term methods of coping with stress.	X	X	X	X	X	X				
(09)		Describe the fatigue risk management system (FRMS) as follows: a data-driven means of continuously monitoring and managing fatigue-related safety risks, based upon scientific principles and knowledge as well as operational experience that aims to ensure relevant personnel are performing at adequate levels of alertness.	X	X	X	X	X	X				
<b>040 03 07 00</b>		<b>Advanced cockpit automation</b>										
<b>040 03 07 01</b>		<b>Advantages and disadvantages</b>										
(01)		Compare the two basic concepts of automation: — as per Boeing, where the pilot remains the last operator; — and as per Airbus, where automated systems can correct erroneous pilot action.	X	X	X	X	X	X	X	1		
(02)		Explain the fundamental restrictions of autoflight systems to be lack of creativity in unknown situations, and lack of personal motivation with regard to safety.	X	X	X	X	X	X	X	1		



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			ATPL	CPL	ATPL/IR	ATPL	CPL					
(03)		List the principal strengths and weaknesses of pilot versus autopilot systems to be creativity, decision-making, prioritisation of tasks, safety attitude versus precision, reliability.	X	X	X	X	X	X	X	1		
(04)		Explain the 'ironies of automation': designers' errors due to wrong interpretation of the data, leaving tasks to the pilot that are too complex to automate, loss of manual and cognitive skills of the pilot. State the necessity for regular training flights as one possible countermeasure.	X	X	X	X	X	X	X	1		
(05)		Describe methods to overcome the drawbacks of autoflight systems to be loss of manual flying capabilities, additional workload through programming, risk of slips during programming, and hypovigilance during cruise.	X	X	X	X	X	X	X	1		
<b>040 03 07 02</b>		<b>Automation complacency</b>										
(01)		State the main weaknesses in the monitoring of automatic systems to be hypovigilance during flight, and loss of flying skills.	X	X	X	X	X	X	X			
(02)		Explain some basic flight crew errors and terms that arise with the introduction of automation: — passive monitoring; — blinkered concentration; — confusion; — mode awareness.	X	X	X	X	X	X	X	1		

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			ATPL	CPL	ATPL/IR	ATPL	CPL					
(03)		Explain how the method of call-outs counteracts ineffective monitoring of automatic systems.	X	X	X	X	X	X	X	1		
(04)		Define 'complacency'.	X	X	X	X	X	X	X	1		
<b>040 03 07 03</b>		<b>Working concepts</b>										
(01)		Explain that the potential disadvantages of automation on crew communication are loss of awareness of input errors, flight modes, failure detection, failure comprehension, status of the aircraft and aircraft position.	X		X	X						
(02)		Explain how the negative effects of automation on pilots may be alleviated by degrading to a lower level of automation to recover comprehension of the flight status from VNAV/LNAV to ALT/HDG or even to manual flying.	X	X	X	X	X	X	X	1		
(03)		Interpret the role of automation with respect to flight safety regarding the basic principle of the use of manual versus autoflight in normal operations, frequent changes in the flight profile, and in abnormal situations.	X	X	X	X	X	X	X	1		

## SUBJECT 050 – METEOROLOGY

The operation of an aircraft is affected by the weather conditions within the atmosphere. The pilot should prove that they fulfil the following objectives in order to complete a flight safely in given meteorological conditions.

(1) Training aims

(i) Knowledge. After completion of the training, the pilot should be able to:

- understand the physical processes in the atmosphere;
- interpret the actual and forecast weather conditions in the atmosphere; and
- demonstrate understanding of the meteorological hazards and their effects on aircraft.

(ii) Skills. After completion of the training, the pilot should be able to:

- collect all the weather information which may affect a given flight;
- analyse and evaluate available weather information before flight as well as that collected in flight; and
- resolve any problems presented by the given weather conditions.

Syllabus reference	BK	Syllabus details and associated Learning Objectives	Aeroplane		Helicopter			IR	CB-IR(A)	BIR Exam	BIR BK	Remarks
			ATPL	CPL	ATPL/IR	ATPL	CPL					
050 00 00 00		<b>METEOROLOGY</b>										
050 01 00 00		<b>THE ATMOSPHERE</b>										
050 01 01 00		<b>Composition, extent, vertical division</b>										
050 01 01 01		<i>Structure of the atmosphere</i>										

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Syllabus reference	BK	Syllabus details and associated Learning Objectives	Aeroplane		Helicopter			IR	CB-IR(A)	BIR Exam	BIR BK	Remarks
			ATPL	CPL	ATPL/IR	ATPL	CPL					
(01)		Describe the vertical division of the atmosphere up to flight level (FL) 650, based on the temperature variations with height.	X	X	X	X	X	X	X			
(02)		List the different layers and their main qualitative characteristics up to FL 650.	X	X	X	X	X	X	X			
<b>050 01 01 02</b>		<b>Troposphere</b>										
(01)		Describe the troposphere.	X	X	X	X	X	X	X			
(02)		Describe the main characteristics of the tropopause.	X	X	X	X	X	X	X			
(03)		Describe the proportions of the most important gases in the air in the troposphere.	X	X	X	X	X	X	X			
(04)		Describe the variations of the FL and temperature of the tropopause from the poles to the equator.	X	X	X	X	X	X	X			
(05)		Describe the breaks in the tropopause along the boundaries of the main air masses.	X	X	X	X	X	X	X			
(06)		Indicate the variations of the FL of the tropopause with the seasons and the variations of atmospheric pressure.	X		X	X						
<b>050 01 01 03</b>		<b>Stratosphere</b>										
(01)		Describe the stratosphere up to FL 650.	X									
(02)		Describe that ozone can occur at jet cruise altitudes and that it constitutes a hazard.	X		X	X						
<b>050 01 02 00</b>		<b>Air temperature</b>										

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			ATPL	CPL	ATPL/IR	ATPL	CPL					
<b>050 01 02 01</b>		<b>Definition and units</b>										
(01)		Define 'air temperature'.	X	X	X	X	X	X	X			
(02)	X	List the units of measurement of air temperature used in aviation meteorology (Celsius, Fahrenheit, Kelvin). (Refer to Subject 050 10 01 01)	X	X	X	X	X	X	X			
<b>050 01 02 02</b>		<b>Vertical distribution of temperature</b>										
(01)		Describe the mean vertical distribution of temperature up to FL 650.	X	X	X	X	X	X	X			
(02)		Mention the general causes of the cooling of the air in the troposphere with increasing altitude.	X	X	X	X	X	X	X			
(03)		Calculate the temperature and temperature deviations (in relation to International Standard Atmosphere (ISA)) at specified levels.	X	X	X	X	X	X	X			
<b>050 01 02 03</b>		<b>Transfer of heat</b>										
(01)		Explain how local cooling or warming processes result in transfer of heat.	X	X	X	X	X	X	X			
(02)		Describe radiation.	X	X	X	X	X	X	X			
(03)		Describe solar radiation reaching the Earth.	X	X	X	X	X	X	X			
(04)		Describe the filtering effect of the atmosphere on solar radiation.	X	X	X	X	X	X	X			
(05)		Describe terrestrial radiation.	X	X	X	X	X	X	X			
(06)		Explain how terrestrial radiation is absorbed by some components of the atmosphere.	X	X	X	X	X	X	X			
(07)		Explain the effect of absorption and radiation in connection with clouds.	X	X	X	X	X	X	X			

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			ATPL	CPL	ATPL/IR	ATPL	CPL					
(08)		Explain the process of conduction.	X	X	X	X	X	X	X			
(09)		Explain the role of conduction in the cooling and warming of the atmosphere.	X	X	X	X	X	X	X			
(10)		Explain the process of convection.	X	X	X	X	X	X	X			
(11)		Name the situations in which convection occurs.	X	X	X	X	X	X	X			
(12)		Explain the process of advection.	X	X	X	X	X	X	X			
(13)		Name the situations in which advection occurs.	X	X	X	X	X	X	X			
(14)		Describe the transfer of heat by turbulence.	X	X	X	X	X	X	X			
(15)		Describe the transfer of latent heat.	X	X	X	X	X	X	X			
<b>050 01 02 04</b>		<b>Lapse rates</b>										
(01)		Describe qualitatively and quantitatively the temperature lapse rates of the troposphere (mean value 0.65 °C/100 m or 2 °C/1 000 ft and actual values).	X	X	X	X	X	X	X		1	
<b>050 01 02 05</b>		<b>Development of inversions, types of inversions</b>										
(01)		Describe the development and types of inversions.	X	X	X	X	X	X	X		1	
(02)		Explain the characteristics of inversions and of an isothermal layer concerning stability and vertical motions.	X	X	X	X	X	X	X		1	
(03)		Explain the reasons for the formation of the following inversions:	X	X	X	X	X	X	X	1		

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			ATPL	CPL	ATPL/IR	ATPL	CPL					
		— ground inversion (nocturnal radiation/advection), subsidence inversion, frontal inversion, inversion above friction layer, valley inversion.										
<b>050 01 02 06</b>		<b>Temperature near the Earth's surface, insolation, surface effects, effect of clouds, effect of wind</b>										
(01)		Explain the cooling/warming of the surface of the Earth by radiation.	X	X	X	X	X	X	X			
(02)		Explain the cooling/warming of the air by molecular or turbulent heat transfer to/from the earth or sea surfaces.	X	X	X	X	X	X	X	1		
(03)		Describe qualitatively the influence of the clouds on the cooling and warming of the surface and the air near the surface.	X	X	X	X	X	X	X	1		
(04)		Explain the influence of the wind on the cooling and warming of the air near the surfaces.	X	X	X	X	X	X	X	1		
<b>050 01 03 00</b>		<b>Atmospheric pressure</b>										
<b>050 01 03 01</b>		<b>Barometric pressure, isobars</b>										
(01)		Define 'atmospheric pressure'.	X	X	X	X	X	X	X		1	
(02)	X	List the units of measurement of the atmospheric pressure used in aviation (hPa, inches of mercury). (Refer to Subject 050 10 01 01)	X	X	X	X	X	X	X		1	
(03)	X	Describe the principle of the barometers (mercury barometer, aneroid barometer).	X	X	X	X	X	X				

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			ATPL	CPL	ATPL/IR	ATPL	CPL					
(04)		Define isobars and identify them on surface weather charts.	X	X	X	X	X	X	X		1	
(05)		Define 'high', 'low', 'trough', 'ridge', 'col'.	X	X	X	X	X	X	X		1	
<b>050 01 03 02</b>		<b>Pressure variation with height, contours (isohypses)</b>										
(01)		Explain the pressure variation with height.	X	X	X	X	X	X	X		1	
(02)		Describe quantitatively the variation of the barometric lapse rate. <i>Remark: An approximation of the average value for the barometric lapse rate near mean sea level (MSL) is 30 ft (9 m) per 1 hPa.</i>	X	X	X	X	X	X	X		1	
(03)		State that (under conditions of ISA) pressure is approximately 50 % of MSL at 18 000 ft and density is approximately 50 % of MSL at 22 000 ft and 25 % of MSL at 40 000 ft.	X	X	X	X	X	X	X			
<b>050 01 03 03</b>		<b>Reduction of pressure to QFF (MSL)</b>										
(01)		Define 'QFF'.	X	X	X	X	X	X	X		1	
(02)		Explain the reduction of measured pressure (QFE) to QFF (MSL).	X	X	X	X	X	X	X		1	
(03)		Mention the use of QFF for surface weather charts.	X	X	X	X	X	X	X		1	
<b>050 01 03 04</b>		<b>Relationship between surface pressure centres and pressure centres aloft</b>										
(01)		Illustrate with a vertical cross section of isobaric surfaces the relationship	X	X	X	X	X	X	X		1	



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			ATPL	CPL	ATPL/IR	ATPL	CPL					
		between surface pressure systems and upper-air pressure systems.										
<b>050 01 04 00</b>		<b>Air density</b>										
<b>050 01 04 01</b>		<b><i>Relationship between pressure, temperature and density</i></b>										
(01)		Describe the relationship between pressure, temperature and density.	X	X	X	X	X	X	X	1		
(02)		Describe the vertical variation of the air density in the atmosphere.	X	X	X	X	X	X	X	1		
<b>050 01 05 00</b>		<b>International Standard Atmosphere (ISA)</b>										
<b>050 01 05 01</b>		<b><i>International Standard Atmosphere (ISA)</i></b>										
(01)		Explain the use of standardised values for the atmosphere.	X	X	X	X	X	X	X	1		
(02)		List the main values of the ISA MSL pressure, MSL temperature, the vertical temperature lapse rate up to FL 650, height and temperature of the tropopause.	X	X	X	X	X	X	X	1		
<b>050 01 06 00</b>		<b>Altimetry</b>										
<b>050 01 06 01</b>		<b><i>Terminology and definitions</i></b>										
(01)		Define the following terms and explain how they are related to each other: height, altitude, pressure altitude, FL, pressure level, true altitude, true height, elevation, QNH, QFE, and standard altimeter setting.	X	X	X	X	X	X	X	1		

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Syllabus reference	BK	Syllabus details and associated Learning Objectives	Aeroplane		Helicopter			IR	CB-IR(A)	BIR Exam	BIR BK	Remarks
			ATPL	CPL	ATPL/IR	ATPL	CPL					
(02)		Describe the terms 'transition altitude', 'transition level', 'transition layer', 'terrain clearance', 'lowest usable flight level'.	X	X	X	X	X	X	X			
<b>050 01 06 02</b>		<b>Altimeter settings</b>										
(01)		Name the altimeter settings associated to height, altitude, pressure altitude and FL.	X	X	X	X	X	X	X			
(02)		Describe the altimeter-setting procedures.	X	X	X	X	X	X	X	1		
<b>050 01 06 03</b>		<b>Calculations</b>										
(01)		Calculate the different readings on the altimeter when the pilot uses different settings (QNH, 1013.25, QFE).	X	X	X	X	X	X	X			
(02)		Illustrate with a numbered example the changes of altimeter setting and the associated changes in reading when the pilot climbs through the transition altitude or descends through the transition level.	X	X	X	X	X	X	X			
(03)		Derive the reading of the altimeter of an aircraft on the ground when the pilot uses the different settings.	X	X	X	X	X	X	X			
(04)		Explain the influence of the air temperature on the distance between the ground and the level read on the altimeter and between two FLs.	X	X	X	X	X	X	X	1		
(05)		Explain the influence of pressure areas on true altitude.	X	X	X	X	X	X	X			

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Syllabus reference	BK	Syllabus details and associated Learning Objectives	Aeroplane		Helicopter			IR	CB-IR(A)	BIR Exam	BIR BK	Remarks
			ATPL	CPL	ATPL/IR	ATPL	CPL					
(06)		Determine the true altitude/height for a given altitude/height and a given ISA temperature deviation.	X	X	X	X	X	X	X			
(07)		Calculate the terrain clearance and the lowest usable FL for given atmospheric temperature and pressure conditions.	X	X	X	X	X	X	X			
(08)		State that the 4 %-rule can be used to calculate true altitude from indicated altitude, and also indicated altitude from true altitude (not precise but sufficient due to the approximation of the 4 %-rule.)	X	X	X	X	X	X	X			
		<i>Remark: The following rules should be considered for altimetry calculations:</i> a) <i>All calculations are based on rounded pressure values to the nearest lower hPa.</i> b) <i>The value for the barometric lapse rate between MSL and 700 hPa to be used is 30 ft/hPa as an acceptable approximation of the barometric lapse rate.</i> c) <i>To determine the true altitude/height, the following rule of thumb, called the ‘4 %-rule’, shall be used: the altitude/height changes by 4 % for each 10 °C temperature deviation from ISA.</i> d) <i>If no further information is given, the deviation of the outside-air</i>										

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Syllabus reference	BK	Syllabus details and associated Learning Objectives	Aeroplane		Helicopter			IR	CB-IR(A)	BIR Exam	BIR BK	Remarks
			ATPL	CPL	ATPL/IR	ATPL	CPL					
		<i>temperature from ISA is considered to be constantly the same given value in the whole layer.</i> e) <i>The elevation of the aerodrome has to be taken into account. The temperature correction has to be considered for the layer between the ground and the position of the aircraft.</i>										
<b>050 01 06 04</b>		<b>Effect of accelerated airflow due to topography</b>										
(01)		Describe qualitatively how the effect of accelerated airflow due to topography (the Bernoulli effect) affects altimetry.	X	X	X	X	X	X	X			
<b>050 02 00 00</b>		<b>WIND</b>										
<b>050 02 01 00</b>		<b>Definition and measurement of wind</b>										
<b>050 02 01 01</b>		<b>Definition and measurement</b>										
(01)		Define 'wind' and 'surface wind'.	X	X	X	X	X	X	X			
(02)		State the units of wind directions (degrees true in reports; degrees magnetic from tower) and speed (kt, m/s).	X	X	X	X	X	X	X			
(03)		Describe that the reported wind is an average wind derived from measurements with an anemometer at a height of 10 m over 2 min for local routine and special reports and ATS units, and over 10 min for aerodrome routine meteorological reports (METARs) and aerodrome special meteorological reports (SPECIs).	X	X	X	X	X	X	X			

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Syllabus reference	BK	Syllabus details and associated Learning Objectives	Aeroplane		Helicopter			IR	CB-IR(A)	BIR Exam	BIR BK	Remarks
			ATPL	CPL	ATPL/IR	ATPL	CPL					
<b>050 02 02 00</b>		<b>Primary cause of wind</b>										
<b>050 02 02 01</b>		<b>Primary cause of wind, pressure gradient, Coriolis force, gradient wind</b>										
(01)		Define the term 'horizontal pressure gradient'.	X	X	X	X	X	X	X			
(02)		Explain how the pressure gradient force acts in relation to the pressure gradient.	X	X	X	X	X	X	X			
(03)		Explain how the Coriolis force acts in relation to the wind.	X	X	X	X	X	X	X			
(04)		Explain the development of the geostrophic wind.	X	X	X	X	X	X	X			
(05)		Indicate how the geostrophic wind flows in relation to the isobars/isohypses in the northern and in the southern hemisphere.	X	X	X	X	X	X	X			
(06)		Analyse the effect of changing latitude on the geostrophic wind speed.	X		X	X						
(07)		Explain the gradient wind effect and indicate how the gradient wind differs from the geostrophic wind in cyclonic and anticyclonic circulation.	X	X	X	X	X	X				
<b>050 02 02 02</b>		<b>Variation of wind in the friction layer</b>										
(01)		Describe why and how the wind changes direction and speed with height in the friction layer in the northern and in the southern hemisphere (rule of thumb).	X	X	X	X	X	X	X	1		

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Syllabus reference	BK	Syllabus details and associated Learning Objectives			Aeroplane		Helicopter			IR	CB-IR(A)	BIR Exam	BIR BK	Remarks
					ATPL	CPL	ATPL/IR	ATPL	CPL					
(02)		State the surface and air-mass conditions that influence the wind in the friction layer (diurnal variation).			X	X	X	X	X	X	X			
(03)		Name terrain, wind speed and stability as the main factors that influence the vertical extent of the friction layer.			X	X	X	X	X	X	X			
(04)		Explain the relationship between iso-bars and wind (direction and speed).			X	X	X	X	X	X	X	1		
		<i>Remark: Approximate value for variation of wind in the friction layer (values to be used in examinations):</i>												
		<i>Type of landscape</i>	<i>Wind speed in friction layer in % of the geostrophic wind</i>	<i>The wind in the friction layer blows across the iso-bars towards the low pressure. Angle between wind</i>										

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Syllabus reference	BK	Syllabus details and associated Learning Objectives			Aeroplane		Helicopter			IR	CB-IR(A)	BIR Exam	BIR BK	Remarks
					ATPL	CPL	ATPL/IR	ATPL	CPL					
				<i>direction and iso-bars.</i>										
		<i>over water</i>	<i>ca 70 %</i>	<i>ca 10°</i>										
		<i>over land</i>	<i>ca 50 %</i>	<i>ca 30°</i>										
		WMO - No. 266												
<b>050 02 02 03</b>		<b>Effects of convergence and divergence</b>												
(01)		Describe atmospheric convergence and divergence.			X	X	X	X	X	X	X	1		
(02)		Explain the relationship between convergence and divergence on the following: pressure systems at the surface and aloft; wind speed; vertical motion and cloud formation (relationship between upper-air conditions and surface pressure systems).			X	X	X	X	X	X	X	1		
<b>050 02 03 00</b>		<b>General global circulation</b>												
<b>050 02 03 01</b>		<b>General circulation around the globe</b>												
(01)		Describe the general global circulation. (Refer to Subject 050 08 01 01)			X	X	X	X	X	X	X			
(02)		Name and sketch or indicate on a map the global distribution of the surface pressure and the resulting wind pattern for all latitudes at low level in January and July.			X		X	X						

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Syllabus reference	BK	Syllabus details and associated Learning Objectives	Aeroplane		Helicopter			IR	CB-IR(A)	BIR Exam	BIR BK	Remarks
			ATPL	CPL	ATPL/IR	ATPL	CPL					
(03)		Sketch or indicate on a map the west-erly and easterly tropospheric winds at high level in January and July.	X		X	X						
<b>050 02 04 00</b>		<b>Local winds</b>										
<b>050 02 04 01</b>		<b>Anabatic and katabatic winds, mountain and valley winds, Venturi effects, land and sea breezes</b>										
(01)		Describe and explain anabatic and katabatic winds.	X	X	X	X	X	X	X		1	
(02)		Describe mountain and valley winds.	X	X	X	X	X	X	X		1	
(03)		Describe the Venturi effect, conver-gence in valleys and mountain areas.	X	X	X	X	X	X	X		1	
(04)		Describe land and sea breezes, and sea-breeze front.	X	X	X	X	X	X	X	1		
(05)		Describe that local, low-level jet streams can develop in the evening.	X	X	X	X	X	X	X			
<b>050 02 05 00</b>		<b>Mountain waves (standing waves, lee waves)</b>										
<b>050 02 05 01</b>		<b>Origin and characteristics</b>										
(01)		Explain the origin and formation of mountain waves.	X	X	X	X	X	X	X		1	
(02)		State the conditions necessary for the formation of mountain waves.	X	X	X	X	X	X	X		1	
(03)		Describe the structure and properties of mountain waves.	X	X	X	X	X	X	X		1	
(04)		Explain how mountain waves may be identified by their associated meteoro-logical phenomena.	X	X	X	X	X	X	X	1		



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Syllabus reference	BK	Syllabus details and associated Learning Objectives	Aeroplane		Helicopter			IR	CB-IR(A)	BIR Exam	BIR BK	Remarks
			ATPL	CPL	ATPL/IR	ATPL	CPL					
(05)		Describe that mountain wave effects can exceed the performance or structural capability of aircraft.	X	X	X	X	X	X	X			
(06)		Describe that mountain wave effects can propagate from low to high level, e.g. over Greenland and elsewhere.	X	X	X	X	X	X	X			
<b>050 02 06 00</b>		<b>Turbulence</b>										
<b>050 02 06 01</b>		<b>Description and types of turbulence</b>										
(01)		Describe turbulence and gustiness.	X	X	X	X	X	X	X		1	
(02)		List the common types of turbulence (convective, mechanical, orographic, frontal, clear-air turbulence).	X	X	X	X	X	X	X		1	
<b>050 02 06 02</b>		<b>Formation and location of turbulence</b>										
(01)		Explain the formation of convective turbulence, mechanical and orographic turbulence, and frontal turbulence.	X	X	X	X	X	X	X		1	
(02)		State where turbulence will normally be found (rough-ground surfaces, relief, inversion layers, cumulonimbus (CB), thunderstorm (TS) zones, unstable layers).	X	X	X	X	X	X	X		1	
<b>050 02 06 03</b>		<b>Clear-air turbulence (CAT) — description, cause and location</b>										
(01)		Describe CAT.	X	X				X	X			
(02)		Describe the formation of CAT.	X	X	X	X	X	X	X			
(03)		State where CAT is found in association with jet streams, in high-level	X									

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Syllabus reference	BK	Syllabus details and associated Learning Objectives	Aeroplane		Helicopter			IR	CB-IR(A)	BIR Exam	BIR BK	Remarks
			ATPL	CPL	ATPL/IR	ATPL	CPL					
		troughs and in other disturbed high-level air flows. (Refer to Subject 050 09 02 02)										
(04)		State that remote sensing of CAT from satellites is not possible and that forecasting is limited.	X	X				X	X			
(05)		State that pilot reports of turbulence are a very valuable source of information as remote measurements are not available.	X	X	X	X	X	X	X			
<b>050 02 07 00</b>		<b>Jet streams</b>										
<b>050 02 07 01</b>		<b>Description</b>										
(01)		Describe jet streams.	X	X				X	X			
(02)		State the defined minimum speed of a jet stream (60 kt).	X	X				X	X			
(03)		State the typical figures for the dimensions of jet streams.	X	X				X	X			
<b>050 02 07 02</b>		<b>Formation and properties of jet streams</b>										
(01)		Explain the formation and state the heights, the speeds, the seasonal variations of speeds, the geographical positions, the seasonal occurrence and the seasonal movements of the arctic (front) jet stream, the polar (front) jet stream, the subtropical jet stream, and the tropical (easterly/equatorial) jet stream.	X	X								
<b>050 02 07 03</b>		<b>Location of jet streams and associated CAT areas</b>										

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Syllabus reference	BK	Syllabus details and associated Learning Objectives	Aeroplane		Helicopter			IR	CB-IR(A)	BIR Exam	BIR BK	Remarks
			ATPL	CPL	ATPL/IR	ATPL	CPL					
(01)		Sketch or describe where polar front and arctic jet streams are found in the troposphere in relation to the tropopause and to fronts.	X	X								
(02)		Describe and indicate the areas of worst wind shear and CAT.	X	X								
<b>050 02 07 04</b>		<b>Intentionally left blank</b>										
<b>050 03 00 00</b>		<b>THERMODYNAMICS</b>										
<b>050 03 01 00</b>		<b>Humidity</b>										
<b>050 03 01 01</b>		<b>Water vapour in the atmosphere</b>										
(01)		State that the density of moist air is less than the density of dry air.	X	X	X	X	X	X	X		1	
(02)		Describe the significance for meteorology of water vapour in the atmosphere.	X	X	X	X	X	X	X		1	
(03)		Indicate the sources of atmospheric humidity.	X	X	X	X	X	X	X		1	
(04)		Define 'saturation of air by water vapour'.	X	X	X	X	X	X				
<b>050 03 01 02</b>		<b>Intentionally left blank</b>										
<b>050 03 01 03</b>		<b>Temperature/dew point, relative humidity</b>										
(01)		Define 'dew point'.	X	X	X	X	X	X	X		1	
(02)		Define 'relative humidity'.	X	X	X	X	X	X	X		1	
(03)		Explain the factors that influence the relative humidity at constant pressure.	X	X	X	X	X	X	X		1	
(04)		Explain the diurnal variation of the relative humidity.	X	X	X	X	X	X	X		1	

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Syllabus reference	BK	Syllabus details and associated Learning Objectives	Aeroplane		Helicopter			IR	CB-IR(A)	BIR Exam	BIR BK	Remarks
			ATPL	CPL	ATPL/IR	ATPL	CPL					
(05)		Describe the relationship between temperature and dew point.	X	X	X	X	X	X	X		1	
(06)		Estimate the relative humidity of the air from the difference between dew point and temperature.	X	X	X	X	X	X	X	1		
<b>050 03 02 00</b>		<b>Change of state of water</b>										
<b>050 03 02 01</b>		<b>Condensation, evaporation, sublimation, freezing and melting, latent heat</b>										
(01)		Define 'condensation', 'evaporation', 'sublimation', 'freezing and melting' and 'latent heat'.	X	X	X	X	X	X	X			
(02)		List the conditions for condensation/evaporation.	X	X	X	X	X	X	X			
(03)		Explain the condensation process.	X	X	X	X	X	X	X			
(04)		Explain the nature of and the need for condensation nuclei.	X	X	X	X	X	X	X			
(05)		Explain the effects of condensation on the weather.	X	X	X	X	X	X	X			
(06)		List the conditions for freezing/melting.	X	X	X	X	X	X	X	1		
(07)		Explain the process of freezing.	X	X	X	X	X	X	X			
(08)		Explain the nature of and the need for freezing nuclei.	X	X	X	X	X	X	X			
(09)		Define 'supercooled water'. (Refer to Subject 050 09 01 01)	X	X	X	X	X	X	X	1		
(10)		List the conditions for sublimation.	X	X	X	X	X	X	X			
(11)		Explain the sublimation process.	X	X	X	X	X	X	X			
(12)		Explain the nature of and the need for sublimation nuclei.	X	X	X	X	X	X	X			

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Syllabus reference	BK	Syllabus details and associated Learning Objectives	Aeroplane		Helicopter			IR	CB-IR(A)	BIR Exam	BIR BK	Remarks
			ATPL	CPL	ATPL/IR	ATPL	CPL					
(13)		Describe the absorption or release of latent heat in each change of state of water.	X	X	X	X	X	X	X			
(14)		Illustrate all the changes of state of water with practical examples.	X	X	X	X	X	X	X	1		
<b>050 03 03 00</b>		<b>Adiabatic processes</b>										
<b>050 03 03 01</b>		<b>Adiabatic processes, stability of the atmosphere</b>										
(01)		Describe the adiabatic process in an unsaturated rising or descending air particle.	X	X	X	X	X	X	X			
(02)		Explain the variation of temperature of an unsaturated rising or descending air particle.	X	X	X	X	X	X	X			
(03)		Explain the variation of humidity of an unsaturated rising or descending air particle.	X	X	X	X	X	X	X			
(04)		Describe the adiabatic process in a saturated rising or descending air particle.	X	X	X	X	X	X	X			
(05)		Explain the variation of temperature of a saturated air particle with changing altitude.	X	X	X	X	X	X	X			
(06)		Explain the static stability of the atmosphere using the actual temperature curve with reference to the adiabatic lapse rates.	X	X	X	X	X	X	X			
(07)		Define qualitatively and quantitatively the terms 'stable', 'conditionally unstable', 'unstable' and 'indifferent'.	X	X	X	X	X	X	X			

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Syllabus reference	BK	Syllabus details and associated Learning Objectives	Aeroplane		Helicopter			IR	CB-IR(A)	BIR Exam	BIR BK	Remarks
			ATPL	CPL	ATPL/IR	ATPL	CPL					
(08)		Illustrate with a schematic sketch the formation of Foehn.	X	X	X	X	X	X	X	1		
(09)		Explain the effect of the advection of air (warm or cold) on the stability of the air. <i>Remark: Dry adiabatic lapse rate = 1 °C/100 m or 3 °C/1 000 ft; average value at lower levels for saturated adiabatic lapse rate = 0.6 °C/100 m or 1.8 °C/1 000 ft (values to be used in examinations).</i>	X	X	X	X	X	X	X			
<b>050 04 00 00</b>		<b>CLOUDS AND FOG</b>										
<b>050 04 01 00</b>		<b>Cloud formation and description</b>										
<b>050 04 01 01</b>		<b>Cloud formation</b>										
(01)		Explain cloud formation by adiabatic cooling, conduction, advection and radiation.	X	X	X	X	X	X	X	1		
(02)		Describe cloud formation based on the following lifting processes: — unorganised lifting in thin layers and turbulent mixing; — forced lifting at fronts or over mountains; — free convection.	X	X	X	X	X	X	X	1		
(03)		List cloud types typical for stable and unstable air conditions.	X	X	X	X	X	X	X	1		
(04)		Summarise the conditions for the dissipation of clouds.	X	X	X	X	X	X	X	1		
<b>050 04 01 02</b>		<b>Cloud types and cloud classification</b>										

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Syllabus reference	BK	Syllabus details and associated Learning Objectives	Aeroplane		Helicopter			IR	CB-IR(A)	BIR Exam	BIR BK	Remarks
			ATPL	CPL	ATPL/IR	ATPL	CPL					
(01)		Describe the different cloud types and their classification.	X	X	X	X	X	X	X		1	
(02)		Identify by shape cirriform, cumuliform and stratiform clouds.	X	X	X	X	X	X	X		1	
(03)		Identify by shape and typical level the 10 cloud types (general).	X	X	X	X	X	X	X		1	
(04)		Describe and identify by shape the following species and supplementary features: castellanus, lenticularis, congestus, calvus, capillatus and virga.	X	X	X	X	X	X	X		1	
(05)		Distinguish between low-, medium- and high-level clouds according to the World Meteorological Organization's (WMO) 'cloud etage'.	X	X	X	X	X	X	X	1		
(06)		Distinguish between ice clouds, mixed clouds and pure-water clouds.	X	X	X	X	X	X	X	1		
<b>050 04 01 03</b>		<b><i>Influence of inversions on cloud development</i></b>										
(01)		Explain the influence of inversions on vertical movements in the atmosphere.	X	X	X	X	X	X	X	1		
(02)		Explain the influence of an inversion on the formation of stratus clouds.	X	X	X	X	X	X	X	1		
(03)		Explain the influence of ground inversion on the formation of fog.	X	X	X	X	X	X	X	1		
(04)		Describe the role of the tropopause inversion with regard to the vertical development of clouds.	X	X	X	X	X					
<b>050 04 01 04</b>		<b><i>Flying conditions in each cloud type</i></b>										

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Syllabus reference	BK	Syllabus details and associated Learning Objectives	Aeroplane		Helicopter			IR	CB-IR(A)	BIR Exam	BIR BK	Remarks
			ATPL	CPL	ATPL/IR	ATPL	CPL					
(01)		Assess the 10 cloud types for icing and turbulence.	X	X	X	X	X	X	X		1	
<b>050 04 02 00</b>		<b>Fog, mist, haze</b>										
<b>050 04 02 01</b>		<b>General aspects</b>										
(01)		Define 'fog', 'mist' and 'haze' with reference to the WMO standards of visibility range.	X	X	X	X	X	X	X		1	
(02)		Explain briefly the formation of fog, mist and haze.	X	X	X	X	X	X	X		1	
(03)		Name the factors that generally contribute to the formation of fog and mist.	X	X	X	X	X	X	X		1	
(04)		Name the factors that contribute to the formation of haze.	X	X	X	X	X	X	X		1	
(05)		Describe freezing fog and ice fog.	X	X	X	X	X	X	X		1	
<b>050 04 02 02</b>		<b>Radiation fog</b>										
(01)		Explain the formation of radiation fog.	X	X	X	X	X	X	X	1		
(02)		Describe the significant characteristics of radiation fog, and its vertical extent.	X	X	X	X	X	X	X	1		
(03)		Summarise the conditions for the dissipation of radiation fog.	X	X	X	X	X	X	X	1		
<b>050 04 02 03</b>		<b>Advection fog</b>										
(01)		Explain the formation of advection fog.	X	X	X	X	X	X	X	1		
(02)		Describe the different possibilities of advection-fog formation (over land, sea and coastal regions).	X	X	X	X	X	X	X	1		
(03)		Describe the significant characteristics of advection fog.	X	X	X	X	X	X	X	1		
(04)		Summarise the conditions for the dissipation of advection fog.	X	X	X	X	X	X	X	1		



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Syllabus reference	BK	Syllabus details and associated Learning Objectives	Aeroplane		Helicopter			IR	CB-IR(A)	BIR Exam	BIR BK	Remarks
			ATPL	CPL	ATPL/IR	ATPL	CPL					
<b>050 04 02 04</b>		<b>Sea smoke</b>										
(01)		Explain the formation of sea smoke.	X	X	X	X	X	X	X	1		
(02)		Explain the conditions for the development of sea smoke.	X	X	X	X	X	X	X	1		
(03)		Summarise the conditions for the dissipation of sea smoke.	X	X	X	X	X	X	X	1		
<b>050 04 02 05</b>		<b>Frontal fog</b>										
(01)		Explain the formation of frontal fog.	X	X	X	X	X	X	X	1		
(02)		Describe the significant characteristics of frontal fog.	X	X	X	X	X	X	X	1		
(03)		Summarise the conditions for the dissipation of frontal fog.	X	X	X	X	X	X	X	1		
<b>050 04 02 06</b>		<b>Orographic fog (hill fog)</b>										
(01)		Summarise the features of orographic fog.	X	X	X	X	X	X	X	1		
(02)		Describe the significant characteristics of orographic fog.	X	X	X	X	X	X	X	1		
(03)		Summarise the conditions for the dissipation of orographic fog.	X	X	X	X	X	X	X	1		
<b>050 05 00 00</b>		<b>PRECIPITATION</b>										
<b>050 05 01 00</b>		<b>Development of precipitation</b>										
<b>050 05 01 01</b>		<b>Process of development of precipitation</b>										
(01)		Describe the two basic processes of forming precipitation (the Wegener–Bergeron–Findeisen process, Coalescence).	X	X	X	X	X	X	X	1		

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Syllabus reference	BK	Syllabus details and associated Learning Objectives	Aeroplane		Helicopter			IR	CB-IR(A)	BIR Exam	BIR BK	Remarks
			ATPL	CPL	ATPL/IR	ATPL	CPL					
(02)		Summarise the outlines of the ice-crystal process (the Wegener–Bergeron–Findeisen process).	X	X	X	X	X	X	X	1		
(03)		Summarise the outlines of the coalescence process.	X	X	X	X	X	X	X	1		
(04)		Explain the development of snow, rain, drizzle and hail.	X	X	X	X	X	X	X	1		
<b>050 05 02 00</b>		<b>Types of precipitation</b>										
<b>050 05 02 01</b>		<b>Types of precipitation, relationship with cloud types</b>										
(01)		List and describe the types of precipitation given in the aerodrome forecast (TAF) and METAR codes (drizzle, rain, snow, snow grains, ice pellets, hail, small hail, snow pellets, ice crystals, freezing drizzle, freezing rain).	X	X	X	X	X	X	X		1	
(02)		State the ICAO/WMO approximate diameters for cloud, drizzle and rain drops.	X	X	X	X	X	X	X	1		
(03)		State that, because of their size, hail stones can cause significant damage to aircraft.	X	X	X	X	X	X	X	1		
(04)	X	Explain the mechanism for the formation of freezing precipitation.	X	X	X	X	X	X	X		1	
(05)		Describe the weather conditions that give rise to freezing precipitation.	X	X	X	X	X	X	X	1		
(06)		Distinguish between the types of precipitation generated in convective and stratiform clouds.	X	X	X	X	X	X	X	1		

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Syllabus reference	BK	Syllabus details and associated Learning Objectives	Aeroplane		Helicopter			IR	CB-IR(A)	BIR Exam	BIR BK	Remarks
			ATPL	CPL	ATPL/IR	ATPL	CPL					
(07)		Assign typical precipitation types and intensities to different cloud types.	X	X	X	X	X	X	X	1		
(08)		Explain the relationship between moisture content and visibility during different types of winter precipitation (e.g. large vs small snowflakes).	X	X	X	X	X	X	X			
<b>050 06 00 00</b>		<b>AIR MASSES AND FRONTS</b>										
<b>050 06 01 00</b>		<b>Air masses</b>										
<b>050 06 01 01</b>		<b>Description, classification and source regions of air masses</b>										
(01)		Define the term 'air mass'.	X	X	X	X	X	X	X		3	
(02)		Describe the properties of the source regions.	X	X	X	X	X	X	X		3	
(03)		Summarise the classification of air masses by source regions.	X	X	X	X	X	X	X		3	
(04)		State the classifications of air masses by temperature and humidity at source.	X	X	X	X	X	X	X		3	
(05)		State the characteristic weather in each of the air masses.	X	X	X	X	X	X	X		3	
(06)		Name the three main air masses that affect Europe.	X	X	X	X	X	X	X		3	
(07)		Classify air masses on a surface weather chart.	X	X	X	X	X	X	X		3	
		<i>Remark: Names and abbreviations of air masses used in examinations:</i> — <i>first letter: humidity</i> — <i>continental (c)</i> — <i>maritime (m)</i>										

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Syllabus reference	BK	Syllabus details and associated Learning Objectives	Aeroplane		Helicopter			IR	CB-IR(A)	BIR Exam	BIR BK	Remarks
			ATPL	CPL	ATPL/IR	ATPL	CPL					
		<ul style="list-style-type: none"> <li>— <i>second letter: type of air mass</i> <ul style="list-style-type: none"> <li>— <i>arctic (A)</i></li> <li>— <i>polar (P)</i></li> <li>— <i>tropical (T)</i></li> <li>— <i>equatorial (E)</i></li> </ul> </li> <li>— <i>third letter: temperature</i> <ul style="list-style-type: none"> <li>— <i>cold (c)</i></li> <li>— <i>warm (w)</i></li> </ul> </li> </ul>										
<b>050 06 01 02</b>		<b>Modifications of air masses</b>										
(01)		List the environmental factors that affect the final properties of an air mass.	X	X	X	X	X	X	X		3	
(02)		Explain how maritime and continental tracks modify air masses.	X	X	X	X	X	X	X		3	
(03)		Explain the effect of passage over cold or warm surfaces.	X	X	X	X	X	X	X		3	
(04)		Explain how air-mass weather is affected by the season, the air-mass track and by orographic and thermal effects over land.	X	X	X	X	X	X	X		3	
(05)		Assess the tendencies of the stability of an air mass and describe the typical resulting air-mass weather including the hazards for aviation.	X	X	X	X	X	X	X		3	
<b>050 06 02 00</b>		<b>Fronts</b>										
<b>050 06 02 01</b>		<b>General aspects</b>										
(01)		Describe the boundaries between air masses (fronts).	X	X	X	X	X	X	X		3	
(02)		Define 'front' and 'frontal zone'.	X	X	X	X	X	X	X		3	

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Syllabus reference	BK	Syllabus details and associated Learning Objectives	Aeroplane		Helicopter			IR	CB-IR(A)	BIR Exam	BIR BK	Remarks
			ATPL	CPL	ATPL/IR	ATPL	CPL					
(03)		Name the global frontal systems (polar front, arctic front).	X	X	X	X	X	X				
(04)		State the approximate seasonal latitudes and geographic positions of the polar front and the arctic front.	X	X	X	X	X	X				
<b>050 06 02 02</b>		<b>Warm front, associated clouds and weather</b>										
(01)		Define a 'warm front'.	X	X	X	X	X	X	X		3	
(02)		Describe the cloud, weather, ground visibility and aviation hazards at a warm front depending on the stability of the warm air.	X	X	X	X	X	X	X	3		
(03)		Explain the seasonal differences in the weather at warm fronts.	X	X	X	X	X	X	X	3		
(04)		Describe the structure, slope and dimensions of a warm front.	X	X	X	X	X	X	X		3	
(05)		Sketch a cross section of a warm front showing weather, cloud and aviation hazards.	X	X	X	X	X	X	X		3	
<b>050 06 02 03</b>		<b>Cold front, associated clouds and weather</b>										
(01)		Define a 'cold front'.	X	X	X	X	X	X	X		3	
(02)		Describe the cloud, weather, ground visibility and aviation hazards at a cold front depending on the stability of the warm air.	X	X	X	X	X	X	X	3		
(03)		Explain the seasonal differences in the weather at cold fronts.	X	X	X	X	X	X	X	3		
(04)		Describe the structure, slope and dimensions of a cold front.	X	X	X	X	X	X	X		3	

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Syllabus reference	BK	Syllabus details and associated Learning Objectives	Aeroplane		Helicopter			IR	CB-IR(A)	BIR Exam	BIR BK	Remarks
			ATPL	CPL	ATPL/IR	ATPL	CPL					
(05)		Sketch a cross section of a cold front showing weather, cloud and aviation hazards.	X	X	X	X	X	X	X		3	
<b>050 06 02 04</b>		<b>Warm sector, associated clouds and weather</b>										
(01)		Describe fronts and air masses associated with the warm sector.	X	X	X	X	X	X	X		3	
(02)		Describe the cloud, weather, ground visibility and aviation hazards in a warm sector.	X	X	X	X	X	X	X	3		
(03)		Explain the seasonal differences in the weather in the warm sector.	X	X	X	X	X	X	X	3		
(04)		Sketch a cross section of a warm sector showing weather, cloud and aviation hazards.	X	X	X	X	X	X	X		3	
<b>050 06 02 05</b>		<b>Weather behind the cold front</b>										
(01)		Describe the cloud, weather, ground visibility and aviation hazards behind the cold front.	X	X	X	X	X	X	X	3		
(02)		Explain the seasonal differences in the weather behind the cold front.	X	X	X	X	X	X	X	3		
<b>050 06 02 06</b>		<b>Occlusions, associated clouds and weather</b>										
(01)	X	Define the term 'occlusion' and 'occluded front'.	X	X	X	X	X	X	X		3	
(02)		Describe the cloud, weather, ground visibility and aviation hazards in a cold occlusion.	X	X	X	X	X	X	X	3		

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Syllabus reference	BK	Syllabus details and associated Learning Objectives	Aeroplane		Helicopter			IR	CB-IR(A)	BIR Exam	BIR BK	Remarks
			ATPL	CPL	ATPL/IR	ATPL	CPL					
(03)		Describe the cloud, weather, ground visibility and aviation hazards in a warm occlusion.	X	X	X	X	X	X	X	3		
(04)		Explain the seasonal differences in the weather at occlusions.	X	X	X	X	X	X	X	3		
(05)		Sketch a cross section of occlusions showing weather, cloud and aviation hazards.	X	X	X	X	X	X	X		3	
(06)		On a sketch illustrate the development of an occlusion and the movement of the occlusion point.	X	X	X	X	X	X	X		3	
<b>050 06 02 07</b>		<b>Stationary front, associated clouds and weather</b>										
(01)		Define a 'stationary front'.	X	X	X	X	X	X	X		3	
(02)		Describe the cloud, weather, ground visibility and aviation hazards in a stationary front.	X	X	X	X	X	X	X	3		
<b>050 06 02 08</b>		<b>Movement of fronts and pressure systems, life cycle</b>										
(01)		Describe the movements of fronts and pressure systems and the life cycle of a mid-latitude depression.	X	X	X	X	X	X	X		3	
(02)		State the rules for predicting the direction and the speed of movement of fronts.	X	X	X	X	X	X	X		3	
(03)		State the difference in the speed of movement between cold and warm fronts.	X	X	X	X	X	X	X		3	

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Syllabus reference	BK	Syllabus details and associated Learning Objectives	Aeroplane		Helicopter			IR	CB-IR(A)	BIR Exam	BIR BK	Remarks
			ATPL	CPL	ATPL/IR	ATPL	CPL					
(04)		State the rules for predicting the direction and the speed of movement of frontal depressions.	X	X	X	X	X	X	X		3	
(05)		Describe, with a sketch if required, the genesis, development and life cycle of a frontal depression with associated cloud and rain belts.	X	X	X	X	X	X	X		3	
<b>050 06 02 09</b>		<b><i>Changes of meteorological elements at a frontal wave</i></b>										
(01)		Sketch a plan and a cross section of a frontal wave (warm front, warm sector, and cold front) and illustrate the changes of pressure, temperature, surface wind and wind in the vertical axis.	X	X	X	X	X	X	X		3	
<b>050 07 00 00</b>		<b>PRESSURE SYSTEMS</b>										
<b>050 07 01 00</b>		<b>The principal pressure areas</b>										
<b>050 07 01 01</b>		<b><i>Location of the principal pressure areas</i></b>										
(01)		Identify or indicate on a map the principal global high-pressure and low-pressure areas in January and July.	X		X	X						
(02)		Explain how these pressure areas are formed.	X		X	X						
(03)		Explain how the pressure areas move with the seasons.	X		X	X						
<b>050 07 02 00</b>		<b>Anticyclone</b>										
<b>050 07 02 01</b>		<b><i>Anticyclones, types, general properties, cold and warm anticyclones, ridges and subsidence</i></b>										



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Syllabus reference	BK	Syllabus details and associated Learning Objectives	Aeroplane		Helicopter			IR	CB-IR(A)	BIR Exam	BIR BK	Remarks
			ATPL	CPL	ATPL/IR	ATPL	CPL					
(01)		List the different types of anticyclones.	X	X	X	X	X	X	X		3	
(02)		Describe the effect of high-level convergence in producing areas of high pressure at ground level.	X	X	X	X	X	X	X		3	
(03)		Describe air-mass subsidence, its effect on the environmental lapse rate, and the associated weather.	X	X	X	X	X	X	X		3	
(04)		Describe the formation of warm and cold anticyclones.	X	X	X	X	X	X	X	3		
(05)		Describe the formation of ridges.	X	X	X	X	X	X	X		3	
(06)		Describe the properties of and the weather associated with warm and cold anticyclones.	X	X	X	X	X	X	X			
(07)		Describe the properties of and the weather associated with ridges.	X	X	X	X	X	X	X	3		
(08)		Describe the blocking anticyclone and its effects.	X	X	X	X	X	X	X		3	
<b>050 07 03 00</b>		<b>Non-frontal depressions</b>										
<b>050 07 03 01</b>		<b><i>Thermal, orographic, polar and secondary depressions; troughs</i></b>										
(01)		Describe the effect of high-level divergence in producing areas of low pressure at ground level.	X	X	X	X	X	X	X		3	
(02)		Describe the formation and properties of thermal, orographic (lee lows), polar and secondary depressions.	X	X	X	X	X	X	X	3		
(03)		Describe the formation, the properties and the associated weather at troughs.	X	X	X	X	X	X	X		3	
<b>050 07 04 00</b>		<b>Tropical revolving storms</b>										

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Syllabus reference	BK	Syllabus details and associated Learning Objectives	Aeroplane		Helicopter			IR	CB-IR(A)	BIR Exam	BIR BK	Remarks
			ATPL	CPL	ATPL/IR	ATPL	CPL					
<b>050 07 04 01</b>		<b><i>Characteristics of tropical revolving storms</i></b>										
(01)		State the conditions necessary for the formation of tropical revolving storms.	X	X	X	X	X					
(02)		State how a tropical revolving storm generally moves in its area of occurrence.	X	X	X	X	X					
(03)		Name the stages of the development of tropical revolving storms (tropical disturbance, tropical depression, tropical storm, severe tropical storm, tropical revolving storm).	X	X	X	X	X					
(04)		Describe the meteorological conditions in and near a tropical revolving storm.	X	X	X	X	X					
(05)		State the approximate dimensions of a tropical revolving storm.	X	X	X	X	X					
(06)		State that the movement of a tropical revolving storm can only rarely be forecast exactly, and that utmost care is necessary near a tropical revolving storm.	X	X	X	X	X					
<b>050 07 04 02</b>		<b><i>Origin and local names, location and period of occurrence</i></b>										
(01)		List the areas of origin and occurrence of tropical revolving storms, and their specified names (hurricane, typhoon, tropical cyclone).	X	X	X	X	X					
(02)		State the expected times of occurrence of tropical revolving storms in each of the source areas, and their approximate frequency.	X	X	X	X	X					

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Syllabus reference	BK	Syllabus details and associated Learning Objectives	Aeroplane		Helicopter			IR	CB-IR(A)	BIR Exam	BIR BK	Remarks
			ATPL	CPL	ATPL/IR	ATPL	CPL					
<b>050 08 00 00</b>		<b>CLIMATOLOGY</b>										
<b>050 08 01 00</b>		<b>Climatic zones</b>										
<b>050 08 01 01</b>		<b>General circulation in the troposphere and lower stratosphere</b>										
(01)	X	Describe the general tropospheric and low stratospheric circulation. (Refer to Subject 050 02 03 01)	X	X	X	X	X					
<b>050 08 01 02</b>		<b>Climatic classification</b>										
(01)		Describe the characteristics of the tropical rain climate, the dry climate, the mid-latitude climate (warm temperate rain climate), the subarctic climate (cold snow forest climate) and the snow climate (polar climate).	X	X	X	X	X					
(02)		Explain how the seasonal movement of the sun generates the transitional climate zones.	X	X	X	X	X					
(03)		State the typical locations of each major climatic zone.	X		X	X						
<b>050 08 02 00</b>		<b>Tropical climatology</b>										
<b>050 08 02 01</b>		<b>Cause and development of tropical showers and thunderstorms: humidity, temperature, tropopause</b>										
(01)		State the conditions necessary for the formation of tropical showers and thunderstorms (mesoscale convective complex, cloud clusters).	X	X	X	X	X					
(02)		Describe the characteristics of tropical squall lines.	X	X	X	X	X					

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			ATPL	CPL	ATPL/IR	ATPL	CPL					
(03)		Explain the formation of convective cloud structures caused by convergence at the boundary of the NE and SE trade winds (Intertropical Convergence Zone (ITCZ)).	X	X	X	X	X					
(04)		State the typical figures for tropical surface air temperatures and humidities, and for heights of the zero-degree isotherm.	X	X	X	X	X					
<b>050 08 02 02</b>		<b>Seasonal variations of weather and wind, typical synoptic situations</b>										
(01)		Indicate on a map the trade winds (tropical easterlies) and describe the associated weather.	X	X	X	X	X					
(02)		Indicate on a map the doldrums and describe the associated weather.	X	X	X	X	X					
(03)		Indicate on a sketch the latitudes of subtropical high (horse latitudes) and describe the associated weather.	X	X								
(04)		Indicate on a map the major monsoon winds.	X	X	X	X	X					
<b>050 08 02 03</b>		<b>Intertropical Convergence Zone (ITCZ), weather in the ITCZ, general seasonal movement</b>										
(01)		Identify or indicate on a map the positions of the ITCZ in January and July.	X	X								
(02)		Explain the seasonal movement of the ITCZ.	X	X								
(03)		Describe the weather and winds at the ITCZ.	X	X								

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Syllabus reference	BK	Syllabus details and associated Learning Objectives	Aeroplane		Helicopter			IR	CB-IR(A)	BIR Exam	BIR BK	Remarks
			ATPL	CPL	ATPL/IR	ATPL	CPL					
(04)		Explain the flight hazards associated with the ITCZ.	X	X								
<b>050 08 02 04</b>		<b>Monsoon, sandstorms, cold-air out-breaks</b>										
(01)		Define in general the term 'monsoon' and give a general overview of regions of occurrence.	X	X	X	X	X					
(02)		Describe the major monsoon conditions. (Refer to Subject 050 08 02 02)		X			X					
(03)		Explain how trade winds change character after a long track and become monsoon winds.	X	X	X	X	X					
(04)		Explain the weather and the flight hazards associated with a monsoon.	X	X	X	X	X					
(05)		Explain the formation of the SW/NE monsoon over West Africa and describe the weather, stressing the seasonal differences.	X	X	X	X	X					
(06)		Explain the formation of the SW/NE monsoon over India and describe the weather, stressing the seasonal differences.	X	X	X	X	X					
(07)		Explain the formation of the monsoon over the Far East and northern Australia and describe the weather, stressing the seasonal differences.	X	X	X	X	X					
(08)		Describe the formation and properties of sandstorms.	X	X	X	X	X					

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Syllabus reference	BK	Syllabus details and associated Learning Objectives	Aeroplane		Helicopter			IR	CB-IR(A)	BIR Exam	BIR BK	Remarks
			ATPL	CPL	ATPL/IR	ATPL	CPL					
(09)		Indicate when and where outbreaks of cold polar air can enter subtropical weather systems.	X	X	X	X	X					
(10)		Name well-known examples of polar-air outbreaks (Blizzard, Pampero).	X	X	X	X	X					
<b>050 08 02 05</b>		<b>Easterly waves</b>										
(01)		Explain the effect of easterly waves on tropical weather systems.	X		X	X						
<b>050 08 03 00</b>		<b>Typical weather situations in the mid-latitudes</b>										
<b>050 08 03 01</b>		<b>Westerly situation (westerlies)</b>										
(01)		Identify on a weather chart the typical westerly situation with travelling polar front waves.	X	X				X	X		3	
<b>050 08 03 02</b>		<b>High-pressure area</b>										
(01)		Describe the high-pressure zones with the associated weather.	X	X	X	X	X	X	X		3	
(02)		Identify on a weather chart the high-pressure regions.	X	X	X	X	X	X	X		3	
<b>050 08 03 03</b>		<b>Intentionally left blank</b>										
<b>050 08 03 04</b>		<b>Cold-air drop</b>										
(01)		Define 'cold-air drop'.	X	X	X	X	X	X	X			
(02)		Describe the formation of a cold-air drop.	X	X	X	X	X	X	X			
(03)		Identify cold-air drops on weather charts.	X	X	X	X	X	X	X			
(04)		Explain the problems and dangers of cold-air drops for aviation.	X	X	X	X	X	X	X			

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Syllabus reference	BK	Syllabus details and associated Learning Objectives	Aeroplane		Helicopter			IR	CB-IR(A)	BIR Exam	BIR BK	Remarks
			ATPL	CPL	ATPL/IR	ATPL	CPL					
<b>050 08 04 00</b>		<b>Local winds and associated weather</b>										
<b>050 08 04 01</b>		<b><i>Foehn, Mistral, Bora</i></b>										
(01)		Describe the mechanism for the development of Foehn winds (including Chinook).	X	X	X	X	X	X				
(02)		Describe the weather associated with Foehn winds.	X	X	X	X	X	X				
(03)		Describe the formation of, the characteristics of, and the weather associated with Mistral and Bora.	X	X	X	X	X	X				
<b>050 08 04 02</b>		<b><i>Harmattan</i></b>										
(01)		Describe the Harmattan wind and the associated visibility problems as an example of local winds affecting visibility.	X	X	X	X	X					
<b>050 09 00 00</b>		<b>FLIGHT HAZARDS</b>										
<b>050 09 01 00</b>		<b>Icing</b>										
<b>050 09 01 01</b>		<b><i>Conditions for ice accretion</i></b>										
(01)		Summarise the general conditions under which ice accretion occurs on aircraft (temperatures of outside air; temperature of the airframe; presence of supercooled water in clouds, fog, rain and drizzle; possibility of sublimation).	X	X	X	X	X	X	X	3		
(02)		Explain the general weather conditions under which ice accretion occurs in a venturi carburettor.	X	X	X	X	X	X	X		3	

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Syllabus reference	BK	Syllabus details and associated Learning Objectives	Aeroplane		Helicopter			IR	CB-IR(A)	BIR Exam	BIR BK	Remarks
			ATPL	CPL	ATPL/IR	ATPL	CPL					
(03)		Explain the general weather conditions under which ice accretion occurs on airframe.	X	X	X	X	X	X	X	3		
(04)		<i>Explain the formation of supercooled water in clouds, rain and drizzle. (Refer to Subject 050 03 02 01)</i>	X	X	X	X	X	X	X	3		
(05)		Explain qualitatively the relationship between the air temperature and the amount of supercooled water.	X	X	X	X	X	X	X	3		
(06)		Explain qualitatively the relationship between the type of cloud and the size and number of the droplets in cumuli-form and stratiform clouds.	X	X	X	X	X	X	X	3		
(07)		Indicate in which circumstances ice can form on an aircraft on the ground: air temperature, humidity, precipitation.	X	X	X	X	X	X	X	3		
(08)		Explain in which circumstances ice can form on an aircraft in flight: inside clouds, in precipitation, and outside clouds and precipitation.	X	X	X	X	X	X	X	3		
(09)		Explain the influence of fuel temperature, radiative cooling of the aircraft surface and temperature of the aircraft surface (e.g. from previous flight) on ice formation.	X	X	X	X	X	X	X	3		
(10)		Describe the different factors that influence the intensity of icing: air temperature, amount of supercooled water in a cloud or in precipitation, amount of ice crystals in the air, speed of the aircraft,	X	X	X	X	X	X	X	3		



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Syllabus reference	BK	Syllabus details and associated Learning Objectives	Aeroplane		Helicopter			IR	CB-IR(A)	BIR Exam	BIR BK	Remarks
			ATPL	CPL	ATPL/IR	ATPL	CPL					
		shape (thickness) of the airframe parts (wings, antennas, etc.).										
(11)		Explain the effects of topography on icing.	X	X	X	X	X	X	X	3		
(12)		Explain the higher concentration of water drops in stratiform orographic clouds.	X	X	X	X	X	X	X	3		
<b>050 09 01 02</b>		<b>Types of ice accretion</b>										
(01)	X	Define 'clear ice'.	X	X	X	X	X	X	X			
(02)		Describe the conditions for the formation of clear ice.	X	X	X	X	X	X	X			
(03)		Explain the formation of the structure of clear ice with the release of latent heat during the freezing process.	X	X	X	X	X	X	X			
(04)		Describe the aspects of clear ice: appearance, weight, solidity.	X	X	X	X	X	X	X			
(05)		Define 'rime ice'.	X	X	X	X	X	X	X			
(06)		Describe the conditions for the formation of rime ice.	X	X	X	X	X	X	X			
(07)		Describe the aspects of rime ice: appearance, weight, solidity.	X	X	X	X	X	X	X	3		
(08)		Define 'mixed ice'.	X	X	X	X	X	X	X	3		
(09)		Describe the conditions for the formation of mixed ice.	X	X	X	X	X	X	X	3		
(10)		Describe the aspects of mixed ice: appearance, weight, solidity.	X	X	X	X	X	X	X	3		
(11)		Describe the possible process of ice formation in snow conditions.	X	X	X	X	X	X	X	3		
(12)		Define 'hoar frost'.	X	X	X	X	X	X	X	3		

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Syllabus reference	BK	Syllabus details and associated Learning Objectives	Aeroplane		Helicopter			IR	CB-IR(A)	BIR Exam	BIR BK	Remarks
			ATPL	CPL	ATPL/IR	ATPL	CPL					
(13)		Describe the conditions for the formation of hoar frost.	X	X	X	X	X	X	X	3		
(14)		Describe the aspects of hoar frost: appearance, solidity.	X	X	X	X	X	X	X	3		
<b>050 09 01 03</b>		<b>Hazards of ice accretion, avoidance</b>										
(01)		State the ICAO qualifying terms for the intensity of icing.	X	X	X	X	X	X	X	3		
(02)		Describe, in general, the hazards of icing.	X	X	X	X	X	X	X	3		
(03)		Assess the dangers of the different types of ice accretion.	X	X	X	X	X	X	X	3		
(04)		Describe the position of the dangerous zones of icing in fronts, in stratiform and cumuliform clouds, and in the different precipitation types.	X	X	X	X	X	X	X	3		
(05)		Indicate the possibilities of avoiding dangerous zones of icing: — in the flight planning: weather briefing, selection of track and altitude; — during flight: recognition of the dangerous zones, selection of appropriate track and altitude.	X	X	X	X	X	X	X	3		
<b>050 09 01 04</b>		<b>Ice crystal icing</b>										
(01)		Describe ice crystal icing.	X	X	X	X	X	X	X		3	
(02)		Describe the atmospheric processes leading to high ice crystal concentration. Define the variable ice water content (IWC).	X	X	X	X	X	X	X		3	

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Syllabus reference	BK	Syllabus details and associated Learning Objectives	Aeroplane		Helicopter			IR	CB-IR(A)	BIR Exam	BIR BK	Remarks
			ATPL	CPL	ATPL/IR	ATPL	CPL					
(03)		Identify weather situations and their relevant areas where high concentrations of ice crystals are likely to occur.	X	X	X	X	X	X	X	3		
(04)		Name, in general, the flight hazards associated with high concentrations of ice crystals.	X	X	X	X	X	X	X	3		
(05)		Explain how a pilot may possibly avoid areas with a high concentration of ice crystals.	X	X	X	X	X	X	X	3		
<b>050 09 02 00</b>		<b>Turbulence</b>										
<b>050 09 02 01</b>		<b>Effects on flight, avoidance</b>										
(01)		State the ICAO qualifying terms for the intensity of turbulence.	X	X	X	X	X	X	X	3		
(02)		Describe the effects of turbulence on an aircraft in flight.	X	X	X	X	X	X	X	3		
(03)		Indicate the possibilities of avoiding turbulence: — in the flight planning: weather briefing, selection of track and altitude; — during flight: selection of appropriate track and altitude.	X	X	X	X	X	X	X	3		
(04)		Describe atmospheric turbulence and distinguish between turbulence, gustiness and wind shear.	X	X	X	X	X	X	X			
(05)		Describe that forecasts of turbulence are not very reliable and state that pilot reports of turbulence are very valuable as they help others to prepare for or avoid turbulence.	X	X	X	X	X	X	X			

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Syllabus reference	BK	Syllabus details and associated Learning Objectives	Aeroplane		Helicopter			IR	CB-IR(A)	BIR Exam	BIR BK	Remarks
			ATPL	CPL	ATPL/IR	ATPL	CPL					
<b>050 09 02 02</b>		<b>Clear-air turbulence (CAT): effects on flight, avoidance</b>										
(01)		Describe the effects of CAT on flight. (Refer to Subject 050 02 06 03)	X	X	X	X	X					
(02)		Indicate the possibilities of avoiding CAT in flight: — in the flight planning: weather briefing, selection of track and altitude; — during flight: selection of appropriate track and altitude.	X	X	X	X	X					
<b>050 09 03 00</b>		<b>Wind shear</b>										
<b>050 09 03 01</b>		<b>Definition of wind shear</b>										
(01)		Define 'wind shear' (vertical and horizontal).	X	X	X	X	X	X	X	3		
(02)		Define 'low-level wind shear'.	X	X	X	X	X	X	X	3		
<b>050 09 03 02</b>		<b>Weather conditions for wind shear</b>										
(01)		Describe the conditions, where and how wind shear can form (e.g. thunderstorms, squall lines, fronts, inversions, land and sea breeze, friction layer, relief).	X	X	X	X	X	X	X	3		
<b>050 09 03 03</b>		<b>Effects on flight, avoidance</b>										
(01)		Describe the effects of wind shear on flight.	X	X	X	X	X	X	X	3		
(02)		Indicate the possibilities of avoiding wind shear in flight: — in the flight planning; — during flight.	X	X	X	X	X	X	X	3		

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Syllabus reference	BK	Syllabus details and associated Learning Objectives	Aeroplane		Helicopter			IR	CB-IR(A)	BIR Exam	BIR BK	Remarks
			ATPL	CPL	ATPL/IR	ATPL	CPL					
<b>050 09 04 00</b>		<b>Thunderstorms</b>										
<b>050 09 04 01</b>		<b><i>Conditions for and process of development, forecast, location, type specification</i></b>										
(01)		Name the cloud types which indicate the development of thunderstorms.	X	X	X	X	X	X	X	3		
(02)		Describe the different types of thunderstorms, their location, the conditions for and the process of development, and list their properties (air-mass thunderstorms, frontal thunderstorms, squall lines, supercell storms, orographic thunderstorms).	X	X	X	X	X	X	X	3		
<b>050 09 04 02</b>		<b><i>Structure of thunderstorms, life cycle</i></b>										
(01)		Assess the average duration of thunderstorms and their different stages.	X	X	X	X	X	X	X	3		
(02)		Describe a supercell storm: initial, supercell, tornado and dissipating stage.	X	X	X	X	X	X	X	3		
(03)		Summarise the flight hazards associated with a fully developed thunderstorm.	X	X	X	X	X	X	X	3		
(04)		Indicate on a sketch the most dangerous zones in and around a single-cell and a multi-cell thunderstorm.	X	X	X	X	X	X	X	3		
<b>050 09 04 03</b>		<b><i>Electrical discharges</i></b>										
(01)		Describe the basic outline of the electric field in the atmosphere.	X	X	X	X	X	X	X	3		

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Syllabus reference	BK	Syllabus details and associated Learning Objectives	Aeroplane		Helicopter			IR	CB-IR(A)	BIR Exam	BIR BK	Remarks
			ATPL	CPL	ATPL/IR	ATPL	CPL					
(02)		Describe types of lightning, i.e. ground stroke, intra-cloud lightning, cloud-to-cloud lightning, upward lightning.	X	X	X	X	X	X	X	3		
(03)		Describe and assess the 'St. Elmo's fire' weather phenomenon.	X	X	X	X	X	X	X		3	
(04)		Describe the development of lightning discharges.	X	X	X	X	X	X	X	3		
(05)		Describe the effect of lightning strike on aircraft and flight execution.	X	X	X	X	X	X	X	3		
<b>050 09 04 04</b>		<b>Development and effects of downbursts</b>										
(01)		Define the term 'downburst'.	X	X	X	X	X	X	X	3		
(02)		Distinguish between macroburst and microburst.	X	X	X	X	X	X	X	3		
(03)		State the weather situations leading to the formation of downbursts.	X	X	X	X	X	X	X	3		
(04)		Describe the process of development of a downburst.	X	X	X	X	X	X	X	3		
(05)		Give the typical duration of a downburst.	X	X	X	X	X	X	X	3		
(06)		Describe the effects of downbursts.	X	X	X	X	X	X	X			
<b>050 09 04 05</b>		<b>Thunderstorm avoidance</b>										
(01)		Explain how the pilot can anticipate each type of thunderstorm: through pre-flight weather briefing, observation in flight, use of specific meteorological information, use of information given by ground weather radar and by airborne weather radar.	X	X	X	X	X	X	X	3		

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Syllabus reference	BK	Syllabus details and associated Learning Objectives	Aeroplane		Helicopter			IR	CB-IR(A)	BIR Exam	BIR BK	Remarks
			ATPL	CPL	ATPL/IR	ATPL	CPL					
		<i>(Refer to Subject 050 10 01 04), use of a lightning detector (stormscope). (Refer to Subject 050 10 01 04), use of the stormscope (lightning detector).</i>										
(02)		Describe practical examples of flight techniques used to avoid the hazards of thunderstorms.	X	X	X	X	X	X	X	3		
<b>050 09 05 00</b>		<b>Tornadoes</b>										
<b>050 09 05 01</b>		<b>Properties and occurrence</b>										
(01)		Define 'tornado'.	X	X	X	X	X	X	X		3	
(02)		Describe the formation of a tornado.	X	X	X	X	X					
(03)		Describe the typical features of a tornado such as appearance, season, time of day, stage of development, speed of movement, and wind speed.	X	X	X	X	X					
(04)		Compare the occurrence of tornadoes in Europe with the occurrence in other locations, especially in the United States of America.	X	X	X	X	X					
(05)		Compare the dimensions and properties of tornadoes and dust devils.	X	X	X	X	X					
<b>050 09 06 00</b>		<b>Inversions</b>										
<b>050 09 06 01</b>		<b>Influence on aircraft performance</b>										
(01)		Compare the flight hazards during take-off and approach associated with a strong inversion alone and with a strong inversion combined with marked wind shear.	X	X	X	X	X	X	X	3		
<b>050 09 07 00</b>		<b>Stratospheric conditions</b>										
<b>050 09 07 01</b>		<b>Influence on aircraft performance</b>										

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Syllabus reference	BK	Syllabus details and associated Learning Objectives	Aeroplane		Helicopter			IR	CB-IR(A)	BIR Exam	BIR BK	Remarks
			ATPL	CPL	ATPL/IR	ATPL	CPL					
(01)		Summarise the advantages of stratospheric flights.	X	X	X	X	X					
(02)		List the influences of the phenomena associated with the lower stratosphere (wind, temperature, air density, turbulence).	X	X	X	X	X					
<b>050 09 08 00</b>		<b>Hazards in mountainous areas</b>										
<b>050 09 08 01</b>		<b><i>Influence of terrain on clouds and precipitation, frontal passage</i></b>										
(01)		Describe the influence of mountainous area on a frontal passage.	X	X	X	X	X	X	X	3		
<b>050 09 08 02</b>		<b><i>Vertical movements, mountain waves, wind shear, turbulence, ice accretion</i></b>										
(01)		Describe the vertical movements, wind shear and turbulence that are typical of mountain areas.	X	X	X	X	X	X	X	3		
(02)		Indicate on a sketch of a chain of mountains the turbulent zones (mountain waves, rotors).	X	X	X	X	X	X	X	3		
(03)		Explain the influence of relief on ice accretion.	X	X	X	X	X	X	X	3		
<b>050 09 08 03</b>		<b><i>Development and effect of valley inversions</i></b>										
(01)		Describe the formation of a valley inversion due to katabatic winds.	X	X	X	X	X	X	X	3		
(02)		Describe the valley inversion formed by warm winds aloft.	X	X	X	X	X	X	X	3		
(03)		Describe the effects of a valley inversion for an aircraft in flight.	X	X	X	X	X	X	X	3		



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Syllabus reference	BK	Syllabus details and associated Learning Objectives	Aeroplane		Helicopter			IR	CB-IR(A)	BIR Exam	BIR BK	Remarks
			ATPL	CPL	ATPL/IR	ATPL	CPL					
<b>050 09 09 00</b>		<b>Visibility-reducing phenomena</b>										
<b>050 09 09 01</b>		<b><i>Reduction of visibility caused by precipitation and obscurations</i></b>										
(01)		Describe the reduction of visibility caused by precipitation: drizzle, rain, snow.	X	X	X	X	X	X	X	3		
(02)		Describe the reduction of visibility caused by obscurations: — fog, mist, haze, smoke, volcanic ash.	X	X	X	X	X	X	X	3		
(03)		Describe the reduction of visibility caused by obscurations: — sand (SA), dust (DU).	X		X	X				3		
(04)		Describe the differences between ground and flight visibility, and slant and vertical visibility when an aircraft is above or within a layer of haze or fog.	X	X	X	X	X	X	X	3		
<b>050 09 09 02</b>		<b><i>Reduction of visibility caused by other phenomena</i></b>										
(01)		Describe the reduction of visibility caused by low drifting and blowing snow.	X	X	X	X	X	X	X	3		
(02)		Describe the reduction of visibility caused by low drifting and blowing dust and sand.	X	X	X	X	X					
(03)		Describe the reduction of visibility caused by dust storm (DS) and sand-storm (SS).	X	X	X	X	X					

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Syllabus reference	BK	Syllabus details and associated Learning Objectives	Aeroplane		Helicopter			IR	CB-IR(A)	BIR Exam	BIR BK	Remarks
			ATPL	CPL	ATPL/IR	ATPL	CPL					
(04)		Describe the reduction of visibility caused by icing (windshield).	X	X	X	X	X	X	X	3		
(05)		Describe the reduction of visibility caused by the position of the sun relative to the visual direction.	X	X	X	X	X	X	X	3		
(06)		Describe the reduction of visibility caused by the reflection of the sun's rays from the top of the layers of haze, fog and clouds.	X	X	X	X	X	X	X	3		
<b>050 10 00 00</b>		<b>METEOROLOGICAL INFORMATION</b>										
<b>050 10 01 00</b>		<b>Observation</b>										
<b>050 10 01 01</b>		<b>Surface observations</b>										
(01)		Define 'gusts', as given in METARs.	X	X	X	X	X	X	X			
(02)		Distinguish wind given in METARs and wind given by the control tower for take-off and landing.	X	X	X	X	X	X	X			
(03)		Define 'visibility'.	X	X	X	X	X	X	X		2	
(04)		Describe the meteorological measurement of visibility.	X	X	X	X	X	X	X		2	
(05)		Define 'prevailing visibility'.	X	X	X	X	X	X	X			
(06)		Define 'ground visibility'.	X	X	X	X	X	X	X	2		
(07)		List the units used for visibility (m, km, statute mile).	X	X	X	X	X	X	X		2	
(08)		Define 'runway visual range'.	X	X	X	X	X	X	X	2		
(09)		Describe the meteorological measurement of runway visual range.	X	X	X	X	X	X	X	2		
(10)		Indicate where the transmissometers/ forward-scatter meters are placed on the aerodrome.	X	X	X	X	X	X	X	2		

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Syllabus reference	BK	Syllabus details and associated Learning Objectives	Aeroplane		Helicopter			IR	CB-IR(A)	BIR Exam	BIR BK	Remarks
			ATPL	CPL	ATPL/IR	ATPL	CPL					
(11)		List the units used for runway visual range (m, ft).	X	X	X	X	X	X	X		2	
(12)		List the different possibilities to transmit information to pilots about runway visual range.	X	X	X	X	X	X	X	2		
(13)		Compare ground visibility, prevailing visibility, and runway visual range.	X	X	X	X	X	X	X	2		
(14)		Indicate the means of observation of present weather.	X	X	X	X	X	X				
(15)		Indicate the means of observing clouds for the purpose of recording: type, amount, height of base (ceilometers), and top.	X	X	X	X	X	X				
(16)		State the clouds which are indicated in METAR, TAF and SIGMET.	X	X	X	X	X	X	X	2		
(17)		Define 'oktas'.	X	X	X	X	X	X	X		2	
(18)		Define 'cloud base'.	X	X	X	X	X	X	X		2	
(19)		Define 'ceiling'.	X	X	X	X	X	X	X		2	
(20)		Name the unit and the reference level used for information about cloud base (ft).	X	X	X	X	X	X	X		2	
(21)		Define 'vertical visibility'.	X	X	X	X	X	X	X		2	
(22)		Explain briefly how and when vertical visibility is measured.	X	X	X	X	X	X	X	2		
(23)		Name the units used for vertical visibility (ft, m).	X	X	X	X	X	X	X		2	
(24)		Indicate the means of observation of air temperature (thermometer).	X	X	X	X	X	X	X			

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Syllabus reference	BK	Syllabus details and associated Learning Objectives	Aeroplane		Helicopter			IR	CB-IR(A)	BIR Exam	BIR BK	Remarks
			ATPL	CPL	ATPL/IR	ATPL	CPL					
(25)		Name the units of relative humidity (%) and dew-point temperature (Celsius, Fahrenheit).	X	X	X	X	X	X				
<b>050 10 01 02</b>		<b>Radiosonde observations</b>										
(01)		Describe the principle of radiosondes.	X	X	X	X	X	X				
(02)	X	Describe and interpret the sounding by radiosonde given on a simplified temperature–pressure (T–P) diagram.	X	X	X	X	X	X				
<b>050 10 01 03</b>		<b>Satellite observations</b>										
(01)		Describe the basic outlines of satellite observations.	X	X	X	X	X	X	X			
(02)		Name the main uses of satellite pictures in aviation meteorology.	X	X	X	X	X	X	X			
(03)		Describe the different types of satellite imagery.	X	X	X	X	X	X	X			
(04)		Interpret qualitatively the satellite pictures in order to get useful information for flights: — location of clouds (distinguish between stratiform and cumuliform clouds).	X	X	X	X	X	X	X			
(05)		Interpret qualitatively the satellite pictures in order to get useful information for flights: — location of fronts.	X	X	X	X	X	X	X			
(06)		Interpret qualitatively the satellite pictures in order to get useful information for flights using atmospheric motion vector images to locate jet streams.	X									
<b>050 10 01 04</b>		<b>Weather radar observations</b>										

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Syllabus reference	BK	Syllabus details and associated Learning Objectives	Aeroplane		Helicopter			IR	CB-IR(A)	BIR Exam	BIR BK	Remarks
			ATPL	CPL	ATPL/IR	ATPL	CPL					
		<i>(Refer to Subject 050 09 04 05)</i>										
(01)		Describe the basic principle and the type of information given by a ground weather radar.	X	X	X	X	X	X				
(02)		Interpret ground weather radar images.	X	X	X	X	X	X	X	2		
(03)		Describe the basic principle and the type of information given by airborne weather radar.	X	X	X	X	X	X	X	2		
(04)		Describe the limits and the errors of airborne weather radar information.	X	X	X	X	X	X	X	2		
(05)		Interpret typical airborne weather radar images.	X	X	X	X	X	X	X	2		
<b>050 10 01 05</b>		<b>Aircraft observations and reporting</b>										
(01)		Describe routine air-report and special air-report (ARS).	X	X	X	X	X	X	X			
(02)		State the obligation of a pilot to prepare air-reports.	X	X	X	X	X	X	X			
(03)		Name the weather phenomena to be stated in an ARS.	X	X	X	X	X	X	X			
<b>050 10 02 00</b>		<b>Weather charts</b>										
<b>050 10 02 01</b>		<b>Significant weather charts</b>										
(01)		Decode and interpret significant weather charts (low, medium and high level).	X	X	X	X	X	X	X	2		
(02)		Describe from a significant weather chart the flight conditions at designated locations or along a defined flight route at a given FL.	X	X	X	X	X	X	X	2		
<b>050 10 02 02</b>		<b>Surface charts</b>										

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Syllabus reference	BK	Syllabus details and associated Learning Objectives	Aeroplane		Helicopter			IR	CB-IR(A)	BIR Exam	BIR BK	Remarks
			ATPL	CPL	ATPL/IR	ATPL	CPL					
(01)		Recognise the following weather systems on a surface weather chart (analysed and forecast): ridges, cols and troughs; fronts; frontal side, warm sector and rear side of mid-latitude frontal lows; high- and low-pressure areas.	X	X	X	X	X	X	X	2		
(02)		Determine from surface weather charts the wind direction and speed.	X	X	X	X	X	X	X			
<b>050 10 02 03</b>		<b>Upper-air charts</b>										
(01)		Define 'constant-pressure chart'.	X	X	X							
(02)		Define 'isohypse (contour line)'. (Refer to Subject 050 01 03 02)	X	X	X							
(03)		Define 'isotherm'.	X	X	X							
(04)		Define 'isotach'.	X	X	X							
(05)		Describe forecast upper-wind and temperature charts.	X	X	X							
(06)		For designated locations or routes determine from forecast upper-wind and temperature charts, if necessary by interpolation, the spot/average values for outside-air temperature, temperature deviation from ISA, wind direction, and wind speed.	X	X	X							
<b>050 10 02 04</b>		<b>Gridded forecast products</b>										
(01)		State that numerical weather prediction uses a 3D grid of weather data, consisting of horizontal data (latitude-longitude) and vertical data (height or pressure).	X	X	X	X	X					

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Syllabus reference	BK	Syllabus details and associated Learning Objectives	Aeroplane		Helicopter			IR	CB-IR(A)	BIR Exam	BIR BK	Remarks
			ATPL	CPL	ATPL/IR	ATPL	CPL					
(02)		Explain that world area forecast centres prepare global sets of gridded forecasts for flight planning purposes (upper wind, temperature, humidity).	X	X	X	X	X					
(03)		State that the WAFCs also produce gridded datasets for Flight Level and temperature of the tropopause, direction and speed of maximum wind, cumulonimbus clouds, icing and turbulence.	X	X	X	X	X					
(04)		Explain that the data on CB and turbulence can be used in the visualization of flight hazards.	X	X	X	X	X					
(05)		Explain that the gridded forecasts can be merged in information processing systems with data relayed from aircraft or pilot reports, e.g. of turbulence, to provide improved situation awareness.	X	X	X	X	X					
<b>050 10 03 00</b>		<b>Information for flight planning</b>										
<b>050 10 03 01</b>		<b>Aviation weather messages</b>										
(01)		Describe, decode and interpret the following aviation weather messages (given in written or graphical format): METAR, aerodrome special meteorological report (SPECI), trend forecast (TREND), TAF, information concerning en-route weather phenomena which may affect the safety of aircraft operations (SIGMET), information concerning en-route weather phenomena which may affect the safety of low-	X	X	X	X	X	X	X	2	3	

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Syllabus reference	BK	Syllabus details and associated Learning Objectives	Aeroplane		Helicopter			IR	CB-IR(A)	BIR Exam	BIR BK	Remarks
			ATPL	CPL	ATPL/IR	ATPL	CPL					
		level aircraft operations (AIRMET), area forecast for low-level flights (GAMET), ARS, volcanic ash advisory information.										
(02)		Describe, decode and interpret the tropical cyclone advisory information in written and graphical form.	X	X	X	X	X					
(03)		Describe the general meaning of MET REPORT and SPECIAL REPORT.	X	X	X	X	X	X	X	2	1	
(04)		List, in general, the cases when a SIGMET and an AIRMET are issued.	X	X	X	X	X	X	X	2	1	
(05)		Describe, decode (by using a code table) and interpret the following messages: runway state message (as written in a METAR). <i>Remark: For runway state message, refer to ICAO Doc 7754 'Air Navigation Plan — European Region'.</i>	X	X	X	X	X	X	X	2	1	
<b>050 10 03 02</b>		<b>Meteorological broadcasts for aviation</b>										
(01)		Describe the meteorological content of broadcasts for aviation: — meteorological information for aircraft in flight (VOLMET); — automatic terminal information service (ATIS).	X	X	X	X	X	X	X	2	1	
(02)		Describe the meteorological content of broadcasts for aviation:	X	X	X	X	X					



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Syllabus reference	BK	Syllabus details and associated Learning Objectives	Aeroplane		Helicopter			IR	CB-IR(A)	BIR Exam	BIR BK	Remarks
			ATPL	CPL	ATPL/IR	ATPL	CPL					
		— HF-VOLMET.										
<b>050 10 03 03</b>		<b>Use of meteorological documents</b>										
(01)		Describe meteorological briefing and advice.	X	X	X	X	X	X	X	2	1	
(02)		List the information that a flight crew can receive from meteorological services for pre-flight planning and apply the content of this information on a designated flight route.	X	X	X	X	X	X	X	2	1	
(03)		List the meteorological information that a flight crew can receive from flight information services during flight and apply the content of this information for the continuation of the flight.	X	X	X	X	X	X	X	2	1	
<b>050 10 03 04</b>		<b>Meteorological warnings</b>										
(01)		Describe and interpret aerodrome warnings and wind-shear warnings and alerts.	X	X	X	X	X	X	X	2	1	
<b>050 10 04 00</b>		<b>Meteorological services</b>										
<b>050 10 04 01</b>		<b>World area forecast system and meteorological offices</b>										
(01)	X	Name the world area forecast centres (WAFCs) as the provider for upper-air forecasts: WAFCs prepare upper-air gridded forecasts of upper winds; upper-air temperature and humidity; direction, speed and flight level of maximum wind; flight level and temperature of tropopause, areas of cumulonimbus	X	X	X	X	X	X	X			

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Syllabus reference	BK	Syllabus details and associated Learning Objectives	Aeroplane		Helicopter			IR	CB-IR(A)	BIR Exam	BIR BK	Remarks
			ATPL	CPL	ATPL/IR	ATPL	CPL					
		clouds, icing, clear-air and in-cloud turbulence, and geopotential altitude of flight levels.										
(02)	X	Name the meteorological (MET) offices as the provider for aerodrome forecasts and briefing documents.	X	X	X	X	X	X	X			
(03)	X	Name the meteorological watch offices (MWOs) as the provider for SIGMET and AIRMET information.	X	X	X	X	X	X				
(04)	X	Name the aeronautical meteorological stations as the provider for METAR and MET reports.	X	X	X	X	X	X				
(05)	X	Name the volcanic ash advisory centres (VAACs) as the provider for forecasts of volcanic ash clouds.	X	X	X	X	X	X				
(06)	X	Name the tropical cyclone advisory centres (TCACs) as the provider for forecasts of tropical cyclones.	X		X	X						
<b>050 10 04 02</b>		<b>International organisations</b>										
(01)	X	Describe briefly the following organisations and their chief activities in relation to weather for aviation: — International Civil Aviation Organization (ICAO) (Refer to Subject 010 'Air Law'); — World Meteorological Organization (WMO).	X	X	X	X	X	X				

## SUBJECT 061 – NAVIGATION – GENERAL NAVIGATION

### Mental dead reckoning (MDR)

Where the term 'mental dead reckoning' (MDR) is used within a Learning Objective (LO), the applicable technique which will be used for the European Central Question Bank (ECQB) questions is based on the methods shown below.

Examination questions will state that an MDR technique is required to produce the solution. If other techniques (e.g. trigonometry) are used to determine the answer, then the determined answer may be incorrect.

### MDR crosswind component (XWC)

The XWC can be calculated using a 'clock code rule', where each 15° of wind angle is represented by 1/4 of an hour — meaning 1/4 the wind strength.

The XWC can be estimated using the values from the table below:

Wind angle	15°	30°	45°	60°
% of wind speed	25	50	75	100

(Wind angle (WA) is the angle between the wind vector and the track/runway direction to the nearest 10°)

Example:

RWY 04 and surface wind from tower is 085°/20 kt. What is the XWC?

$$WA = 45^\circ$$

$$XWC = (0.75) \times 20$$

$$= 15 \text{ kt}$$

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MDR headwind component (HWC)/tailwind component (TWC)

The H/TWC can be estimated using the values from the following table:

90° – wind angle	10°	20°	30°	40°	50°	60°
% of wind speed	0.2	0.3	0.5	0.6	0.8	0.9

To assist recall, an aid is shown below:

90° – wind angle	10°	20°	30°	40°	50°	60°
Aid	1	1	2	2	3	3
% of wind speed	0.2	0.3	0.5	0.6	0.8	0.9

Example:

RWY 04 and surface wind from tower is 080°/20 kt. What is the HWC?

WA = 40°

90° – WA = 50°

HWC = (0.8) × 20

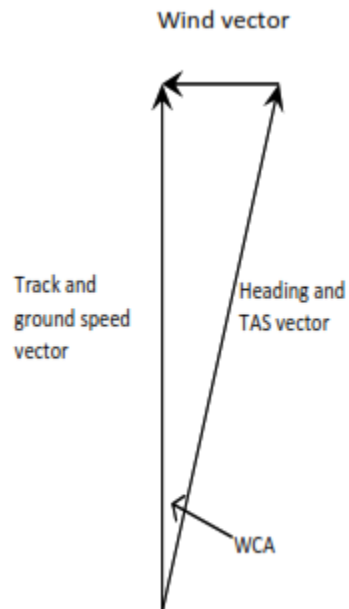
= 16 kt

Alternately, for XWC and TWC/HWC MDR calculations, the values in the following table can be used, assuming XWC = wind velocity × sine WA and TWC/HWC = wind velocity × cosine WA:

Wind angle	0°	10°	20°	30°	40°	50°	60°	70°	80°	90°
Sine	0	0.2	0.3	0.5	0.6	0.8	0.9	0.9	1	1
Aid	0	1	1	2	2	3	3	2	2	1

MDR triangle of velocities (TOV)

Heading is determined by calculating the XWC as previously described, then applying the 1:60 rule to the TOV as follows:



This MDR technique works for the relatively small WCAs which are typical for medium to high TAS values (the ground speed (GS) therefore can be assumed to be equal to the TAS for application of the 1:60 rule).

Example 1:

Planned track =  $070^{\circ}$  (T)

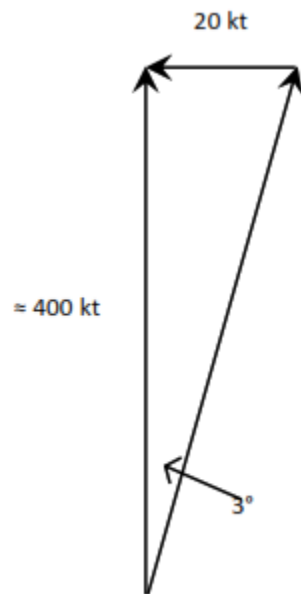
TAS = 400 kt

$$WV = 100^\circ (T)/40 \text{ kt}$$

$$WA = 30^\circ$$

$$XWC = (0.5) \times 40$$

$$= 20 \text{ kt}$$



$$\text{Heading required} = 073^\circ (T)$$

GS is determined by using the headwind/tailwind example previously explained.

$$WA = 30^\circ$$

$$90^\circ - 30^\circ = 60^\circ$$

$$HWC = (0.9) \times 40$$

$$= 36 \text{ kt}$$

$$GS = 400 - 36 = 364 \text{ kt}$$

Example 2:

$$\text{Planned track} = 327^\circ (\text{T})$$

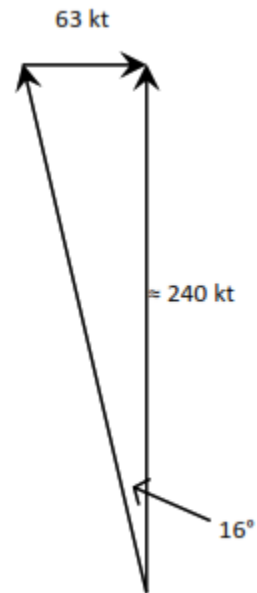
$$\text{TAS} = 240 \text{ kt}$$

$$\text{WV} = 210^\circ (\text{T})/70 \text{ kt}$$

$$WA = 60^\circ$$

$$\text{XWC} = (0.9) \times 7$$

$$= 63 \text{ kt}$$



WCA =  $16^\circ$

Heading required =  $311^\circ$  (T)

GS is determined by using the headwind/tailwind example previously explained.

WA =  $60^\circ$

$90^\circ - 60^\circ = 30^\circ$

TWC =  $(0.5) \times 70$



= 35 kt

GS = 240 + 35 = 275 kt

VFR navigation (061 02 00 00)

The techniques referred to within the LOs are based on the methods as described below.

Mental dead reckoning (MDR) off-track corrections

Based on the 1:60 rule

1 NM of cross-track error (XTE) for every 60 NM along track from waypoint = 1° of track error angle (TKE).

1 NM of XTE for every 60 NM along track to waypoint = 1° of closing angle (CA).

Change of heading required to regain track in same distance as covered from waypoint to position off track = 2 × TKE.

Change of heading required to reach next waypoint from position off track = TKE + CA.

Example 1:

Planned heading is 162° (T), and after 40 NM along track the aircraft position is fixed 2 NM right of planned track. What heading is required to regain track in approximately the same time as has taken to the fix position?

TKE = 3°

Heading required = 156° (T)

Example 2:

Planned heading is  $317^\circ$  (T), and after 22 NM along track the aircraft position is fixed 3.5 NM left of planned track. What heading is required to fly direct to the next waypoint which is another 45 NM down track?

TKE =  $10^\circ$ , CA =  $5^\circ$

Heading required =  $332^\circ$  (T)

Mental dead reckoning (MDR) estimated time of arrival (ETA) calculations

Round the GS to the nearest NM/min, and then make the same percentage adjustment for the distance.

Example:

Distance to go = 42 NM

GS = 132 kt

GS rounded to 120 kt = 2 NM/min

Percentage change = 10 %

Distance =  $42 - 10\% = 38$  NM

Time =  $38 / 2 = 19$  min

Unsure-of-position procedure

As soon as the position of the aircraft is in doubt:

1. note the time;

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2. communicate if in contact with an air traffic control (ATC) unit to request assistance;
3. consider using any radio-navigation aids that may be available to give position information (do not become distracted from flying the aircraft safely);
4. if short of fuel or near controlled airspace, and not in contact with ATC, set 121.5 MHz and make a PAN call;
5. if that is not necessary, check the directional indicator (DI) and compass are still synchronised and continue to fly straight and level and on route plan heading;
6. estimate the distance travelled since the last known position;
7. compare the ground with your estimated position on the map (look at the terrain for hills and valleys or line features such as a motorway, railway, river or coastline);
8. once the position has been re-established, keep checking the heading (and look out for other aircraft) and continue the flight by updating the estimated position regularly while looking for unique features such as a lake, wood, built-up area, mast, or a combination of roads, rivers and railways.

Procedure when lost

If the unsure-of-position procedure does not resolve the problem:

1. inform someone — call first on the working frequency and state the word 'LOST';
2. if there is no contact on that frequency or there is no frequency selected, change to 121.5 MHz and make a PAN call; select 7700 with ALT on the transponder if fitted.

In all cases: maintain visual meteorological conditions (VMC), note the fuel state, and try to identify an area suitable for a precautionary landing.

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Consider the 'HELP ME' mnemonic:

- H. High ground/obstructions — are there any nearby?
- E. Entering controlled airspace — is that a possibility?
- L. Limited experience, low time or student pilot — let someone know.
- P. PAN call in good time — don't leave it too late.
- M. MET conditions — is the weather deteriorating?
- E. Endurance — is fuel getting low?

Syllabus reference	BK	Syllabus details and associated Learning Objectives	Aeroplane		Helicopter			IR	CB-IR(A)	BIR Exam	BIR BK	Remarks
			ATPL	CPL	ATPL /IR	ATPL	CPL					
060 00 00 00		<b>NAVIGATION</b>										
061 00 00 00		<b>GENERAL NAVIGATION</b>										
061 01 00 00		<b>BASICS OF NAVIGATION</b>										
061 01 01 00		<b>The Earth</b>										
061 01 01 01		<b>Form</b>										
(01)	X	State that the geoid is an irregular shape based on the surface of the oceans influenced only by gravity and centrifugal force.	X	X	X	X	X					
(02)	X	State that a number of different ellipsoids are used to describe the shape of the Earth for mapping but that WGS-84 is the reference ellipsoid required for geographical coordinates.	X	X	X	X	X					

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Syllabus reference	BK	Syllabus details and associated Learning Objectives	Aeroplane		Helicopter			IR	CB-IR(A)	BIR Exam	BIR BK	Remarks
			ATPL	CPL	ATPL /IR	ATPL	CPL					
(03)		State that the circumference of the Earth is approximately 40 000 km or approximately 21 600 NM.	X	X	X	X	X					
<b>061 01 01 02</b>		<b>Earth rotation</b>										
(01)	X	Describe the rotation of the Earth around its own spin axis and the plane of the ecliptic (including the relationship of the spin axis to the plane of the ecliptic).	X	X	X	X	X					
(02)		Explain the effect that the inclination of the Earth's spin axis has on insolation and duration of daylight.	X	X	X	X	X					
<b>061 01 02 00</b>		<b>Position</b>										
<b>061 01 02 01</b>		<b>Position reference system</b>										
(01)	X	State that geodetic latitude and longitude is used to define a position on the WGS-84 ellipsoid.	X	X	X	X	X					
(02)		Define geographic (geodetic) latitude and parallels of latitude.	X	X	X	X	X					
(03)		Calculate the difference in latitude between any two given positions.	X	X	X	X	X					
(04)		Define geographic (geodetic) longitude and meridians.	X	X	X	X	X					
(05)		Calculate the difference in longitude between any two given positions.	X	X	X	X	X					
<b>061 01 03 00</b>		<b>Direction</b>										
<b>061 01 03 01</b>		<b>Datums</b>										
(01)	X	Define 'true north' (TN).	X	X	X	X	X					
(02)		Measure a true direction on any given aeronautical chart.	X	X	X	X	X					

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Syllabus reference	BK	Syllabus details and associated Learning Objectives	Aeroplane		Helicopter			IR	CB-IR(A)	BIR Exam	BIR BK	Remarks
			ATPL	CPL	ATPL /IR	ATPL	CPL					
(03)	X	Define 'magnetic north' (MN).	X	X	X	X	X					
(04)		Define and apply variation.	X	X	X	X	X					
(05)		Explain changes of variation with time and position.	X	X	X	X	X					
(06)	X	Define 'compass north' (CN).	X	X	X	X	X					
(07)		Apply deviation.	X	X	X	X	X					
<b>061 01 03 02</b>		<b>Track and heading</b>										
(01)		Calculate XWC by: – trigonometry; and – MDR.	X	X	X	X	X					
(02)		Explain and apply the concepts of drift and WCA.	X	X	X	X	X					
(03)		Calculate the actual track with appropriate data of heading and drift.	X	X	X	X	X					
(04)		Calculate TKE with appropriate data of WCA and drift.	X	X	X	X	X					
(05)		Calculate the heading change at an off-course fix to directly reach the next waypoint using the 1:60 rule.	X	X	X	X	X					
(06)		Calculate the average drift angle based upon an off-course fix observation.	X	X	X	X	X					
<b>061 01 04 00</b>		<b>Distance</b>										
<b>061 01 04 01</b>		<b>WGS-84 ellipsoid</b>										
(01)	X	State that 1 NM is equal to 1 852 km, which is the average distance of 1' of latitude change on the WGS-84 ellipsoid.	X	X	X	X	X					

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Syllabus reference	BK	Syllabus details and associated Learning Objectives	Aeroplane		Helicopter			IR	CB-IR(A)	BIR Exam	BIR BK	Remarks
			ATPL	CPL	ATPL /IR	ATPL	CPL					
(02)		State that 1' of longitude change at the equator on the WGS-84 ellipsoid is approximately equal to 1 NM.	X	X	X	X	X					
<b>061 01 04 02</b>		<b>Units</b>										
(01)		Convert between units of distance (nautical mile (NM), kilometre (km), statute mile (SM), feet (ft), inches (in)).	X	X	X	X	X					
<b>061 01 04 03</b>		<b>Graticule distances</b>										
(01)		Calculate the distance between positions on the same meridian, on opposite (antipodal) meridians, on the same parallel of latitude, and calculate new latitude/longitude when given distances north-south and east-west.	X	X	X	X	X					
<b>061 01 04 04</b>		<b>Air mile</b>										
(01)		Evaluate the effect of wind and altitude on air distance.	X	X	X	X	X					
(02)		Convert between ground distance (NM) and air distance (NAM) using the formula: NAM = NM × TAS/GS.	X	X	X	X	X					
<b>061 01 05 00</b>		<b>Speed</b>										
<b>061 01 05 01</b>		<b>True airspeed (TAS)</b>										
(01)		Calculate TAS from CAS, and CAS from TAS by: – mechanical computer; and – rule of thumb (2 % per 1 000 ft).	X	X	X	X	X					

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Syllabus reference	BK	Syllabus details and associated Learning Objectives	Aeroplane		Helicopter			IR	CB-IR(A)	BIR Exam	BIR BK	Remarks
			ATPL	CPL	ATPL /IR	ATPL	CPL					
<b>061 01 05 02</b>		<b><i>Mach number (M)</i></b>										
(01)		Calculate TAS from M, and M from TAS.	X	X								
<b>061 01 05 03</b>		<b><i>CAS/TAS/M relationship</i></b>										
(01)		Deduce the CAS, TAS and M relationship in climb/descent/cruise (flying at constant CAS or M).	X	X								
(02)		Deduce CAS and TAS in climb/descent/cruise (flying at constant CAS).			X	X	X					
<b>061 01 05 04</b>		<b><i>Ground speed (GS)</i></b>										
(01)		Calculate headwind component (HWC) and tailwind component (TWC) by: – trigonometry; and – MDR.	X	X	X	X	X					
(02)		Apply HWC and TWC to determine GS from TAS and vice versa.	X	X	X	X						
(03)	X	Explain the relationship between GS and TAS with increasing WCA.	X	X	X	X	X					
(04)		Calculate GS with: – mechanical computer (TOV solution); and – MDR (given track, TAS and WV).	X	X	X	X	X					
(05)		Perform GS, distance and time calculations.	X	X	X	X	X					
(06)		Calculate revised GS to reach a way-point at a specific time.	X	X	X	X	X					



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Syllabus reference	BK	Syllabus details and associated Learning Objectives	Aeroplane		Helicopter			IR	CB-IR(A)	BIR Exam	BIR BK	Remarks
			ATPL	CPL	ATPL /IR	ATPL	CPL					
(07)		Calculate the average GS based on two observed fixes.	X	X	X	X	X					
<b>061 01 05 05</b>		<b>Flight log</b>										
(01)		Enter revised navigational en-route data, for the legs concerned, into the flight plan (e.g. updated wind and GS and correspondingly losses or gains in time and fuel consumption).	X	X	X	X	X					
<b>061 01 05 06</b>		<b>Gradient versus rate of climb/descent</b>										
(01)		Estimate average climb/descent gradient (%) or glide path degrees according to the following rule of thumb: <ul style="list-style-type: none"> <li>— Gradient in degrees = (vertical distance (ft) / 100) / ground distance (NM))</li> <li>— Gradient in % = (vertical distance (ft) / 60) / ground distance (NM))</li> <li>— Gradient in degrees = arctan (altitude difference (ft) / ground distance (ft)).</li> </ul> <i>N.B. These rules of thumb approximate 1 NM to 6 000 ft and are based on the 1:60 rule.</i>	X	X	X	X	X					
(02)		Calculate rate of descent (ROD) on a given glide-path angle or gradient using the following rule of thumb formulae: <ul style="list-style-type: none"> <li>— <math>ROD \text{ (ft/min)} = GP^\circ \times GS \text{ (NM/min)} \times 100</math></li> </ul>	X	X	X	X	X					

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Syllabus reference	BK	Syllabus details and associated Learning Objectives	Aeroplane		Helicopter			IR	CB-IR(A)	BIR Exam	BIR BK	Remarks
			ATPL	CPL	ATPL /IR	ATPL	CPL					
		— ROD (ft/min) = GP% × GS (kt)										
(03)		Calculate climb/descent gradient (ft/NM, % and degrees), GS or vertical speed according to the following formula: — Vertical speed (ft/min) = (GS (kt) × gradient (ft/NM)) / 60.	X	X	X	X	X					
(04)	X	State that it is necessary to determine the position of the aircraft accurately before commencing descent in order to ensure safe ground clearance.	X	X	X	X	X					
<b>061 01 06 00</b>		<b>Triangle of velocities (TOV)</b>										
<b>061 01 06 01</b>		<b>Construction</b>										
(01)		Draw and correctly label the TOV.	X	X	X	X	X					
<b>061 01 06 02</b>		<b>Solutions</b>										
(01)		Resolve the TOV for: — heading and GS (with mechanical computer and MDR); — WV (with mechanical computer); and — track and GS (with mechanical computer and MDR).	X	X	X	X	X					
<b>061 01 07 00</b>		<b>Dead reckoning (DR)</b>										
<b>061 01 07 01</b>		<b>Dead reckoning (DR) technique</b>										
(01)		Determine a DR position.	X	X	X	X	X					
(02)		Evaluate the difference between a DR and a fix position.	X	X	X	X	X					
(03)		Define 'speed factor' (SF).	X	X	X	X	X					

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Syllabus reference	BK	Syllabus details and associated Learning Objectives	Aeroplane		Helicopter			IR	CB-IR(A)	BIR Exam	BIR BK	Remarks
			ATPL	CPL	ATPL /IR	ATPL	CPL					
		Speed divided by 60, used for mental flight-path calculations.										
(04)		Calculate wind correction angle (WCA) using the formula: — $WCA = XWC \text{ (crosswind component)}/SF$	X	X	X	X	X					
<b>061 01 08 00</b>		<b>Navigation in climb and descent</b>										
<b>061 01 08 01</b>		<b>Average airspeed</b>										
(01)		Average TAS used for climb problems is calculated at the altitude 2/3 of the cruising altitude.	X	X	X	X	X					
(02)		Average TAS used for descent problems is calculated at the altitude 1/2 of the descent altitude.	X	X	X	X	X					
<b>061 01 08 02</b>		<b>Average wind velocity (WV)</b>										
(01)		WV used for climb problems is the WV at the altitude 2/3 of the cruising altitude.	X	X	X	X	X					
(02)		WV used for descent problems is the WV at the altitude 1/2 of the descent altitude.	X	X	X	X	X					
(03)		Calculate the average climb/descent GS from given TAS at various altitudes, and WV at various altitudes and true track.	X	X	X	X	X					
<b>061 01 08 03</b>		<b>Ground speed (GS)/distance covered during climb or descent</b>										
(01)	X	State that most aircraft operating handbooks supply graphical material	X	X	X	X	X					

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Syllabus reference	BK	Syllabus details and associated Learning Objectives	Aeroplane		Helicopter			IR	CB-IR(A)	BIR Exam	BIR BK	Remarks
			ATPL	CPL	ATPL /IR	ATPL	CPL					
		to calculate climb and descent problems.										
(02)		Calculate the flying time and distance during climb/descent from given average rate of climb/descent and using average GS using the following formulae valid for a 3°-glide path: — rate of descent = $(GS \times 10) / 2$ — rate of descent = speed factor (SF) $\times$ glide-path angle $\times 100$	X	X	X	X	X					
(03)		Given distance, speed and present altitude, calculate the rate of climb/descent in order to reach a certain position at a given altitude.	X	X	X	X	X					
(04)		Given speed, rate of climb/descent and altitude, calculate the distance required in order to reach a certain position at a given altitude.	X	X	X	X	X					
(05)		Given speed, distance to go and altitude to climb/descent, calculate the rate of climb/descent.	X	X	X	X	X					
<b>061 02 00 00</b>		<b>VISUAL FLIGHT RULES (VFR) NAVIGATION</b>										
<b>061 02 01 00</b>		<b>Ground features</b>										
<b>061 02 01 01</b>		<b>Ground features</b>										
(01)		Recognise which elements would make a ground feature suitable for use for VFR navigation.	X	X	X	X	X					

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Syllabus reference	BK	Syllabus details and associated Learning Objectives	Aeroplane		Helicopter			IR	CB-IR(A)	BIR Exam	BIR BK	Remarks
			ATPL	CPL	ATPL /IR	ATPL	CPL					
<b>061 02 01 02</b>		<b>Visual identification</b>										
(01)		Describe the problems of VFR navigation at lower levels and the causes of reduced visibility.	X	X	X	X	X					
(02)		Describe the problems of VFR navigation at night.	X	X	X	X	X					
<b>061 02 02 00</b>		<b>VFR navigation techniques</b>										
<b>061 02 02 01</b>		<b>Use of visual observations and application to in-flight navigation</b>										
(01)	X	Describe what is meant by the term 'map reading'.	X	X	X	X	X					
(02)	X	Define the term 'visual checkpoint'.	X	X	X	X	X					
(03)		Discuss the general features of a visual checkpoint and give examples.	X	X	X	X	X					
(04)		State that the evaluation of the differences between DR positions and actual position can refine flight performance and navigation.	X	X	X	X	X					
(05)	X	Establish fixes on navigational charts by plotting visually derived intersecting lines of position.	X	X	X	X	X					
(06)	X	Describe the use of a single observed position line to check flight progress.	X	X	X	X	X					
(07)	X	Describe how to prepare and align a map/chart for use in visual navigation.	X	X	X	X	X					
(08)		Describe visual-navigation techniques including: — use of DR position to locate identifiable landmarks;	X	X	X	X	X					

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Syllabus reference	BK	Syllabus details and associated Learning Objectives	Aeroplane		Helicopter			IR	CB-IR(A)	BIR Exam	BIR BK	Remarks
			ATPL	CPL	ATPL /IR	ATPL	CPL					
		<ul style="list-style-type: none"> <li>— identification of charted features/landmarks;</li> <li>— factors affecting the selection of landmarks;</li> <li>— an understanding of seasonal and meteorological effects on the appearance and visibility of landmarks;</li> <li>— selection of suitable landmarks;</li> <li>— estimation of distance from landmarks from successive bearings;</li> <li>— estimation of the distance from a landmark using an approximation of the sighting angle and the flight altitude.</li> </ul>										
(09)		Describe the action to be taken if there is no visual checkpoint available at a scheduled turning point.	X	X	X	X	X					
(10)		Understand the difficulties and limitations that may be encountered in map reading in some geographical areas due to the nature of terrain, lack of distinctive landmarks, or lack of detailed and accurate charted data.	X	X	X	X	X					
(11)	X	State the function of contour lines on a topographical chart.	X	X	X	X	X					

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Syllabus reference	BK	Syllabus details and associated Learning Objectives	Aeroplane		Helicopter			IR	CB-IR(A)	BIR Exam	BIR BK	Remarks
			ATPL	CPL	ATPL /IR	ATPL	CPL					
(12)	X	Indicate the role of 'layer tinting' (colour gradient) in relation to the depiction of topography on a chart.	X	X	X	X	X					
(13)		Using the contours shown on a chart, describe the appearance of a significant feature.	X	X	X	X	X					
(14)		Apply the techniques of DR, map reading, orientation, timing and revision of ETAs and headings.	X	X	X	X	X					
<b>061 02 02 02</b>		<b>Unplanned events</b>										
(01)		Explain what needs to be considered in case of diversion, when unsure of position and when lost.	X	X	X	X	X					
<b>061 03 00 00</b>		<b>GREAT CIRCLES AND RHUMB LINES</b>										
<b>061 03 01 00</b>		<b>Great circles</b>										
<b>061 03 01 01</b>		<b>Properties</b>										
(01)		Describe the geometric properties of a great circle (including the vertex) and a small circle.	X	X								
(02)		Describe the geometric properties of a great circle and a small circle, up to 30° difference of longitude.			X	X	X					
(03)	X	Explain why a great-circle route is the shortest distance between any two positions on the Earth.	X	X	X	X	X					
(04)		Name examples of great circles on the surface of the Earth.	X	X	X	X	X					
<b>061 03 01 02</b>		<b>Convergence</b>										

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Syllabus reference	BK	Syllabus details and associated Learning Objectives	Aeroplane		Helicopter			IR	CB-IR(A)	BIR Exam	BIR BK	Remarks
			ATPL	CPL	ATPL /IR	ATPL	CPL					
(01)	X	Explain why the track direction of a great-circle route (other than following a meridian or the equator) changes.	X	X	X	X	X					
(02)		State the formula used to approximate the value of Earth convergence as change of longitude × sine mean latitude.	X	X	X	X	X					
(03)		Calculate the approximate value of Earth convergence between any two positions, up to 30° difference of longitude.	X	X	X	X	X					
<b>061 03 02 00</b>		<b>Rhumb lines</b>										
<b>061 03 02 01</b>		<b>Properties</b>										
(01)	X	Describe the geometric properties of a rhumb line.	X	X	X	X	X					
(02)	X	State that a rhumb-line route is not the shortest distance between any two positions on the Earth (excluding meridians and equator).	X	X	X	X	X					
<b>061 03 03 00</b>		<b>Relationship</b>										
<b>061 03 03 01</b>		<b>Distances</b>										
(01)		Explain that the variation in distance of the great-circle route and rhumb-line route between any two positions increases with increasing latitude or change in longitude.	X	X	X	X	X					
<b>061 03 03 02</b>		<b>Conversion angle</b>										
(01)		Calculate and apply the conversion angle.	X	X								
<b>061 04 00 00</b>		<b>CHARTS</b>										



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Syllabus reference	BK	Syllabus details and associated Learning Objectives	Aeroplane		Helicopter			IR	CB-IR(A)	BIR Exam	BIR BK	Remarks
			ATPL	CPL	ATPL /IR	ATPL	CPL					
<b>061 04 01 00</b>		<b>Chart requirements</b>										
<b>061 04 01 01</b>		<b>ICAO Annex 4 ‘Aeronautical Charts’</b>										
(01)		State the requirement for conformality and for a straight line to approximate a great circle.	X	X	X	X	X					
<b>061 04 01 02</b>		<b>Convergence</b>										
(01)		Explain and calculate the constant of the cone (sine of parallel of origin).	X	X	X	X	X					
(02)		Explain the relationship between Earth and chart convergence with respect to the ICAO requirement for a straight line to approximate a great circle.	X	X	X	X	X					
<b>061 04 01 03</b>		<b>Scale</b>										
(01)		Recognise methods of representing scale on aeronautical charts.	X	X	X	X	X					
(02)		Perform scale calculations based on typical en-route chart scales.	X	X	X	X	X					
<b>061 04 02 00</b>		<b>Projections</b>										
<b>061 04 02 01</b>		<b>Methods of projection</b>										
(01)	X	Identify azimuthal, cylindrical and conical projections.	X	X	X	X	X					
<b>061 04 02 02</b>		<b>Polar stereographic</b>										
(01)		State the properties of a polar stereographic projection.	X	X	X	X	X					
(02)		Calculate straight line track changes on a polar stereographic chart.	X	X	X	X	X					
<b>061 04 02 03</b>		<b>Direct Mercator</b>										

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Syllabus reference	BK	Syllabus details and associated Learning Objectives	Aeroplane		Helicopter			IR	CB-IR(A)	BIR Exam	BIR BK	Remarks
			ATPL	CPL	ATPL /IR	ATPL	CPL					
(01)		State the properties of a direct Mercator projection.	X	X	X	X	X					
(02)		Given the scale at one latitude, calculate the scale at different latitudes.	X	X	X	X	X					
(03)		Given a chart length at one latitude, show that it represents a different Earth distance at other latitudes.	X	X	X	X	X					
<b>061 04 02 04</b>		<b>Lambert</b>										
(01)		State the properties of a Lambert projection.	X	X	X	X	X					
(02)		Calculate straight line track changes on a Lambert chart.	X	X	X	X	X					
(03)		Explain the scale variation throughout the charts as follows: — the scale indicated on the chart will be correct at the standard parallels; — the scale will increase away from the parallel of origin; — the scale within the standard parallels differs by less than 1 % from the scale stated on the chart.	X	X	X	X	X					
(04)		Given appropriate data, calculate initial, final or rhumb-line tracks between two positions (lat./long.).	X	X	X	X	X					
(05)		Given two positions (lat./long.) and information to determine convergency between the two positions, calculate the parallel of origin.	X	X	X	X	X					

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Syllabus reference	BK	Syllabus details and associated Learning Objectives	Aeroplane		Helicopter			IR	CB-IR(A)	BIR Exam	BIR BK	Remarks
			ATPL	CPL	ATPL /IR	ATPL	CPL					
(06)		Given a Lambert chart, determine the parallel of origin, or constant of cone.	X	X	X	X	X					
(07)		Given constant of cone or parallel of origin, great-circle track at one position and great-circle track at another position, calculate the difference of longitude between the two positions.	X	X	X	X	X					
<b>061 04 03 00</b>		<b>Practical use</b>										
<b>061 04 03 01</b>		<b>Symbology</b>										
(01)		Recognise ICAO Annex 4 symbology.	X	X	X	X	X					
<b>061 04 03 02</b>		<b>Plotting</b>										
(01)		Measure tracks and distances on VFR and IFR en-route charts.	X	X	X	X	X					
(02)		Fix the aircraft position on an en-route chart with information from VOR and DME equipment.	X	X	X	X	X					
(03)		Resolve bearings of an NDB station for plotting on an aeronautical chart.	X	X	X	X	X					
<b>061 05 00 00</b>		<b>TIME</b>										
<b>061 05 01 00</b>		<b>Local Mean Time (LMT)</b>										
<b>061 05 01 01</b>		<b>Mean solar day</b>										
(01)	X	Explain the concepts of a mean solar day and LMT.	X	X	X	X	X					
<b>061 05 01 02</b>		<b>Local Mean Time (LMT) and Universal Time Coordinated (UTC)</b>										
(01)		Perform LMT and UTC calculations.	X	X	X	X	X					
<b>061 05 02 00</b>		<b>Standard time</b>										
<b>061 05 02 01</b>		<b>Standard time and daylight saving time</b>										

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Syllabus reference	BK	Syllabus details and associated Learning Objectives	Aeroplane		Helicopter			IR	CB-IR(A)	BIR Exam	BIR BK	Remarks
			ATPL	CPL	ATPL /IR	ATPL	CPL					
(01)		Explain and apply the concept of standard time and daylight saving time, and perform standard time and daylight saving time calculations.	X	X	X	X	X					
<b>061 05 02 02</b>		<b>International Date Line</b>										
(01)		State the changes when crossing the International Date Line.	X	X	X	X	X					
<b>061 05 03 00</b>		<b>Sunrise and sunset</b>										
<b>061 05 03 01</b>		<b>Sunrise and sunset times</b>										
(01)		Define sunrise, sunset, and civil twilight, and extract times from a suitable source (e.g. an almanac).	X	X	X	X	X					
(02)		Explain the changes to sunrise, sunset, and civil twilight times with date, latitude and altitude.	X	X	X	X	X					
(03)		Explain at which time of the year the duration of daylight changes at the highest rate.	X	X	X	X	X					

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**SUBJECT 062 – NAVIGATION – RADIO NAVIGATION**

Syllabus reference	BK	Syllabus details and associated Learning Objectives	Aeroplane		Helicopter			IR	CB-IR(A)	BIR Exam	BIR BK	Remarks
			ATPL	CPL	ATPL/IR	ATPL	CPL					
<b>060 00 00 00</b>		<b>NAVIGATION</b>										
<b>062 00 00 00</b>		<b>RADIO NAVIGATION</b>										
<b>062 01 00 00</b>		<b>BASIC RADIO PROPAGATION THEORY</b>										
<b>062 01 01 00</b>		<b>Basic principles</b>										
<b>062 01 01 01</b>		<b><i>Electromagnetic waves</i></b>										
(01)	X	State that radio waves travel at the speed of light, being approximately 300 000 km/s.	X	X	X	X	X	X				
(02)	X	Define a 'cycle': a complete series of values of a periodical process.	X	X	X	X	X	X				
<b>062 01 01 02</b>		<b><i>Frequency, wavelength, amplitude, phase angle</i></b>										
(01)	X	Define 'frequency': the number of cycles occurring in 1 second expressed in Hertz (Hz).	X	X	X	X	X	X				
(02)	X	Define 'wavelength': the physical distance travelled by a radio wave during one cycle of transmission.	X	X	X	X	X	X				
(03)	X	Define 'amplitude': the maximum deflection in an oscillation or wave.	X	X	X	X	X	X				
(04)	X	State that the relationship between wavelength and frequency is: wavelength ( $\lambda$ ) = speed of light (c) / frequency (f).	X	X	X	X	X	X				
(05)	X	Define 'phase angle': the fraction of one wavelength expressed in degrees from 000° to 360°.	X	X	X	X	X	X				

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Syllabus reference	BK	Syllabus details and associated Learning Objectives	Aeroplane		Helicopter			IR	CB-IR(A)	BIR Exam	BIR BK	Remarks
			ATPL	CPL	ATPL/IR	ATPL	CPL					
(06)	X	Define 'phase angle difference/shift': the angular difference between the corresponding points of two cycles of equal wavelength, which is measurable in degrees (°).	X	X	X	X	X	X				
<b>062 01 01 03</b>		<b>Frequency bands, sidebands, single sideband</b>										
(01)		List the bands of the frequency spectrum for electromagnetic waves: — very low frequency (VLF): 3–30 kHz; — low frequency (LF): 30–300 kHz; — medium frequency (MF): 300–3 000 kHz; — high frequency (HF): 3–30 MHz; — very high frequency (VHF): 30–300 MHz; — ultra-high frequency (UHF): 300–3 000 MHz; — super high frequency (SHF): 3–30 GHz; — extremely high frequency (EHF): 30–300 GHz.	X	X	X	X	X	X				
(02)		State that when a carrier wave is modulated, the resultant radiation consists of the carrier frequency plus additional upper and lower sidebands.	X	X	X	X	X	X				
(03)		State that HF meteorological information for aircraft in flight	X	X	X	X	X	X				

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Syllabus reference	BK	Syllabus details and associated Learning Objectives	Aeroplane		Helicopter			IR	CB-IR(A)	BIR Exam	BIR BK	Remarks
			ATPL	CPL	ATPL/IR	ATPL	CPL					
		(VOLMET) and HF two-way communication use a single sideband.										
(04)		State that the following abbreviations (classifications according to International Telecommunication Union (ITU) regulations) are used for aviation applications: — N0N: carrier without modulation as used by non-directional radio beacons (NDBs); — A1A: carrier with keyed Morse code modulation as used by NDBs; — A2A: carrier with amplitude modulated Morse code as used by NDBs; — A3E: carrier with amplitude modulated speech used for communication (VHF-COM).	X	X	X	X	X	X				
<b>062 01 01 04</b>		<b>Pulse characteristics</b>										
(01)		Define the following terms that are associated with a pulse string: — pulse length; — pulse power; — continuous power.	X	X	X	X	X	X				
<b>062 01 01 05</b>		<b>Carrier, modulation</b>										
(01)	X	Define 'carrier wave': the radio wave acting as the carrier or transporter.	X	X	X	X	X	X				
(02)	X	Define 'modulation': the technical term for the process of impressing and transporting information by radio waves.	X	X	X	X	X	X				

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Syllabus reference	BK	Syllabus details and associated Learning Objectives	Aeroplane		Helicopter			IR	CB-IR(A)	BIR Exam	BIR BK	Remarks
			ATPL	CPL	ATPL/IR	ATPL	CPL					
<b>062 01 01 06</b>		<b><i>Kinds of modulation (amplitude, frequency, pulse, phase)</i></b>										
(01)	X	Define 'amplitude modulation': the information that is impressed onto the carrier wave by altering the amplitude of the carrier.	X	X	X	X	X	X				
(02)	X	Define 'frequency modulation': the information that is impressed onto the carrier wave by altering the frequency of the carrier.	X	X	X	X	X	X				
(03)	X	Describe 'pulse modulation': a modulation form used in radar by transmitting short pulses followed by larger interruptions.	X	X	X	X	X	X				
(04)	X	Describe 'phase modulation': a modulation form used in GPS where the phase of the carrier wave is reversed.	X	X	X	X	X	X				
<b>062 01 02 00</b>		<b>Antennas</b>										
<b>062 01 02 01</b>		<b><i>Characteristics</i></b>										
(01)	X	Define 'antenna': an antenna or aerial is an electrical device which converts electric power into radio waves, and vice versa.	X	X	X	X	X	X				
(02)	X	State that the simplest type of antenna is a dipole, which is a wire of length equal to one half of the wavelength.	X	X	X	X	X	X				
(03)	X	State that an electromagnetic wave always consists of an oscillating	X	X	X	X	X	X				



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Syllabus reference	BK	Syllabus details and associated Learning Objectives	Aeroplane		Helicopter			IR	CB-IR(A)	BIR Exam	BIR BK	Remarks
			ATPL	CPL	ATPL/IR	ATPL	CPL					
		electric (E) and an oscillating magnetic (H) field which propagates at the speed of light.										
(04)	X	State that the E and H fields are perpendicular to each other. The oscillations are perpendicular to the propagation direction and are in-phase.	X	X	X	X	X	X				
<b>062 01 02 02</b>		<b>Polarisation</b>										
(01)	X	State that the polarisation of an electromagnetic wave describes the orientation of the plane of oscillation of the electrical component of the wave with regard to its direction of propagation.	X	X	X	X	X	X				
<b>062 01 02 03</b>		<b>Types of antennas</b>										
(01)		Name the common different types of directional antennas: — loop antenna used in old automatic direction-finding (ADF) receivers; — parabolic antenna used in weather radars; — slotted planar array used in more modern weather radars.	X	X	X	X	X	X				
(02)		Explain 'antenna shadowing'.	X	X	X	X	X					
(03)		Explain the importance of antenna placement on aircraft.	X	X	X	X	X					
<b>062 01 03 00</b>		<b>Wave propagation</b>										
<b>062 01 03 01</b>		<b>Structure of the ionosphere and its effect on radio waves</b>										

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Syllabus reference	BK	Syllabus details and associated Learning Objectives	Aeroplane		Helicopter			IR	CB-IR(A)	BIR Exam	BIR BK	Remarks
			ATPL	CPL	ATPL/IR	ATPL	CPL					
(01)	X	State that the ionosphere is the ionised component of the Earth's upper atmosphere from approximately 60 to 400 km above the surface, which is vertically structured in three regions or layers.	X	X	X	X	X	X				
(02)	X	State that the layers of the ionosphere are named D, E and F layers, and their depth varies with time.	X	X	X	X	X	X				
(03)	X	State that electromagnetic waves refracted from the E and F layers of the ionosphere are called sky waves.	X	X	X	X	X	X				
(04)	X	Explain how the different layers of the ionosphere influence wave propagation.	X	X	X	X	X	X				
<b>062 01 03 02</b>		<b>Ground waves</b>										
(01)	X	Define 'ground or surface waves': the electromagnetic waves travelling along the surface of the Earth.	X	X	X	X	X	X				
<b>062 01 03 03</b>		<b>Space waves</b>										
(01)	X	Define 'space waves': the electromagnetic waves travelling through the air directly from the transmitter to the receiver.	X	X	X	X	X	X				
<b>062 01 03 04</b>		<b>Propagation with the frequency bands</b>										
(01)		State that radio waves in VHF, UHF, SHF and EHF propagate as space waves.	X	X	X	X	X	X				

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Syllabus reference	BK	Syllabus details and associated Learning Objectives	Aeroplane		Helicopter			IR	CB-IR(A)	BIR Exam	BIR BK	Remarks
			ATPL	CPL	ATPL/IR	ATPL	CPL					
(02)		State that radio waves in LF, MF and HF propagate as surface/ground waves and sky waves.	X	X	X	X	X	X				
<b>062 01 03 05</b>		<b>Doppler principle</b>										
(01)	X	State that the Doppler effect is the phenomenon where the frequency of a wave will increase or decrease if there is relative motion between the transmitter and the receiver.	X	X	X	X	X	X				
<b>062 01 03 06</b>		<b>Factors affecting propagation</b>										
(01)	X	Define 'skip distance': the distance between the transmitter and the point on the surface of the Earth where the first sky wave return arrives.	X	X	X	X	X	X				
(02)		State that skip zone/dead space is the distance between the limit of the surface wave and the sky wave.	X	X	X	X	X	X				
(03)		Describe 'fading': when a receiver picks up two signals with the same frequency, and the signals will interfere with each other causing changes in the resultant signal strength and polarisation.	X	X	X	X	X	X				
(04)		State that radio waves in the VHF band and above are limited in range as they are not reflected by the ionosphere and do not have a surface wave.	X	X	X	X	X	X				
(05)	X	Describe the physical phenomena 'reflection', 'refraction', 'diffraction', 'absorption' and 'interference'.	X	X	X	X	X	X				

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Syllabus reference	BK	Syllabus details and associated Learning Objectives	Aeroplane		Helicopter			IR	CB-IR(A)	BIR Exam	BIR BK	Remarks
			ATPL	CPL	ATPL/IR	ATPL	CPL					
(06)		State that multipath is when the signal arrives at the receiver via more than one path (the signal being reflected from surfaces near the receiver).	X	X	X	X	X	X				
<b>062 02 00 00</b>		<b>RADIO AIDS</b>										
<b>062 02 01 00</b>		<b>Ground direction finding (DF)</b>										
<b>062 02 01 01</b>		<b>Principles</b>										
(01)	X	Describe the use of a ground DF.	X	X	X	X	X	X				
(02)		Explain the limitation of range because of the path of the VHF signal.	X	X	X	X	X	X				
<b>062 02 01 02</b>		<b>Presentation and interpretation</b>										
(01)		Define the term 'QDM': the magnetic bearing to the station.	X	X	X	X	X	X	X		1	
(02)		Define the term 'QDR': the magnetic bearing from the station.	X	X	X	X	X	X	X		1	
(03)		Explain that by using more than one ground station, the position of an aircraft can be determined and transmitted to the pilot.	X	X	X	X	X	X				
<b>062 02 01 03</b>		<b>Coverage and range</b>										
(01)		Use the formula: $1.23 \times \sqrt{\text{transmitter height in feet}} + 1.23 \times \sqrt{\text{receiver height in feet}}$ to calculate the range in NM.	X	X	X	X	X	X	X		2	
<b>062 02 01 04</b>		<b>Errors and accuracy</b>										
(01)	X	Explain why synchronous transmissions will cause errors.	X	X	X	X	X	X				
(02)	X	Describe the effect of 'multipath signals'.	X	X	X	X	X	X				

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Syllabus reference	BK	Syllabus details and associated Learning Objectives	Aeroplane		Helicopter			IR	CB-IR(A)	BIR Exam	BIR BK	Remarks
			ATPL	CPL	ATPL/IR	ATPL	CPL					
(03)		Explain that VDF information is divided into the following classes according to ICAO Annex 10: – Class A: accurate to a range within $\pm 2^\circ$ ; – Class B: accurate to a range within $\pm 5^\circ$ ; – Class C: accurate to a range within $\pm 10^\circ$ ; – Class D: accurate to less than Class C.	X	X	X	X	X	X				
<b>062 02 02 00</b>		<b>Non-directional radio beacon (NDB)/automatic direction finding (ADF)</b>										
<b>062 02 02 01</b>		<b>Principles</b>										
(01)	X	Define the acronym 'NDB': non-directional radio beacon.	X	X	X	X	X	X	X		2	
(02)	X	Define the acronym 'ADF': automatic direction-finding equipment.	X	X	X	X	X	X	X		2	
(03)	X	State that the NDB is the ground part of the system.	X	X	X	X	X	X	X		2	
(04)	X	State that the ADF is the airborne part of the system.	X	X	X	X	X	X	X		2	
(05)		State that the NDB operates in the LF and MF frequency bands.	X	X	X	X	X	X	X	2		
(06)		State that the frequency band assigned to aeronautical NDBs according to ICAO Annex 10 is 190–1 750 kHz.	X	X	X	X	X	X	X	2		

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Syllabus reference	BK	Syllabus details and associated Learning Objectives	Aeroplane		Helicopter			IR	CB-IR(A)	BIR Exam	BIR BK	Remarks
			ATPL	CPL	ATPL/IR	ATPL	CPL					
(07)		Define a 'locator beacon': an LF/MF NDB used as an aid to final approach usually with a range of 10–25 NM.	X	X	X	X	X	X	X	2		
(08)	X	State that certain commercial radio stations transmit within the frequency band of the NDB.	X	X	X	X	X	X	X		2	
(09)	X	State that according to ICAO Annex 10, an NDB station has an automatic ground monitoring system.	X	X	X	X	X	X	X			
(10)		Describe the use of NDBs for navigation.	X	X	X	X	X	X	X	2		
(11)		Describe the procedure to identify an NDB station.	X	X	X	X	X	X	X	2		
(12)	X	Interpret the term 'cone of confusion' in respect of an NDB.	X	X	X	X	X	X	X		2	
(13)	X	State that an NDB station emits a N0N/A1A or a N0N/A2A signal.	X	X	X	X	X	X	X		2	
(14)	X	State the function of the beat frequency oscillator (BFO).	X	X	X	X	X	X	X		2	
(15)	X	State that in order to identify a N0N/A1A NDB, the BFO circuit of the receiver has to be activated.	X	X	X	X	X	X	X		2	
(16)	X	State that on modern aircraft, the BFO is activated automatically.	X	X	X	X	X	X	X		2	
<b>062 02 02 02</b>		<b>Presentation and interpretation</b>										
(01)	X	Name the types of indicators commonly in use: – electronic display;	X	X	X	X	X	X	X		2	

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Syllabus reference	BK	Syllabus details and associated Learning Objectives	Aeroplane		Helicopter			IR	CB-IR(A)	BIR Exam	BIR BK	Remarks
			ATPL	CPL	ATPL/IR	ATPL	CPL					
		<ul style="list-style-type: none"> <li>radio magnetic indicator (RMI);</li> <li>fixed-card ADF (radio compass);</li> <li>moving-card ADF.</li> </ul>										
(02)		Interpret the indications given on RMI, fixed-card and moving-card ADF displays.	X	X	X	X	X	X	X	2		
(03)		Given a display, interpret the relevant ADF information.	X	X	X	X	X	X	X	2		
(04)		Calculate the true bearing from the compass heading and relative bearing.	X	X	X	X	X	X	X	2		
(05)		Convert the compass bearing into magnetic bearing and true bearing.	X	X	X	X	X	X	X	2		
(06)		Describe how to fly the following in-flight ADF procedures: <ul style="list-style-type: none"> <li>homing and tracking, and explain the influence of wind;</li> <li>interception of inbound QDM and outbound QDR;</li> <li>changing from one QDM/QDR to another;</li> <li>determining station passage and the abeam point.</li> </ul>	X	X	X	X	X	X	X	2		
<b>062 02 02 03</b>		<b>Coverage and range</b>										
(01)	X	State that the power of the transmitter limits the range of an NDB.	X	X	X	X	X	X	X		2	

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Syllabus reference	BK	Syllabus details and associated Learning Objectives	Aeroplane		Helicopter			IR	CB-IR(A)	BIR Exam	BIR BK	Remarks
			ATPL	CPL	ATPL/IR	ATPL	CPL					
(02)		Explain the relationship between power and range.	X	X	X	X	X	X	X			
(03)	X	Describe the propagation path of NDB radio waves with respect to the ionosphere and the Earth's surface.	X	X	X	X	X	X	X		2	
(04)		Explain that the interference between sky waves and ground waves leads to 'fading'.	X	X	X	X	X	X	X	2		
(05)		Define that the accuracy the pilot has to fly the required bearing in order to be considered established during approach, according to ICAO Doc 8168, has to be within $\pm 5^\circ$ .	X	X	X	X	X	X	X	2		
(06)		State that there is no warning indication of NDB failure.	X	X	X	X	X	X	X	2		
<b>062 02 02 04</b>		<b>Errors and accuracy</b>										
(01)	X	Explain 'coastal refraction': as a radio wave travelling over land crosses the coast, the wave speeds up over water and the wave front bends.	X	X	X	X	X	X	X		2	
(02)	X	Define 'night/twilight effect': the influence of sky waves and ground waves arriving at the ADF receiver with a difference of phase and polarisation which introduce bearing errors.	X	X	X	X	X	X	X		2	
(03)		State that interference from other NDB stations on the same frequency may occur at night due to sky-wave contamination.	X	X	X	X	X	X	X	2		



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Syllabus reference	BK	Syllabus details and associated Learning Objectives	Aeroplane		Helicopter			IR	CB-IR(A)	BIR Exam	BIR BK	Remarks
			ATPL	CPL	ATPL/IR	ATPL	CPL					
<b>062 02 02 05</b>		<b>Factors affecting range and accuracy</b>										
(01)		Describe diffraction of radio waves in mountainous terrain (mountain effect).	X	X	X	X	X	X	X	2		
(02)		State that static radiation energy from a cumulonimbus cloud may interfere with the radio wave and influence the ADF bearing indication.	X	X	X	X	X	X	X	2		
(03)		Explain that the bank angle of the aircraft causes a dip error.	X	X	X	X	X	X	X			
<b>062 02 03 00</b>		<b>VHF omnidirectional radio range (VOR): conventional VOR (CVOR) and Doppler VOR (DVOR)</b>										
<b>062 02 03 01</b>		<b>Principles</b>										
(01)	X	Explain the working principle of VOR using the following general terms: — reference phase; — variable phase; — phase difference.	X	X	X	X	X	X				
(02)		State that the frequency band allocated to VOR according to ICAO Annex 10 is VHF, and the frequencies used are 108.0–117.975 MHz.	X	X	X	X	X	X	X	2		
(03)		State that frequencies within the allocated VOR range 108.0–111.975 MHz, which have an odd number in the first decimal place, are used by instrument landing system (ILS).	X	X	X	X	X	X	X	2		
(04)		State that the following types of VOR are in operation:	X	X	X	X	X	X	X	2		

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Syllabus reference	BK	Syllabus details and associated Learning Objectives	Aeroplane		Helicopter			IR	CB-IR(A)	BIR Exam	BIR BK	Remarks
			ATPL	CPL	ATPL/IR	ATPL	CPL					
		<ul style="list-style-type: none"> <li>— conventional VOR (CVOR): a first-generation VOR station emitting signals by means of a rotating antenna;</li> <li>— Doppler VOR (DVOR): a second-generation VOR station emitting signals by means of a combination of fixed antennas utilising the Doppler principle;</li> <li>— en-route VOR for use by IFR traffic;</li> <li>— terminal VOR (TVOR): a station with a shorter range used as part of the approach and departure structure at major aerodromes;</li> <li>— test VOR (VOT): a VOR station emitting a signal to test VOR indicators in an aircraft.</li> </ul>										
(05)		State that automatic terminal information service (ATIS) information is transmitted on VOR frequencies.	X	X	X	X	X	X	X	2		
(06)	X	List the three main components of VOR airborne equipment: <ul style="list-style-type: none"> <li>— the antenna;</li> <li>— the receiver;</li> <li>— the indicator.</li> </ul>	X	X	X	X	X	X	X		2	
(07)		Describe the identification of a VOR in terms of Morse-code letters and additional plain text.	X	X	X	X	X	X	X	2		

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Syllabus reference	BK	Syllabus details and associated Learning Objectives	Aeroplane		Helicopter			IR	CB-IR(A)	BIR Exam	BIR BK	Remarks
			ATPL	CPL	ATPL/IR	ATPL	CPL					
(08)	X	State that according to ICAO Annex 10, a VOR station has an automatic ground monitoring system.	X	X	X	X	X	X				
(09)		State that failure of the VOR station to stay within the required limits can cause the removal of identification and navigation components from the carrier or radiation to cease.	X	X	X	X	X	X	X	2		
<b>062 02 03 02</b>		<b>Presentation and interpretation</b>										
(01)		Read off the radial on an RMI.	X	X	X	X	X	X		2		
(02)		Read off the angular displacement in relation to a preselected radial on a horizontal situation indicator (HSI) or omnibearing indicator (OBI).	X	X	X	X	X	X		2		
(03)		Explain the use of the TO/FROM indicator in order to determine aircraft position relative to the VOR considering also the heading of the aircraft.	X	X	X	X	X	X		2		
(04)		Interpret VOR information as displayed on HSI, CDI and RMI.	X	X	X	X	X	X		2		
(05)		Describe the following in-flight VOR procedures: — tracking, and explain the influence of wind when tracking; — interception of a radial inbound and outbound to/from a VOR; — changing from one radial inbound/outbound to another; — determining station passage and the abeam point.	X	X	X	X	X	X		2		

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Syllabus reference	BK	Syllabus details and associated Learning Objectives	Aeroplane		Helicopter			IR	CB-IR(A)	BIR Exam	BIR BK	Remarks
			ATPL	CPL	ATPL/IR	ATPL	CPL					
(06)		State that when converting a radial into a true bearing, the variation at the VOR station has to be taken into account.	X	X	X	X	X	X		2		
<b>062 02 03 03</b>		<b><i>Intentionally left blank</i></b>										
<b>062 02 03 04</b>		<b><i>Errors and accuracy</i></b>										
(01)		Define that the accuracy the pilot has to fly the required bearing in order to be considered established on a VOR track when flying approach procedures, according to ICAO Doc 8168, has to be within the half-full scale deflection of the required track.	X	X	X	X	X	X	X	2		
(02)		State that due to reflections from terrain, radials can be bent and lead to wrong or fluctuating indications, which is called 'scalloping'.	X	X	X	X	X	X	X	2		
<b>062 02 04 00</b>		<b><i>Distance-measuring equipment (DME)</i></b>										
<b>062 02 04 01</b>		<b><i>Principles</i></b>										
(01)		State that DME operates in the UHF band.	X	X	X	X	X	X	X	2		
(02)	X	State that the system comprises two basic components: — the aircraft component: the interrogator; — the ground component: the transponder.	X	X	X	X	X	X	X		2	
(03)		Describe the principle of distance measurement using DME in terms	X	X	X	X	X	X				

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Syllabus reference	BK	Syllabus details and associated Learning Objectives	Aeroplane		Helicopter			IR	CB-IR(A)	BIR Exam	BIR BK	Remarks
			ATPL	CPL	ATPL/IR	ATPL	CPL					
		of a timed transmission from the interrogator and reply from the transponder on different frequencies.										
(04)		Explain that the distance measured by DME is slant range.	X	X	X	X	X	X	X	2		
(05)		Illustrate that a position line using DME is a circle with the station at its centre.	X	X	X	X	X	X	X	2		
(06)		State that the pairing of VHF and UHF frequencies (VOR/DME) enables the selection of two items of navigation information from one frequency setting.	X	X	X	X	X	X	X		2	
(07)	X	Describe, in the case of co-location with VOR and ILS, the frequency pairing and identification procedure.	X	X	X	X	X	X	X		2	
(08)		State that military UHF tactical air navigation aid (TACAN) stations may be used for DME information.	X	X	X	X	X	X	X	2		
<b>062 02 04 02</b>		<b>Presentation and interpretation</b>										
(01)	X	State that when identifying a DME station co-located with a VOR station, the identification signal with the higher-tone frequency is the DME which identifies itself approximately every 40 seconds.	X	X	X	X	X	X	X		2	
(02)		Calculate ground distance from given slant range and altitude.	X	X	X	X	X	X	X	2		
(03)		Describe the use of DME to fly a DME arc in accordance with ICAO Doc 8168 Volume 1.	X	X	X	X	X	X	X	2		

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Syllabus reference	BK	Syllabus details and associated Learning Objectives	Aeroplane		Helicopter			IR	CB-IR(A)	BIR Exam	BIR BK	Remarks
			ATPL	CPL	ATPL/IR	ATPL	CPL					
(04)	X	State that a DME system may have a ground speed (GS) and time to station read-out combined with the DME read-out.	X	X	X	X	X	X	X		2	
<b>062 02 04 03</b>		<b>Coverage and range</b>										
(01)		Explain why a ground station can generally respond to a maximum of 100 aircraft.	X	X	X	X	X	X	X	2		
(02)		Explain which aircraft will be denied a DME range first when more than 100 interrogations are being made.	X	X	X	X	X	X	X	2		
<b>062 02 04 04</b>		<b>Intentionally left blank</b>										
<b>062 02 04 05</b>		<b>Factors affecting range and accuracy</b>										
(01)		Explain why the GS read-out from a DME can be less than the actual GS, and is zero when flying a DME arc.	X	X	X	X	X	X	X			
<b>062 02 05 00</b>		<b>Instrument landing system (ILS)</b>										
<b>062 02 05 01</b>		<b>Principles</b>										
(01)		Name the three main components of an ILS: — the localiser (LOC); — the glide path (GP); — range information (markers or DME).	X		X			X	X	2		
(02)	X	State the site locations of the ILS components: — the LOC antenna should be located on the extension of	X		X			X	X		2	

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Syllabus reference	BK	Syllabus details and associated Learning Objectives	Aeroplane		Helicopter			IR	CB-IR(A)	BIR Exam	BIR BK	Remarks
			ATPL	CPL	ATPL/IR	ATPL	CPL					
		the runway centre line at the stop-end; — the GP antenna should be located beyond the runway threshold, laterally displaced to the side of the runway centre line.										
(03)		Explain that marker beacons produce radiation patterns to indicate predetermined distances from the threshold along the ILS GP.	X		X			X	X	2		
(04)		State that marker beacons are sometimes replaced by a DME paired with the LOC frequency.	X		X			X	X	2		
(05)		State that in the ILS LOC frequency assigned band 108.0–111.975 MHz, only frequencies which have an odd number in the first decimal are ILS LOC frequencies.	X		X			X	X	2		
(06)		State that the GP operates in the UHF band.	X		X			X	X	2		
(07)	X	Describe the use of the 90-Hz and the 150-Hz signals in the LOC and GP transmitters/receivers, stating how the signals at the receivers vary with angular deviation.	X		X			X	X			
(08)		State that the UHF GP frequency is selected automatically by being paired with the LOC frequency.	X		X			X				
(09)		Explain that both the LOC and the GP antenna radiates side lobes (false beams) which can give rise to	X		X			X	X	2		

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Syllabus reference	BK	Syllabus details and associated Learning Objectives	Aeroplane		Helicopter			IR	CB-IR(A)	BIR Exam	BIR BK	Remarks
			ATPL	CPL	ATPL/IR	ATPL	CPL					
		false centre-line and false GP indication.										
(10)	X	Explain that the back beam from the LOC antenna may be used as a published 'non-precision approach'.	X		X			X	X		2	
(11)		State that the recommended GP is 3°.	X		X			X	X	2		
(12)		<p>Name the frequency, modulation and identification assigned to all marker beacons.</p> <p>All marker beacons operate on 75-MHz carrier frequency.</p> <p>The modulation frequencies of the audio are:</p> <ul style="list-style-type: none"> <li>— outer marker: low;</li> <li>— middle marker: medium;</li> <li>— inner marker: high.</li> </ul> <p>The audio frequency modulation (for identification) is the continuous modulation of the audio frequency and is keyed as follows:</p> <ul style="list-style-type: none"> <li>— outer marker: 2 dashes per second continuously;</li> <li>— middle marker: a continuous series of alternate dots and dashes;</li> <li>— inner marker: 6 dots per second continuously.</li> <li>— The outer-marker cockpit indicator is coloured blue,</li> </ul>	X		X			X	X	2		



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Syllabus reference	BK	Syllabus details and associated Learning Objectives	Aeroplane		Helicopter			IR	CB-IR(A)	BIR Exam	BIR BK	Remarks
			ATPL	CPL	ATPL/IR	ATPL	CPL					
		the middle marker amber, and the inner marker white.										
(13)		State that the final-approach area contains a fix or facility that permits verification of the ILS GP–altimeter relationship. The outer marker or DME is usually used for this purpose.	X		X			X	X	2		
<b>062 02 05 02</b>		<b>Presentation and interpretation</b>										
(01)		Describe the ILS identification regarding frequency and Morse code or plain text.	X		X			X	X	2		
(02)		State that an ILS installation has an automatic ground monitoring system.	X		X			X				
(03)		State that the LOC and GP monitoring system monitors any shift in the LOC and GP mean course line or reduction in signal strength.	X		X			X				
(04)		State that warning flags will appear for both the LOC and the GP if the received signal strength is below a threshold value.	X		X			X	X	2		
(05)		Describe the circumstances in which warning flags will appear for both the LOC and the GP: — absence of the carrier frequency;	X		X			X				

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Syllabus reference	BK	Syllabus details and associated Learning Objectives	Aeroplane		Helicopter			IR	CB-IR(A)	BIR Exam	BIR BK	Remarks
			ATPL	CPL	ATPL/IR	ATPL	CPL					
		<ul style="list-style-type: none"> <li>— absence of the modulation simultaneously;</li> <li>— the percentage modulation of the navigation signal reduced to 0.</li> </ul>										
(06)		Interpret the indications on a CDI and an HSI: <ul style="list-style-type: none"> <li>— full-scale deflection of the CDI needle corresponds to approximately 2.5° displacement from the ILS centre line;</li> <li>— full-scale deflection on the GP corresponds to approximately 0.7° from the ILS GP centre line.</li> </ul>	X		X			X	X	2		
(07)		Interpret the aircraft's position in relation to the extended runway centre line on a back-beam approach.	X		X			X		2		
(08)		Explain the setting of the course pointer of an HSI and the course selector of an omnibearing indicator (OBI) for front-beam and back-beam approaches.	X		X			X		2		
<b>062 02 05 03</b>		<b>Coverage and range</b>										
(01)		Sketch the standard coverage area of the LOC and GP with angular sector limits in degrees and distance limits from the transmitter: LOC coverage area is 10° on either side of the centre line to a distance	X		X			X	X	2		

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Syllabus reference	BK	Syllabus details and associated Learning Objectives	Aeroplane		Helicopter			IR	CB-IR(A)	BIR Exam	BIR BK	Remarks
			ATPL	CPL	ATPL/IR	ATPL	CPL					
		of 25 NM from the runway, and 35° on either side of the centre line to a distance of 17 NM from the runway; GP coverage area is 8° on either side of the centre line to a distance of minimum 10 NM from the runway.										
<b>062 02 05 04</b>		<b>Errors and accuracy</b>										
(01)		Explain that ILS approaches are divided into facility performance categories defined in ICAO Annex 10.	X		X			X	X			
(02)		Define the following ILS operation categories: — Category I; — Category II; — Category IIIA; — Category IIIB; — Category IIIC.	X		X			X				
(03)		Explain that all Category III ILS operations guidance information is provided from the coverage limits of the facility to, and along, the surface of the runway.	X		X			X				
(04)		Explain why the accuracy requirements are progressively higher for CAT I, CAT II and CAT III ILS.	X		X			X				
(05)		Explain the following in accordance with ICAO Doc 8168: — the accuracy the pilot has to fly the ILS LOC to be considered established on an ILS track is within the	X		X			X	X	2		

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Syllabus reference	BK	Syllabus details and associated Learning Objectives	Aeroplane		Helicopter			IR	CB-IR(A)	BIR Exam	BIR BK	Remarks
			ATPL	CPL	ATPL/IR	ATPL	CPL					
		half-full scale deflection of the required track; — the aircraft has to be established within the half-scale deflection of the LOC before starting descent on the GP; — the pilot has to fly the ILS GP to a maximum of half-scale fly-up deflection of the GP in order to stay in protected airspace.										
(06)		State that if a pilot deviates by more than half-course deflection on the LOC or by more than half-dot deflection on the GP, an immediate go-around should be executed because obstacle clearance may no longer be guaranteed.	X		X			X	X	2		
(07)		Describe ILS beam bends as deviations from the nominal LOC and GP respectively which can be assessed by flight test.	X		X			X				
(08)		Explain that multipath interference is caused by reflections from objects within the ILS coverage area.	X		X			X				
<b>062 02 05 05</b>		<b>Factors affecting range and accuracy</b>										
(01)		Define the 'ILS-critical area': an area of defined dimensions around the	X		X			X	X			

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Syllabus reference	BK	Syllabus details and associated Learning Objectives	Aeroplane		Helicopter			IR	CB-IR(A)	BIR Exam	BIR BK	Remarks
			ATPL	CPL	ATPL/IR	ATPL	CPL					
		LOC and GP antennas where vehicles, including aircraft, are excluded during all ILS operations.										
(02)		Define the 'ILS-sensitive area': an area extending beyond the ILS-critical area where the parking or movement of vehicles, including aircraft, is controlled to prevent the possibility of unacceptable interference to the ILS signal during ILS operations.	X		X			X	X			
<b>062 02 06 00</b>		<b>Microwave landing system (MLS)</b>										
<b>062 02 06 01</b>		<b>Principles</b>										
(01)		Explain the principle of operation: — horizontal course guidance during the approach; — vertical guidance during the approach; — horizontal guidance for departure and missed approach; — DME (DME/P) distance; — transmission of special information regarding the system and the approach conditions.	X		X			X				
(02)		State that MLS operates in the SHF band on any one of 200 channels, on assigned frequencies.	X		X			X				
(03)		Explain the reason why MLS can be installed at aerodromes where, as a result of the effects of surrounding buildings or terrain, ILS siting is difficult.	X		X			X				
<b>062 02 06 02</b>		<b>Presentation and interpretation</b>										

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Syllabus reference	BK	Syllabus details and associated Learning Objectives	Aeroplane		Helicopter			IR	CB-IR(A)	BIR Exam	BIR BK	Remarks
			ATPL	CPL	ATPL/IR	ATPL	CPL					
(01)		Interpret the display of airborne equipment designed to continuously show the position of the aircraft in relation to a preselected course and glide path, along with distance information, during approach and departure.	X		X			X				
(02)		Explain that segmented approaches can be carried out with a presentation with two cross bars directed by a computer which has been programmed with the approach to be flown.	X		X			X				
(03)		Illustrate that segmented and curved approaches can only be executed with DME/P installed.	X		X			X				
(04)		Explain why aircraft are equipped with a multimode receiver (MMR) in order to be able to receive ILS, MLS and GPS.	X		X			X				
(05)		Explain why MLS without DME/P gives an ILS lookalike straight-line approach.	X		X			X				
<b>062 02 06 03</b>		<b>Coverage and range</b>										
(01)		Describe the coverage area for the approach direction as being within a sector of $\pm 40^\circ$ of the centre line out to a range of 20 NM from the threshold (according to ICAO Annex 10).	X		X			X				
<b>062 03 00 00</b>		<b>RADAR</b>										
<b>062 03 01 00</b>		<b>Pulse techniques</b>										

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Syllabus reference	BK	Syllabus details and associated Learning Objectives	Aeroplane		Helicopter			IR	CB-IR(A)	BIR Exam	BIR BK	Remarks
			ATPL	CPL	ATPL/IR	ATPL	CPL					
<b>062 03 01 01</b>		<b><i>Pulse techniques and associated terms</i></b>										
(01)		Name the different applications of radar with respect to air traffic control (ATC), weather observations, and airborne weather radar (AWR).	X	X	X	X	X	X	X	2		
(02)	X	Describe the pulse technique and echo principle on which primary radar systems are based.	X	X	X	X	X	X			2	
(03)	X	State that the range of a radar depends on pulse repetition frequency (PRF), pulse length, pulse power, height of aircraft, height of antenna and frequency used.	X	X	X	X	X	X				
<b>062 03 02 00</b>		<b>Ground radar</b>										
<b>062 03 02 01</b>		<b><i>Principles</i></b>										
(01)		Explain that primary radar provides bearing and distance of targets.	X		X	X		X	X	2		
(02)	X	Explain that primary ground radar is used to detect aircraft that are not equipped with a secondary radar transponder.	X		X	X		X	X		2	
<b>062 03 02 02</b>		<b><i>Presentation and interpretation</i></b>										
(01)		State that modern ATC systems use inputs from various sensors to generate the display.	X		X	X		X	X		2	
<b>062 03 03 00</b>		<b>Airborne weather radar</b>										
<b>062 03 03 01</b>		<b><i>Principles</i></b>										
(01)		List the two main tasks of the weather radar in respect of weather and navigation.	X		X	X		X	X			

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Syllabus reference	BK	Syllabus details and associated Learning Objectives	Aeroplane		Helicopter			IR	CB-IR(A)	BIR Exam	BIR BK	Remarks
			ATPL	CPL	ATPL/IR	ATPL	CPL					
(02)		State that modern weather radars employ frequencies that give wavelengths of about 3 cm that reflect best on wet hailstones.	X		X	X		X	X			
(03)	X	State that the antenna is stabilised in the horizontal plane with signals from the aircraft's attitude reference system.	X		X	X		X	X			
(04)	X	Describe the cone-shaped pencil beam of about 3 to 5° beam width used for weather detection.	X		X	X		X	X			
<b>062 03 03 02</b>		<b>Presentation and interpretation</b>										
(01)		Explain the functions of the following different controls on the radar control panel: – off/on switch; – function switch with WX, WX+T and MAP modes; – gain-control setting (auto/manual); – tilt/autotilt switch.	X		X	X		X	X			
(02)		Name, for areas of differing reflection intensity, the colour gradations (green, yellow, red and magenta) indicating the increasing intensity of precipitation.	X		X	X		X	X			
(03)	X	State the use of azimuth-marker lines and range lines in respect of the relative bearing and the distance to a thunderstorm on the screen.	X		X	X		X	X			



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Syllabus reference	BK	Syllabus details and associated Learning Objectives	Aeroplane		Helicopter			IR	CB-IR(A)	BIR Exam	BIR BK	Remarks
			ATPL	CPL	ATPL/IR	ATPL	CPL					
<b>062 03 03 03</b>		<b>Coverage and range</b>										
(01)		Explain how the radar is used for weather detection and for mapping (range, tilt and gain, if available).	X		X	X		X	X			
<b>062 03 03 04</b>		<b>Errors, accuracy, limitations</b>										
(01)		Explain why AWR should be used with extreme caution when on the ground.	X		X	X		X	X			
<b>062 03 03 05</b>		<b>Factors affecting range and accuracy</b>										
(01)		Explain the danger of the area behind heavy rain (shadow area) where no radar waves will penetrate.	X		X	X		X	X			
(02)		Describe appropriate tilt settings in relation to altitude and thunderstorms.	X		X	X		X	X			
(03)		Explain why a thunderstorm may not be detected when the tilt is set too high.	X		X	X		X	X			
<b>062 03 03 06</b>		<b>Application for navigation</b>										
(01)		Describe the navigation function of the radar in the mapping mode.	X		X	X		X	X			
(02)		Describe the use of the weather radar to avoid a thunderstorm (Cb).	X		X	X		X	X			
(03)		Explain how turbulence (not CAT) can be detected by a modern weather radar.	X		X	X		X	X			
(04)		Explain how wind shear can be detected by a modern weather radar.	X		X	X		X	X			

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Syllabus reference	BK	Syllabus details and associated Learning Objectives	Aeroplane		Helicopter			IR	CB-IR(A)	BIR Exam	BIR BK	Remarks
			ATPL	CPL	ATPL/IR	ATPL	CPL					
<b>062 03 04 00</b>		<b>Secondary surveillance radar and transponder</b>										
<b>062 03 04 01</b>		<b>Principles</b>										
(01)		State that the ATC system is based on the replies provided by the airborne transponders in response to interrogations from the ATC secondary radar.	X	X	X	X	X	X	X	2		
(02)	X	State that the ground ATC secondary radar uses techniques which provide the ATC with information that cannot be acquired by the primary radar.	X	X	X	X	X	X	X		2	
(03)	X	State that an airborne transponder provides coded-reply signals in response to interrogation signals from the ground secondary radar and from aircraft equipped with traffic alert and collision avoidance system (TCAS).	X	X	X	X	X	X	X		2	
(04)		State the advantages of secondary surveillance radar (SSR) over a primary radar regarding range and collected information due to transponder principal information and active participation of the aircraft.	X	X	X	X	X	X	X	2		
<b>062 03 04 02</b>		<b>Modes and codes</b>										
(01)	X	State that the interrogator transmits its interrogations in the form of a series of pulse pairs.	X	X	X	X	X	X	X		2	
(02)		Name the interrogation modes: — Mode A;	X	X	X	X	X	X	X		2	

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Syllabus reference	BK	Syllabus details and associated Learning Objectives	Aeroplane		Helicopter			IR	CB-IR(A)	BIR Exam	BIR BK	Remarks
			ATPL	CPL	ATPL/IR	ATPL	CPL					
		<ul style="list-style-type: none"> <li>Mode C;</li> <li>Mode S.</li> </ul>										
(03)		State that the interrogation frequency and the reply frequency are different.	X	X	X	X	X					
(04)		Explain that the decoding of the time interval between the pulse pairs determines the operating mode of the transponder: <ul style="list-style-type: none"> <li>Mode A: transmission of aircraft transponder code;</li> <li>Mode C: transmission of aircraft pressure altitude;</li> <li>Mode S: selection of aircraft address and transmission of flight data for the ground surveillance.</li> </ul>	X	X	X	X	X					
(05)		State that Mode A designation is a sequence of four digits which can be manually selected from 4 096 available codes.	X	X	X	X	X	X	X		2	
(06)		State that in Mode C reply, the pressure altitude is reported in 100-ft increments.	X	X	X	X	X	X			2	
(07)		State that in addition to the information provided, on request from ATC, a special position identification (SPI) pulse can be transmitted but only as a result of a manual selection by the pilot (IDENT button).	X	X	X	X	X	X			2	

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Syllabus reference	BK	Syllabus details and associated Learning Objectives	Aeroplane		Helicopter			IR	CB-IR(A)	BIR Exam	BIR BK	Remarks
			ATPL	CPL	ATPL/IR	ATPL	CPL					
(08)	X	State the need for compatibility of Mode S with Mode A and C.	X	X	X	X	X	X			2	
(09)		Explain that Mode S transponders receive interrogations from TCAS and SSR ground stations.	X	X	X	X	X	X			2	
(10)	X	State that Mode S interrogation contains either the aircraft address, selective call or all-call address.	X	X	X	X	X	X			2	
(11)		State that every aircraft is allocated an ICAO aircraft address, which is hard-coded into the Mode S transponder (Mode S address).	X	X	X	X	X	X	X		2	
(12)		Explain that a 24-bit address is used in all Mode S transmissions, so that every interrogation can be directed to a specific aircraft.	X	X	X	X	X	X				
(13)		State that Mode S can provide enhanced vertical tracking, using a 25-ft altitude increment.	X	X	X	X	X	X				
(14)		State that SSR can be used for automatic dependent surveillance — broadcast (ADS-B).	X	X	X	X	X	X				
<b>062 03 04 03</b>		<b>Presentation and interpretation</b>										
(01)		State that an aircraft can be identified by a unique code.	X	X	X	X	X	X	X	2		
(02)		State which information can be presented on the ATC display system: — pressure altitude; — flight level; — flight number or aircraft registration number;	X	X	X	X	X	X	X	2		

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Syllabus reference	BK	Syllabus details and associated Learning Objectives	Aeroplane		Helicopter			IR	CB-IR(A)	BIR Exam	BIR BK	Remarks
			ATPL	CPL	ATPL/IR	ATPL	CPL					
		— GS.										
(03)	X	Explain the use and function of the selector modes: OFF, Standby, ON (Mode A), ALT (Mode A, C and S), TEST, and of the reply lamp.	X	X	X	X	X	X	X		2	
<b>062 04 00 00</b>		<b>INTENTIONALLY LEFT BLANK</b>										
<b>062 05 00 00</b>		<b>INTENTIONALLY LEFT BLANK</b>										
<b>062 06 00 00</b>		<b>GLOBAL NAVIGATION SATELLITE SYSTEMS (GNSSs)</b>										
<b>062 06 01 00</b>		<b>Global navigation satellite systems (GNSSs)</b>										
<b>062 06 01 01</b>		<b>General</b>										
(01)		State that there are four main GNSSs. These are: — USA NAVigation System with Timing And Ranging Global Positioning System (NAVSTAR GPS); — Russian GLObal NAVigation Satellite System (GLONASS); — European Galileo (under construction); — Chinese BeiDou (under construction).	X	X	X	X	X	X	X	2		
(02)	X	State that all four systems (will) consist of a constellation of satellites which can be used by a suitably equipped receiver to determine position.	X	X	X	X	X	X	X		2	
<b>062 06 01 02</b>		<b>Operation</b>										

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Syllabus reference	BK	Syllabus details and associated Learning Objectives	Aeroplane		Helicopter			IR	CB-IR(A)	BIR Exam	BIR BK	Remarks
			ATPL	CPL	ATPL/IR	ATPL	CPL					
		<b>Global navigation satellite system (GNSS)</b>										
(01)		State that there are currently two modes of operation: standard positioning service (SPS) for civilian users, and precise positioning service (PPS) for authorised users.	X	X	X	X	X	X	X	2		
(02)		SPS was originally designed to provide civilian users with a less accurate positioning capability than PPS.	X	X	X	X	X	X	X	2		
(03)	X	Name the three GNSS segments as follows: — space segment; — control segment; — user segment.	X	X	X	X	X	X	X		2	
		<b>Space segment (example: NAVSTAR GPS)</b>										
(04)		State that each satellite broadcasts ranging signals on two UHF frequencies: L1 and L2.	X	X	X	X	X	X				
(05)		State that SPS is a positioning and timing service provided on frequency L1.	X	X	X	X	X	X				
(06)		State that PPS uses both frequencies L1 and L2.	X	X	X	X	X	X				
(07)	X	State that the satellites transmit a coded signal used for ranging, identification (satellite individual PRN code), timing and navigation.	X	X	X	X	X	X				
(08)	X	State that the navigation message contains:	X	X	X	X	X	X				

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Syllabus reference	BK	Syllabus details and associated Learning Objectives	Aeroplane		Helicopter			IR	CB-IR(A)	BIR Exam	BIR BK	Remarks
			ATPL	CPL	ATPL/IR	ATPL	CPL					
		<ul style="list-style-type: none"> <li>— satellite clock correction parameters;</li> <li>— Universal Time Coordinated (UTC) parameters;</li> <li>— an ionospheric model;</li> <li>— satellite health data.</li> </ul>										
(09)	X	State that an ionospheric model is used to calculate the time delay of the signal travelling through the ionosphere.	X	X	X	X	X	X	X		2	
(10)	X	State that two codes are transmitted on the L1 frequency, namely a coarse acquisition (C/A) code and a precision (P) code. The P code is not used for standard positioning service (SPS).	X	X	X	X	X	X				
(11)	X	State that satellites are equipped with atomic clocks which allow the system to keep very accurate time reference.	X	X	X	X	X	X	X		2	
		<b>Control segment</b>										
(12)	X	State that the control segment comprises: <ul style="list-style-type: none"> <li>— a master control station;</li> <li>— a ground antenna;</li> <li>— monitoring stations.</li> </ul>	X	X	X	X	X	X	X		2	
(13)	X	State that the control segment provides: <ul style="list-style-type: none"> <li>— monitoring of the constellation status;</li> </ul>	X	X	X	X	X	X	X			

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Syllabus reference	BK	Syllabus details and associated Learning Objectives	Aeroplane		Helicopter			IR	CB-IR(A)	BIR Exam	BIR BK	Remarks
			ATPL	CPL	ATPL/IR	ATPL	CPL					
		— correction of orbital parameters; — navigation data uploading.										
		<b>User segment</b>										
(14)	X	State that GNSS supplies three-dimensional position fixes and speed data, plus a precise time reference.	X	X	X	X	X	X	X		2	
(15)	X	State that a GNSS receiver is able to determine the distance to a satellite by determining the difference between the time of transmission by the satellite and the time of reception.	X	X	X	X	X	X	X		2	
(16)	X	State that the initial distance calculated to the satellites is called pseudo-range because the difference between the GNSS receiver and the satellite time references initially creates an erroneous range.	X	X	X	X	X	X			2	
(17)	X	State that each range defines a sphere with its centre at the satellite.	X	X	X	X	X	X	X		2	
(18)	X	State that there are four unknown parameters (x, y, z and $\Delta t$ ) (receiver clock error) which require the measurement of ranges to four different satellites in order to get the position.	X	X	X	X	X	X	X		2	
(19)	X	State that the GNSS receiver is able to synchronise to the correct time reference when receiving four satellites.	X	X	X	X	X	X	X		2	
(20)	X	State that the receiver is able to calculate aircraft ground speed using	X	X	X	X	X	X			2	



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Syllabus reference	BK	Syllabus details and associated Learning Objectives	Aeroplane		Helicopter			IR	CB-IR(A)	BIR Exam	BIR BK	Remarks
			ATPL	CPL	ATPL/IR	ATPL	CPL					
		the space vehicle (SV) Doppler frequency shift or the change in receiver position over time.										
		<b>NAVigation System with Timing And Ranging Global Positioning System (NAVSTAR GPS) integrity</b>										
(21)		Define 'receiver autonomous integrity monitoring (RAIM)' as a technique that ensures the integrity of the provided data by redundant measurements.	X	X	X	X	X	X	X	2		
(22)		State that RAIM is achieved by consistency checks among range measurements.	X	X	X	X	X	X	X	2		
(23)		State that basic RAIM requires five satellites. A sixth one is for isolating a faulty satellite from the navigation solution.	X	X	X	X	X	X	X			
(24)		State that agreements have been concluded between the appropriate agencies for the compatibility and interoperability by any approved user of NAVSTAR and GLONASS systems.	X	X	X	X	X	X				
(25)	X	State that the different GNSSs use different data with respect to reference systems, orbital data, and navigation services.	X	X	X	X	X	X				
<b>062 06 01 03</b>		<b>Errors and factors affecting accuracy</b>										
(01)		List the most significant factors that affect accuracy:	X	X	X	X	X	X	X			

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Syllabus reference	BK	Syllabus details and associated Learning Objectives	Aeroplane		Helicopter			IR	CB-IR(A)	BIR Exam	BIR BK	Remarks
			ATPL	CPL	ATPL/IR	ATPL	CPL					
		<ul style="list-style-type: none"> <li>— ionospheric propagation delay;</li> <li>— dilution of precision;</li> <li>— satellite clock error;</li> <li>— satellite orbital variations;</li> <li>— multipath.</li> </ul>										
(02)		State that a user equivalent range error (UERE) can be computed from all these factors.	X	X	X	X	X	X				
(03)	X	State that the error from the ionospheric propagation delay (IPD) can be reduced by modelling, using a model of the ionosphere, or can almost be eliminated by using two frequencies.	X	X	X	X	X	X				
(04)	X	State that ionospheric delay is the most significant error.	X	X	X	X	X	X				
(05)		State that dilution of precision arises from the geometry and number of satellites in view. It is called geometric dilution of precision (GDOP).	X	X	X	X	X	X				
(06)		State that the UERE in combination with the geometric dilution of precision (GDOP) allows for an estimation of position accuracy.	X	X	X	X	X	X				
(07)	X	State that errors in the satellite orbits are due to: <ul style="list-style-type: none"> <li>— solar winds;</li> <li>— gravitation of the Sun and the Moon.</li> </ul>	X	X	X	X	X	X				

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Syllabus reference	BK	Syllabus details and associated Learning Objectives	Aeroplane		Helicopter			IR	CB-IR(A)	BIR Exam	BIR BK	Remarks
			ATPL	CPL	ATPL/IR	ATPL	CPL					
<b>062 06 02 00</b>		<b>Ground-, satellite- and aircraft-based augmentation systems</b>										
<b>062 06 02 01</b>		<b>Ground-based augmentation systems (GBASs)</b>										
(01)		Explain the principle of a GBAS: to measure on the ground the errors in the signals transmitted by GNSS satellites and relay the measured errors to the user for correction.	X	X	X	X	X	X	X			
(02)	X	State that the ICAO GBAS standard is based on this technique through the use of a data link in the VHF band of ILS-VOR systems (108–118 MHz).	X	X	X	X	X	X	X			
(03)		State that for a GBAS station the coverage is about 20 NM.	X	X	X	X	X	X	X			
(04)		State that GBAS provides information for guidance in the terminal area, and for three-dimensional guidance in the final approach segment (FAS) by transmitting the FAS data block.	X	X	X	X	X	X	X			
(05)		State that one ground station can support all the aircraft subsystems within its coverage providing the aircraft with approach data, corrections and integrity information for GNSS satellites in view via a VHF data broadcast (VDB).	X	X	X	X	X	X				
(06)	X	State that the minimum software designed coverage area is 10° on either side of the final approach path	X	X	X	X	X	X				

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Syllabus reference	BK	Syllabus details and associated Learning Objectives	Aeroplane		Helicopter			IR	CB-IR(A)	BIR Exam	BIR BK	Remarks
			ATPL	CPL	ATPL/IR	ATPL	CPL					
		to a distance between 15 and 20 NM, and 35° on either side of the final approach path up to a distance of 15 NM.										
(07)		State that outside this area the FAS data of GBAS is not used.	X	X	X	X	X	X				
(08)	X	State that GBAS based on GPS is sometimes called local area augmentation system (LAAS).	X	X	X	X	X	X				
(09)		State that a GBAS-based approach is called GLS approach (GLS-GNSS landing system).	X	X	X	X	X	X				
<b>062 06 02 02</b>		<b>Satellite-based augmentation systems (SBASs)</b>										
(01)	X	Explain the principle of an SBAS: to measure on the ground the errors in the signals received from the satellites and transmit differential corrections and integrity messages for navigation satellites.	X	X	X	X	X	X	X		2	
(02)	X	State that the frequency band of the data link is identical to that of the GPS signals.	X	X	X	X	X	X	X		2	
(03)	X	Explain that the use of geostationary satellites enables messages to be broadcast over very wide areas.	X	X	X	X	X	X	X		2	
(04)	X	State that pseudo-range measurements to these geostationary satellites can also be made, as if they were GPS satellites.	X	X	X	X	X	X	X		2	

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Syllabus reference	BK	Syllabus details and associated Learning Objectives	Aeroplane		Helicopter			IR	CB-IR(A)	BIR Exam	BIR BK	Remarks
			ATPL	CPL	ATPL/IR	ATPL	CPL					
(05)	X	State that SBAS consists of two elements: — ground infrastructure (monitoring and processing stations); — communication satellites.	X	X	X	X	X	X	X		2	
(06)		State that SBAS allows the implementation of three-dimensional Type A and Type B approaches.	X	X	X	X	X	X	X	2		
(07)	X	State the following examples of SBAS: — European Geostationary Navigation Overlay Service (EGNOS) in western Europe and the Mediterranean; — wide area augmentation system (WAAS) in the USA; — multi-functional transport satellite (MTSAT)-based augmentation system (MSAS) in Japan; — GPS and geostationary earth orbit augmented navigation (GAGAN) in India.	X	X	X	X	X	X	X		2	
(08)	X	State that SBAS is designed to significantly improve accuracy and integrity.	X	X	X	X	X	X	X		2	
(09)		Explain that integrity and safety are improved by alerting SBAS users	X	X	X	X	X	X	X	2		

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Syllabus reference	BK	Syllabus details and associated Learning Objectives	Aeroplane		Helicopter			IR	CB-IR(A)	BIR Exam	BIR BK	Remarks
			ATPL	CPL	ATPL/IR	ATPL	CPL					
		within 6 seconds if a GPS malfunction occurs.										
<b>062 06 02 03</b>		<b><i>Intentionally left blank</i></b>										
<b>062 06 02 04</b>		<b><i>Aircraft-based augmentation systems (ABASs)</i></b>										
(01)		Explain the principle of ABAS: to use redundant elements within the GPS constellation (e.g. multiplicity of distance measurements to various satellites) or the combination of GNSS measurements with those of other navigation sensors (such as inertial systems) in order to develop integrity control.	X	X	X	X	X	X	X	2		
(02)		State that the type of ABAS using only GNSS information is named receiver autonomous integrity monitoring (RAIM).	X	X	X	X	X	X	X	2		
(03)		State that a system using information from additional onboard sensors is named aircraft autonomous integrity monitoring (AAIM).	X	X	X	X	X	X	X	2		
(04)		Explain that the typical sensors used are barometric altimeter and inertial reference system (IRS).	X	X	X	X	X	X	X	2		
<b>062 07 00 00</b>		<b>PERFORMANCE-BASED NAVIGATION (PBN)</b>										
<b>062 07 01 00</b>		<b>Performance-based navigation (PBN) concept (as described in ICAO Doc 9613)</b>										
<b>062 07 01 01</b>		<b>PBN principles</b>										

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Syllabus reference	BK	Syllabus details and associated Learning Objectives	Aeroplane		Helicopter			IR	CB-IR(A)	BIR Exam	BIR BK	Remarks
			ATPL	CPL	ATPL/IR	ATPL	CPL					
(01)		List the factors used to define area navigation (RNAV) or required navigation performance (RNP) system performance requirements (accuracy, integrity and continuity).	X		X			X	X		3	
(02)	X	State that these RNAV and RNP systems are necessary to optimise the utilisation of available airspace.	X		X			X			2, 3	
(03)		State that it is necessary for flight crew and air traffic controllers to be aware of the on-board RNAV or RNP system capabilities in order to determine whether the performance of the RNAV or RNP system is appropriate for the specific airspace requirements.	X		X			X			2, 3	
(04)		Define accuracy as the conformance of the true position and the required position.	X		X			X			2, 3	
(05)		Define continuity as the capability of the system to perform its function without unscheduled interruptions during the intended operation.	X		X			X	X	2	3	
(06)		Define integrity as a measure of the trust that can be placed in the correctness of the information supplied by the total system. Integrity includes the ability of a system to provide timely and valid alerts to the user.	X		X			X	X	2	3	
(07)		State that, unlike conventional navigation, PBN is not sensor-specific.	X		X			X	X	2	3	

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Syllabus reference	BK	Syllabus details and associated Learning Objectives	Aeroplane		Helicopter			IR	CB-IR(A)	BIR Exam	BIR BK	Remarks
			ATPL	CPL	ATPL/IR	ATPL	CPL					
(08)		Explain the difference between raw data and computed data.	X		X			X	X	2	3	
(09)		Define availability as the percentage of time (annually) during which the system is available for use.	X		X			X	X	2	3	
<b>062 07 01 02</b>		<b>PBN components</b>										
(01)		List the components of PBN as navigational aid (NAVAID) infrastructure, navigation specification and navigation application.	X		X			X				
<b>062 07 01 03</b>		<b>PBN scope</b>										
(01)		State that in oceanic/remote, en-route and terminal phases of flight, PBN is limited to operations with linear lateral performance requirements and time constraints.	X		X			X				
(02)		State that in the approach phases of flight, PBN accommodates both linear and angular laterally guided operations, and explain the difference between the two.	X		X			X				
<b>062 07 02 00</b>		<b>Navigation specifications</b>										
<b>062 07 02 01</b>		<b>Area navigation (RNAV) and required navigation performance (RNP)</b>										
(01)		State the difference between RNAV and RNP in terms of the requirement for on-board performance monitoring and alerting.	X		X			X	X	2	3	
<b>062 07 02 02</b>		<b>Navigation functional requirements</b>										



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Syllabus reference	BK	Syllabus details and associated Learning Objectives	Aeroplane		Helicopter			IR	CB-IR(A)	BIR Exam	BIR BK	Remarks
			ATPL	CPL	ATPL/IR	ATPL	CPL					
(01)	X	List the basic functional requirements of the RNAV and RNP specifications (continuous indication of lateral deviation, distance/bearing to active waypoint, GS or time to active waypoint, navigation data storage and failure indication).	X		X			X				
<b>062 07 02 03</b>		<b>Designation of RNP and RNAV specifications</b>										
(01)		Interpret X in RNAV X or RNP X as the lateral navigation (LNAV) accuracy (total system error) in nautical miles, which is expected to be achieved at least 95 % of the flight time by the population of aircraft operating within the given airspace, route or procedure.	X		X			X		2	3	
(02)		State that aircraft approved to the more stringent accuracy requirements may not necessarily meet some of the functional requirements of the navigation specification that has a less stringent accuracy requirement.	X		X			X	X	2	3	
(03)		State that RNAV 10 and RNP 4 are used in the oceanic/remote phase of flight.	X		X			X				
(04)		State that RNAV 5 is used in the en-route and arrival phases of flight.	X		X			X	X	2	3	
(05)		State that RNAV 2 and RNP 2 are also used as navigation specifications.	X		X			X				

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			ATPL	CPL	ATPL/IR	ATPL	CPL					
(06)		State that RNP 2 is used in the en-route and oceanic/remote phases of flight.	X		X			X				
(07)		State that RNAV 2 might be used in the en-route continental, arrival and departure phases of flight.	X		X			X				
(08)		State that RNAV 1 and RNP 1 are used in the arrival and departure phases of flight.	X		X			X	X	2		
(09)		State that required navigation performance approach (RNP APCH) is used in the approach phase of flight.	X		X			X	X	2		
(10)		State that required navigation performance authorisation required approach (RNP AR APCH) is used in the approach phase of flight.	X		X			X	X	2		
(11)		State that RNP 0.3 navigation specification is used in all phases of flight except for oceanic/remote and final approach, primarily for helicopters.	X		X			X				
(12)		State that RNAV 1, RNP 1 and RNP 0.3 may also be used in en-route phases of low-level instrument flight rule (IFR) helicopter flights.	X		X			X				
<b>062 07 03 00</b>		<b>Use of performance-based navigation (PBN)</b>										
<b>062 07 03 01</b>		<b><i>Intentionally left blank</i></b>										
<b>062 07 03 02</b>		<b><i>Intentionally left blank</i></b>										
<b>062 07 03 03</b>		<b><i>Specific RNAV and RNP system functions</i></b>										

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Syllabus reference	BK	Syllabus details and associated Learning Objectives	Aeroplane		Helicopter			IR	CB-IR(A)	BIR Exam	BIR BK	Remarks
			ATPL	CPL	ATPL/IR	ATPL	CPL					
(01)		Recognise the definition of radius to fix (RF) leg.	X		X			X	X	2	3	
(02)		Recognise the definition of a fixed radius transition (FRT).	X		X			X	X	2	3	
(03)		State the importance of respecting the flight director guidance and the speed constraints associated with an RF procedure.	X		X			X	X	2	3	
(04)		Explain the difference between a fly-by-turn and a fly-over.	X		X			X	X	2	3	
(05)		State that the Aeronautical Radio, Incorporated (ARINC) 424 path terminators set the standards for coding the SIDs, STARs and instrument approach procedures (IAPs) from the official published government source documentation into the ARINC navigation database format.	X		X			X				
(06)		State that the path terminators define a specific type of termination of the previous flight path.	X		X			X				
(07)		Define the term 'offset flight path'.	X		X			X	X	2	3	
<b>062 07 03 04</b>		<b><i>Intentionally left blank</i></b>										
<b>062 07 04 00</b>		<b>Performance-based navigation (PBN) operations</b>										
<b>062 07 04 01</b>		<b>Performance-based navigation (PBN) principles</b>										
(01)		Define 'path definition error' (PDE).	X		X			X	X	2	3	
(02)		Define 'flight technical error' (FTE) and state that the FTE is the error in following the prescribed path, either	X		X			X	X	2	3	

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Syllabus reference	BK	Syllabus details and associated Learning Objectives	Aeroplane		Helicopter			IR	CB-IR(A)	BIR Exam	BIR BK	Remarks
			ATPL	CPL	ATPL/IR	ATPL	CPL					
		by the auto-flight system or by the pilot.										
(03)		Define 'navigation system error' (NSE) and state that the accuracy of a navigation system may be referred to as NSE.	X		X			X	X	2	3	
(04)		Define 'total system error' (TSE) and state that the geometric sum of the PDE, FTE and NSE equals the TSE.	X		X			X	X	2	3	
(05)		State that navigation accuracy depends on the TSE.	X		X			X				
<b>062 07 04 02</b>		<b><i>On-board performance monitoring and alerting</i></b>										
(01)		State that on-board performance monitoring and alerting of flight technical errors is managed by on-board systems or flight crew procedures.	X		X			X	X	2	3	
(02)		State that on-board performance monitoring and alerting of navigation system errors is a requirement of on-board equipment for RNP.	X		X			X	X	2	3	
(03)		State that, dependent on the navigation sensor, the estimated position error (EPE) is compared with the required navigation specification.	X		X			X				
(04)		Explain how a navigation system assesses the EPE.	X		X			X				
(05)		Give an example of how the loss of the ability to operate in RNP airspace may be indicated by the navigation system.	X		X			X				

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Syllabus reference	BK	Syllabus details and associated Learning Objectives	Aeroplane		Helicopter			IR	CB-IR(A)	BIR Exam	BIR BK	Remarks
			ATPL	CPL	ATPL/IR	ATPL	CPL					
(06)		State that on-board performance monitoring and alerting of path definition error is managed by gross reasonableness checks of navigation data.	X		X			X	X	2	3	
<b>062 07 04 03</b>		<b>Abnormal situations</b>										
(01)		State that abnormal and contingency procedures are to be used in case of loss of the PBN capability.	X		X			X	X	2	3	
<b>062 07 04 04</b>		<b>Database management</b>										
(01)		State that, unless otherwise specified in the operations documentation or acceptable means of compliance (AMCs), the navigational database must be valid for the current aeronautical information regulation and control (AIRAC) cycle.	X		X			X	X	2	3	
<b>062 07 05 00</b>		<b>Requirements of specific RNAV and RNP specifications</b>										
<b>062 07 05 01</b>		<b>RNAV 10</b>										
(01)		State that RNAV 10 requires that aircraft operating in oceanic and remote areas be equipped with at least two independent and serviceable long-range navigation systems (LRNSs) comprising an INS, an inertial reference system (IRS)/flight management system (FMS) or a GNSS.	X		X			X				
(02)		State that operators may extend their RNAV 10 navigation capability time by updating.	X		X			X				

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Syllabus reference	BK	Syllabus details and associated Learning Objectives	Aeroplane		Helicopter			IR	CB-IR(A)	BIR Exam	BIR BK	Remarks
			ATPL	CPL	ATPL/IR	ATPL	CPL					
<b>062 07 05 02</b>		<b>RNAV 5</b>										
(01)		State that manual data entry is acceptable for RNAV 5.	X		X			X	X	2	3	
<b>062 07 05 03</b>		<b>RNAV 1/RNAV 2/RNP 1/RNP 2</b>										
(01)		State that pilots must not fly an RNAV 1, RNAV 2, RNP 1 or RNP 2 standard instrument departure (SID) or standard instrument arrival (STAR) unless it is retrievable by route name from the on-board navigation database and conforms to the charted route.	X		X			X	X	2	3	
(02)		State that the route may subsequently be modified through the insertion (from the database) or deletion of specific waypoints in response to ATC clearances.	X		X			X	X	2	3	
(03)		State that the manual entry, or creation of new waypoints by manual entry, of either latitude and longitude or place/bearing/distance values is not permitted.	X		X			X	X	2	3	
<b>062 07 05 04</b>		<b>Intentionally left blank</b>										
<b>062 07 05 05</b>		<b>Required navigation performance approach (RNP APCH)</b>										
(01)		State that pilots must not fly an RNP APCH unless it is retrievable by procedure name from the on-board navigation database and conforms to the charted procedure.	X		X			X	X	2		

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Syllabus reference	BK	Syllabus details and associated Learning Objectives	Aeroplane		Helicopter			IR	CB-IR(A)	BIR Exam	BIR BK	Remarks
			ATPL	CPL	ATPL/IR	ATPL	CPL					
(02)		State that an RNP APCH to LNAV minima is a non-precision IAP designed for two-dimensional approach operations.	X		X			X	X	2		
(03)		State that an RNP APCH to lateral navigation (LNAV)/vertical navigation (VNAV) minima has lateral guidance based on GNSS and vertical guidance based on either SBAS or barometric vertical navigation (Baro-VNAV).	X		X			X	X	2		
(04)		State that an RNP APCH to LNAV/VNAV minima may only be conducted with vertical guidance certified for the purpose.	X		X			X	X	2		
(05)		Explain why an RNP APCH to LNAV/VNAV minima based on Baro-VNAV may only be conducted when the aerodrome temperature is within a promulgated range if the barometric input is not automatically temperature-compensated.	X		X			X	X	2		
(06)		State that the correct altimeter setting is critical for the safe conduct of an RNP APCH using Baro-VNAV.	X		X			X	X	2		
(07)		State that an RNP APCH to LNAV/VNAV minima is a three-dimensional operation.	X		X			X	X	2		
(08)		State that an RNP APCH to localiser performance with vertical guidance (LPV) minima is a three-dimensional operation.	X		X			X	X	2		

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Syllabus reference	BK	Syllabus details and associated Learning Objectives	Aeroplane		Helicopter			IR	CB-IR(A)	BIR Exam	BIR BK	Remarks
			ATPL	CPL	ATPL/IR	ATPL	CPL					
(09)		State that RNP APCH to LPV minima requires a final approach segment (FAS) data block.	X		X			X	X	2		
(10)		State that RNP approaches to LPV minima require SBAS.	X		X			X	X	2		
(11)		State that the FAS data block is a standard data format to describe the final approach path.	X		X			X	X	2		
<b>062 07 05 06</b>		<b>Required navigation performance authorisation required approach (RNP AR APCH)</b>										
(01)		State that RNP AR APCH requires authorisation.	X		X			X	X	2		
<b>062 07 05 07</b>		<b>Advanced required navigation performance (A-RNP)</b>										
(01)		State that A-RNP incorporates the navigation specifications RNAV 5, RNAV 2, RNAV 1, RNP 2, RNP 1 and RNP APCH.	X		X			X				
<b>062 07 05 08</b>		<b>PBN point-in-space (PinS) departure</b>										
(01)		State that a PinS departure is a departure procedure designed for helicopters only.			X			X				
(02)		State that a PinS departure procedure includes either a 'proceed VFR' or a 'proceed visually' instruction from the landing location to the initial departure fix (IDF).			X			X				
(03)		Recognise the differences in the instructions 'proceed VFR' and 'proceed visually'.			X			X				



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			ATPL	CPL	ATPL/IR	ATPL	CPL					
<b>062 07 05 09</b>		<b><i>PBN point-in-space (PinS) approach</i></b>										
(01)		State that a PinS approach procedure is an instrument RNP APCH procedure designed for helicopters only, and that it may be published with LNAV minima or LPV minima.			X			X				
(02)		State that a PinS approach procedure includes either a 'proceed VFR' or a 'proceed visually' instruction from the missed approach point (MAPt) to a landing location.			X			X				
(03)		Recognise the differences between 'proceed VFR' and 'proceed visually'.			X			X				

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**SUBJECT 070 – OPERATIONAL PROCEDURES**

Syllabus reference	BK	Syllabus details and associated Learning Objectives	Aeroplane		Helicopter			IR	CB-IR(A)	BIR Exam	BIR BK	Remarks
			ATPL	CPL	ATPL/IR	ATPL	CPL					
<b>070 00 00 00</b>		<b>OPERATIONAL PROCEDURES</b>										
<b>071 01 00 00</b>		<b>GENERAL REQUIREMENTS</b>										
<b>071 01 01 00</b>		<b>ICAO Annex 6</b>										
<b>071 01 01 01</b>		<b>Definitions</b>										
(01)		Define the following: alternate aerodrome; flight time (aeroplanes); take-off alternate; en-route alternate; destination alternate.	X	X								
(02)		Define 'alternate heliport'; 'flight time (helicopters)'. <b>Source:</b>			X	X	X					
<b>071 01 01 02</b>		<b>Applicability</b>										
(01)		State that Part I shall be applicable to the operation of aeroplanes by operators authorised to conduct international commercial air transport (CAT) operations.	X	X								
(02)		State that Part III shall be applicable to all helicopters engaged in international CAT operations or in international general aviation operations, except helicopters engaged in aerial work.			X	X	X					
<b>071 01 01 03</b>		<b>General</b>										
(01)		Explain the compliance with laws, regulations and procedures.	X	X	X	X	X					
(02)		State the condition(s) required for the establishment of a flight data analysis programme, and state what this programme is part of.	X	X	X	X	X					

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			ATPL	CPL	ATPL/IR	ATPL	CPL					
(03)		Explain what is a flight safety documents system.	X	X	X	X	X					
(04)		Explain what is maintenance release.	X	X	X	X	X					
(05)		List and describe the lights to be displayed by aircraft.	X	X	X	X	X					
<b>071 01 02 00</b>		<b>Operational requirements</b>										
<b>071 01 02 01</b>		<b>Applicability</b>										
(01)	X	State the operational regulations applicable to CAT and other activities (e.g. specialised operations (SPO)).	X	X	X	X	X					
(02)		State the nature of CAT operations and exceptions.	X	X	X	X	X					
<b>071 01 02 02</b>		<b>General</b>										
(01)	X	Explain why CAT flights must meet the applicable operational requirements.	X	X	X	X	X					
(02)		Define 'flight manual limitations — flight through the height velocity (HV) envelope'.			X	X	X					
(03)		Define 'helicopter emergency medical service (HEMS)'.			X	X	X					
(04)		Define 'operations over a hostile environment — applicability'. Explain that there are certain areas which should not be overflown and state possible sources of that information (e.g. governmental warnings, operator risk assessment).			X	X	X					
(05)		Define 'local area operations — approval'.			X	X	X					

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			ATPL	CPL	ATPL/IR	ATPL	CPL					
(06)		Explain the requirements about language used for crew communication and in the operations manual.	X	X	X	X	X					
(07)		Explain which are the operator requirements regarding the management system.	X	X	X	X	X					
(08)		Explain which are the operator requirements regarding accident prevention and the flight safety programme.	X	X	X	X	X					
(09)		Explain which are the regulations concerning the carriage of persons on an aircraft.	X	X	X	X	X					
(10)		Explain the operator's and commander's responsibility concerning portable electronic devices (PEDs).	X	X	X	X	X					
(11)		Explain the operator's and commander's responsibility regarding admission in an aircraft of a person under the influence of drug or alcohol.	X	X	X	X	X					
(12)		Explain the regulations concerning the endangerment of safety.	X	X	X	X	X					
(13)		List the documents to be carried on each flight.	X	X	X	X	X					
(14)		Explain the operator's responsibility regarding manuals to be carried on board an aircraft.	X	X	X	X	X					
(15)		List the additional information and forms to be carried on board an aircraft.	X	X	X	X	X					
(16)		List the copies of items of information to be retained on the ground by the operator.	X	X	X	X	X					

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Syllabus reference	BK	Syllabus details and associated Learning Objectives	Aeroplane		Helicopter			IR	CB-IR(A)	BIR Exam	BIR BK	Remarks
			ATPL	CPL	ATPL/IR	ATPL	CPL					
(17)		Explain what responsibilities the operator and the commander have regarding the production of and access to records and documents.	X	X	X	X	X					
<b>071 01 02 03</b>		<b>Operator certification and supervision</b>										
(01)		Explain what requirement has to be satisfied for the issue of an air operator certificate (AOC).	X	X	X	X	X					
(02)		Explain what the rules applicable to air operator certification are.	X	X	X	X	X					
(03)		Explain the conditions to be met for the issue or revalidation of an AOC.	X	X	X	X	X					
(04)		Explain the contents and conditions of the AOC.	X	X	X	X	X					
<b>071 01 02 04</b>		<b>Operational procedures (except preparation for long-range flight)</b>										
(01)		Define the terms used for operational procedures.	X	X								
(02)		State the operator's responsibilities regarding the use of air traffic services (ATS).	X	X	X	X	X					
(03)		State the operator's responsibilities regarding authorisation of aerodromes/heliports by the operator.	X	X	X	X	X					
(04)		Explain which elements must be considered by the operator when specifying aerodrome/heliport operating minima.	X	X	X	X	X					
(05)		Explain what the operator's responsibilities are regarding departure and approach procedures.	X	X	X	X	X					

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Syllabus reference	BK	Syllabus details and associated Learning Objectives	Aeroplane		Helicopter			IR	CB-IR(A)	BIR Exam	BIR BK	Remarks
			ATPL	CPL	ATPL/IR	ATPL	CPL					
(06)		Explain which parameters should be considered in noise-abatement procedures.	X	X								
(07)		Explain which elements should be considered regarding routes and areas of operation.	X	X	X	X	X					
(08)		Explain the requirements for flights in reduced vertical separation minima (RVSM) airspace.	X	X								
(09)		List the factors to be considered when establishing minimum flight altitude.	X	X	X	X	X					
(10)		Explain the requirements for carrying persons with reduced mobility.	X	X	X	X	X					
(11)		Explain the operator's responsibilities for the carriage of inadmissible passengers, deportees or persons in custody.	X	X	X	X	X					
(12)		Explain the requirements regarding passenger seating and emergency evacuation.	X	X	X	X	X					
(13)		Detail the procedures for passenger briefing in respect of emergency equipment and exits.	X	X	X	X	X					
(14)		State the flight preparation forms to be completed before flight.	X	X	X	X	X					
(15)		State the commander's responsibilities during flight preparation.	X	X	X	X	X					
(16)		State the rules for aerodrome/heliport selection.	X	X	X	X	X					
(17)		Explain the planning minima for instrument flight rule (IFR) flights.	X		X							
(18)		Explain the rules for refuelling/defueling with passengers on board.	X	X	X	X	X					

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Syllabus reference	BK	Syllabus details and associated Learning Objectives	Aeroplane		Helicopter			IR	CB-IR(A)	BIR Exam	BIR BK	Remarks
			ATPL	CPL	ATPL/IR	ATPL	CPL					
(19)		Explain the 'crew members at station' policy.	X	X	X	X	X					
(20)		Explain the use of seats, safety belts and harnesses.	X	X	X	X	X					
(21)		Explain the requirements for securing passenger cabin and galley.	X	X	X	X	X					
(22)		Explain the commander's responsibility regarding smoking on board.	X	X	X	X	X					
(23)		State under which conditions a commander can commence or continue a flight regarding meteorological conditions.	X	X	X	X	X					
(24)		Explain the commander's responsibility regarding ice and other contaminants.	X	X	X	X	X					
(25)		Explain the commander's responsibility regarding fuel to be carried and in-flight fuel management.	X	X	X	X	X					
(26)		Detail the rules regarding carriage and use of supplemental oxygen for passengers and aircrew.	X	X	X	X	X					
		<b>Flight preparation</b>										
(27)		Explain the commander's responsibility regarding approach and landing.	X	X	X	X	X					
(28)		Explain the circumstances under which a report shall be submitted.	X	X	X	X	X					
<b>071 01 02 05</b>		<b>All-weather operations</b>										
(01)		Explain the operator's responsibility regarding aerodrome/heliport operating minima.	X		X							

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Syllabus reference	BK	Syllabus details and associated Learning Objectives	Aeroplane		Helicopter			IR	CB-IR(A)	BIR Exam	BIR BK	Remarks
			ATPL	CPL	ATPL/IR	ATPL	CPL					
(02)		Define the following terms: 'circling', 'low-visibility procedures', 'low-visibility take-off', 'visual approach'.	X		X							
(03)		Define the following terms: 'flight control system', 'fail-passive flight control system', 'fail-operational flight control system', 'fail-operational hybrid landing system'.	X									
(04)		Define the following terms: 'final approach and take-off area'.			X							
(05)		Explain the general operating requirements for low-visibility operations.	X		X							
(06)		Define aerodrome/heliport considerations regarding low-visibility operations.	X		X							
(07)		Explain the training and qualification requirements for flight crew to conduct low-visibility operations.	X		X							
(08)		Explain the operating procedures for low-visibility operations.	X		X							
(09)		Explain the operator's and commander's responsibilities regarding minimum equipment for low-visibility operations.	X		X							
(10)		Explain the VFR operating minima.	X		X							
(11)		Aerodrome operating minima: explain under which conditions the commander can commence take-off.	X		X							
(12)		Aerodrome operating minima: explain that take-off minima are expressed as visibility or runway visual range (RVR).	X		X							



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Syllabus reference	BK	Syllabus details and associated Learning Objectives	Aeroplane		Helicopter			IR	CB-IR(A)	BIR Exam	BIR BK	Remarks
			ATPL	CPL	ATPL/IR	ATPL	CPL					
(13)		Aerodrome operating minima: explain the take-off RVR value depending on the aerodrome facilities.	X		X							
(14)		Aerodrome operating minima: explain the system minima for non-precision approach (NPA) (minimum descent altitude/height (MDA/H) and decision altitude/height (DA/H), not RVR).	X		X							
(15)		Aerodrome operating minima: explain under which conditions a pilot can continue the approach below MDA/H or DA/H.	X		X							
(16)		Aerodrome operating minima: explain the lowest minima for precision approach category 1 (including single-pilot operations).	X		X							
(17)		Aerodrome operating minima: explain the lowest minima for precision approach category 2 operations.	X		X							
(18)		Aerodrome operating minima: explain the lowest minima for precision approach category 3 operations.	X									
(19)		Aerodrome operating minima: explain the lowest minima for circling and visual approach.	X		X							
(20)		Aerodrome operating minima: explain the RVR value and cloud ceiling depending on the aerodrome.			X							
(21)		Aerodrome operating minima: explain under which conditions an airborne radar approach can be performed and state the relevant minima.			X							
<b>071 01 02 06</b>		<b>Instruments and equipment</b>										

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Syllabus reference	BK	Syllabus details and associated Learning Objectives	Aeroplane		Helicopter			IR	CB-IR(A)	BIR Exam	BIR BK	Remarks
			ATPL	CPL	ATPL/IR	ATPL	CPL					
(01)		Explain which items do not require an equipment approval.	X	X	X	X	X					
(02)		Explain the requirements regarding availability of spare electrical fuses.	X	X								
(03)		Explain the requirements regarding wind-shield wipers.	X	X								
(04)		List the minimum equipment required for day and night VFR flights.	X	X	X	X	X					
(05)		List the minimum equipment required for IFR flights.	X		X							
(06)		Explain the required additional equipment for single-pilot operations under IFR.	X		X							
(07)		State the requirements for an altitude alerting system.	X	X								
(08)		State the requirements for radio altimeters.			X	X	X					
(09)		State the requirements for ground proximity warning system (GPWS)/terrain awareness and warning system (TAWS).	X	X								
(10)		State the requirements for airborne collision avoidance system (ACAS).	X	X								
(11)		State the conditions under which an aircraft must be fitted with a weather radar.	X	X	X	X	X					
(12)		State the circumstances under which a cockpit voice recorder (CVR) is compulsory (after 1998).	X	X	X	X	X					
(13)		State the rules regarding the location, construction, installation, and operation	X	X	X	X	X					

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Syllabus reference	BK	Syllabus details and associated Learning Objectives	Aeroplane		Helicopter			IR	CB-IR(A)	BIR Exam	BIR BK	Remarks
			ATPL	CPL	ATPL/IR	ATPL	CPL					
		of cockpit voice recorders (CVRs) (after 1998).										
(14)		State the circumstances under which a flight data recorder (FDR) is compulsory (after 1998).	X	X	X	X	X					
(15)		State the rules regarding the location, construction, installation, and operation of flight data recorders (FDRs) (after 1998).	X	X	X	X	X					
(16)		Explain the requirements about seats, seat safety belts, harnesses, and child-restraint devices.	X	X	X	X	X					
(17)		Explain the requirements about 'Fasten seat belt' and 'No smoking' signs.	X	X	X	X	X					
(18)		Explain the requirements regarding internal doors and curtains.	X	X								
		<b>First-aid and emergency equipment</b>										
(19)		Explain the requirements regarding first-aid kits.	X	X	X	X	X					
(20)		Explain the requirements regarding emergency medical kits and first-aid oxygen.	X	X								
(21)		Detail the rules regarding crew protective breathing equipment.	X	X								
(22)		Describe the type and location of handheld fire extinguishers.	X	X	X	X	X					
(23)		Describe the location of crash axes and crowbars.	X	X								
(24)		Specify the colours and markings used to indicate break-in points.	X	X	X	X	X					

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Syllabus reference	BK	Syllabus details and associated Learning Objectives	Aeroplane		Helicopter			IR	CB-IR(A)	BIR Exam	BIR BK	Remarks
			ATPL	CPL	ATPL/IR	ATPL	CPL					
(25)		Explain the requirements for means of emergency evacuation.	X	X								
(26)		Explain the requirements for megaphones.	X	X	X	X	X					
(27)		Explain the requirements for emergency lighting and marking.	X	X	X	X	X					
(28)		Explain the requirements for an emergency locator transmitter (ELT).	X	X	X	X	X					
(29)		Explain the requirements for life jackets, life rafts, survival kits, and ELTs.	X	X	X	X	X					
(30)		Explain the requirements for crew survival suit.			X	X	X					
(31)		Explain the requirements for survival equipment.	X	X	X	X	X					
(32)		Explain the additional requirements for helicopters operating to or from helidecks located in hostile sea areas.			X	X	X					
(33)		Explain the requirements for emergency flotation equipment.			X	X	X					
<b>071 01 02 07</b>		<b>Communication and navigation equipment</b>										
(01)		Explain the general requirements for communication and navigation equipment.	X	X	X	X	X					
(02)		Explain why the radio-communication equipment must be able to send and receive on 121.5 MHz.	X	X	X	X	X					
(03)		Explain the requirements regarding the provision of an audio selector panel.	X	X	X	X	X					

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Syllabus reference	BK	Syllabus details and associated Learning Objectives	Aeroplane		Helicopter			IR	CB-IR(A)	BIR Exam	BIR BK	Remarks
			ATPL	CPL	ATPL/IR	ATPL	CPL					
(04)		List the requirements for radio equipment when flying under VFR by reference to visual landmarks.	X	X	X	X	X					
(05)		List the requirements for communication and navigation equipment when operating under IFR or under VFR over routes not navigated by reference to visual landmarks.	X	X	X	X	X					
(06)		Explain what equipment is required to operate in airspace with reduced vertical separation minima (RVSM).	X	X								
(07)		Explain the conditions under which a crew member interphone system and public address system are mandatory.	X	X	X	X	X					
(08)		List the equipment for operations requiring a radio communication.			X	X	X					
(09)		List the equipment for operations that require a radio navigation system.			X	X	X					
(10)		Explain the requirements regarding the provision of a transponder.	X	X	X	X	X					
(11)		Explain the requirements regarding the management of aeronautical databases.	X	X								
<b>071 01 02 08</b>		<b><i>Intentionally left blank</i></b>										
<b>071 01 02 09</b>		<b><i>Flight crew</i></b>										
(01)		Explain the requirement regarding flight crew composition and in-flight relief.	X	X	X	X	X					
(02)		Explain the requirement for conversion training and checking.	X	X	X	X	X					
(03)		Explain the requirement for differences training and familiarisation training.	X	X	X	X	X					

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Syllabus reference	BK	Syllabus details and associated Learning Objectives	Aeroplane		Helicopter			IR	CB-IR(A)	BIR Exam	BIR BK	Remarks
			ATPL	CPL	ATPL/IR	ATPL	CPL					
(04)		Explain the conditions for upgrade from co-pilot to commander.	X	X	X	X	X					
(05)		Explain the minimum qualification requirements to operate as a commander.	X	X	X	X	X					
(06)		Explain the requirement for recurrent training and checking.	X	X	X	X	X					
(07)		Explain the requirement for a pilot to operate on either pilot's seat.	X	X	X	X	X					
(08)		Explain the minimum recent experience requirements for the commander and the co-pilot.	X	X	X	X	X					
(09)		Specify the route and aerodrome/heliport knowledge required for a PIC/commander.	X	X	X	X	X					
(10)		Explain the requirement to operate on more than one aircraft type or variant.	X	X	X	X	X					
(11)		Explain that when a flight crew member operates both helicopters and aeroplanes, the operations are limited to one of each type.	X	X	X	X	X					
(12)		Explain the requirement(s) for training records.	X	X	X	X	X					
(13)		Explain the crew members' responsibilities in the execution of their duties, and define the commander's authority.	X	X	X	X	X					
(14)		Explain the operator's and commander's responsibilities regarding persons on board, admission to the flight crew compartment and carriage of unauthorised persons or cargo.	X	X	X	X	X					

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Syllabus reference	BK	Syllabus details and associated Learning Objectives	Aeroplane		Helicopter			IR	CB-IR(A)	BIR Exam	BIR BK	Remarks
			ATPL	CPL	ATPL/IR	ATPL	CPL					
(15)		Explain the requirements for the initial operator's crew resource management (CRM) training.	X	X	X	X	X					
<b>071 01 02 10</b>		<b>Cabin crew/crew members other than flight crew</b>										
(01)		Explain who is regarded as cabin crew member.	X	X	X	X	X					
(02)		Detail the requirements regarding the number and composition of cabin crew.	X	X	X	X	X					
(03)		Explain the conditions and the additional conditions for assignment to duties.	X	X	X	X	X					
(04)		Explain the requirements regarding senior cabin crew members.	X	X	X	X	X					
(05)		Explain the conditions for operating on more than one aircraft type or variant.	X	X	X	X	X					
(06)		Explain what is the operator's responsibility regarding the distinction between cabin crew members and additional crew members.	X	X	X	X	X					
<b>071 01 02 11</b>		<b>Intentionally left blank</b>										
<b>071 01 02 12</b>		<b>Flight and duty time limitations and rest requirements</b>										
(01)		Explain the definitions used for the regulation of flight time limitations.	X	X								
(02)		Explain the flight and duty time limitations.	X	X								
(03)		Explain the requirements regarding the maximum daily flight duty period.	X	X								
(04)		Explain the requirements regarding rest periods.	X	X								

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Syllabus reference	BK	Syllabus details and associated Learning Objectives	Aeroplane		Helicopter			IR	CB-IR(A)	BIR Exam	BIR BK	Remarks
			ATPL	CPL	ATPL/IR	ATPL	CPL					
(05)		Explain the possible extension of flight duty period due to in-flight rest.	X	X								
(06)		Explain that it is the captain's discretion to extend flight duty in case of unforeseen circumstances in actual flight operations.	X	X								
(07)		Explain the requirement regarding standby.	X	X								
<b>071 01 03 00</b>		<b>Long-range flights</b>										
<b>071 01 03 01</b>		<b>Flight management</b>										
(01)		Minimum time routes: define and interpret minimum time route (route that gives the shortest flight time from departure to destination adhering to all ATC and air-space restrictions).	X									
(02)		State the circumstances in which a take-off alternate must be selected.	X		X							
(03)		State the maximum flight distance of a take-off alternate for: – two-engined aeroplanes; – ETOPS-approved aeroplanes; – three- or four-engined aeroplanes.	X		X							
(04)		State the factors to be considered in the selection of a take-off alternate.	X		X							
(05)		State when a destination alternate need not be selected.	X		X							
(06)		State when two destination alternates must be selected.	X		X							



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			ATPL	CPL	ATPL/IR	ATPL	CPL					
(07)		State the factors to be considered in the selection of a destination alternate aerodrome.	X		X							
(08)		State the factors to be considered in the selection of an en-route alternate aerodrome.	X		X							
<b>071 01 03 02</b>		<b><i>Transoceanic and polar flights (ICAO Doc 7030 'Regional Supplementary Procedures — North Atlantic Operations and Airspace Manual')</i></b>										
(01)		According to ICAO Doc 7030, explain that special rules apply to the North Atlantic (NAT) Region, and crews need to be specifically trained before flying in this area.	X									
(02)		Describe the possible indications of navigation system degradation, including any system-generated warning.	X									
(03)		Describe by what emergency means course and inertial navigation system (INS) can be cross-checked in the case of three navigation systems and two navigation systems.	X									
(04)		Describe the general ICAO procedures applicable in NAT airspace if the aircraft is unable to continue the flight in accordance with its air traffic control (ATC) clearance.	X									
(05)		Describe the ICAO procedures applicable in NAT airspace in case of radio-communication failure.	X									

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Syllabus reference	BK	Syllabus details and associated Learning Objectives	Aeroplane		Helicopter			IR	CB-IR(A)	BIR Exam	BIR BK	Remarks
			ATPL	CPL	ATPL/IR	ATPL	CPL					
(06)		Describe the recommended initial action if an aircraft is unable to obtain a revised ATC clearance.	X									
(07)		Describe the subsequent action for aircraft able to maintain assigned flight level and for aircraft unable to maintain assigned flight level.	X									
(08)		Describe determination of tracks and courses for random routes in NAT airspace.	X									
(09)		Specify the method by which planned tracks are defined (by latitude and longitude) in the NAT airspace: when operating predominately in an east–west direction south of 70°N, and when operating predominately in an east–west direction north of 70°N.	X									
(10)		State the maximum flight time recommended between significant points on random routes.	X									
(11)		Specify the method by which planned tracks for random routes are defined for flights operating predominantly in a north–south direction.	X									
(12)		Describe how the desired random route must be specified in the ATC flight plan.	X									
(13)		Describe what precautions can be taken when operating in the area of compass unreliability as a contingency against INS failure.	X									
<b>071 01 03 03</b>		<b>North Atlantic High Level Airspace (NAT HLA)</b>										

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			ATPL	CPL	ATPL/IR	ATPL	CPL					
		<b>NAT Region</b> North Atlantic Operations and Airspace Manual										
(01)		State the lateral dimensions (in general terms) and vertical limits of the NAT HLA.	X									
(02)		Define the following acronyms: LRNS, MASPS, NAT HLA, OCA, OTS, PRM, RVSM, SLOP, and WATRS.	X									
(03)		State the NAT HLA operations.	X									
(04)		Describe the routes for aircraft with only one long-range navigation system (LRNS).	X									
(05)		Describe the routes for aircraft with short-range navigation equipment only.	X									
(06)		Explain why the horizontal (i.e. latitudinal and longitudinal) and vertical navigation performance of operators within NAT HLA is monitored on a continual basis.	X									
(07)		Describe the organised track system (OTS).	X									
(08)		State the OTS changeover periods.	X									
(09)		Describe the NAT track message.	X									
(10)		Illustrate routes between northern Europe and the Spain/Canaries/Lisbon flight information region (FIR) within NAT HLA.	X									
(11)		Describe the function of the North American Routes (NARs) and Shannon Oceanic Transition Area (SOTA) and Northern Oceanic Transition Area (NOTA).	X									

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			ATPL	CPL	ATPL/IR	ATPL	CPL					
(12)		State that all flights should plan to operate on great-circle tracks joining successive significant waypoints.	X									
(13)		State that during the hours of validity of the OTS, operators are encouraged to plan flights: — in accordance with the OTS; — or along a route to join or leave an outer track of the OTS; — or on a random route to remain clear of the OTS, either laterally or vertically.	X									
(14)		State which flight levels are available on OTS tracks during OTS periods.	X									
(15)		State which flight levels are to be planned on random tracks or outside OTS periods.	X									
(16)		Selection of cruising altitude. Specify the appropriate cruising levels for normal long-range IFR flights and for those operating on the North Atlantic OTS.	X									
(17)		<i>Intentionally left blank</i>										
(18)		State that pilots should notify the oceanic area control centre (OAC) of the maximum acceptable flight level possible at the boundary.	X									
(19)		State that at some aerodromes which are situated close to oceanic boundaries, the oceanic clearance must be obtained before departure.	X									

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Syllabus reference	BK	Syllabus details and associated Learning Objectives	Aeroplane		Helicopter			IR	CB-IR(A)	BIR Exam	BIR BK	Remarks
			ATPL	CPL	ATPL/IR	ATPL	CPL					
(20)		State that if an aircraft encounters, whilst en-route to the NAT Oceanic Airspace, an in-flight equipment failure relevant to the airspace, then the pilot must advise ATC when requesting oceanic clearance.	X									
(21)		State that after obtaining and reading back the clearance, the pilot should monitor the forward estimate for oceanic entry, and if this changes by 3 minutes or more, unless providing position reports via automatic dependent surveillance — contract (ADS-C), the pilot must pass a revised estimate on to ATC.	X									
(22)		State that pilots should pay particular attention when the issued clearance differs from the flight plan as a significant proportion of navigation errors investigated in the NAT Region involve aircraft which have followed their flight plan rather than the differing clearance.	X									
(23)		State that if the entry point of the oceanic route for which the flight is cleared differs from that originally requested or the oceanic flight level differs from the current flight level, the pilot is responsible for requesting and obtaining the necessary domestic re-clearance.	X									
(24)		State that there are three elements to an oceanic clearance: route, speed, and flight level, and that these elements serve to provide for the three basic elements of separation: lateral, longitudinal, and vertical.	X									

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Syllabus reference	BK	Syllabus details and associated Learning Objectives	Aeroplane		Helicopter			IR	CB-IR(A)	BIR Exam	BIR BK	Remarks
			ATPL	CPL	ATPL/IR	ATPL	CPL					
(25)		<b><i>Communications and position-reporting procedures</i></b> State that pilots communicate with OACCs via aeradio stations staffed by communicators who have no executive ATC authority.	X									
(26)		State that messages are relayed from the ground station to the air traffic controllers of the relevant OACC for action.	X									
(27)		State that frequencies from the lower HF bands tend to be used for communications during night-time and those from the higher bands during daytime. When initiating contact with an aeradio station, the pilot should state the HF frequency in use.	X									
(28)		State that since oceanic traffic typically communicates with ATC through aeradio facilities, a satellite communication (SAT-VOICE) call, made due to unforeseen inability to communicate by other means, should be made to such a facility rather than the ATC centre, unless the urgency of the communication dictates otherwise.	X									
(29)		State that an air-to-air VHF frequency has been established for worldwide use when aircraft are out of range of VHF ground stations which utilise the same or adjacent frequencies. This frequency, 123.450 MHz, is intended for pilot-to-pilot exchanges of operationally significant information.	X									

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			ATPL	CPL	ATPL/IR	ATPL	CPL					
(30)		State that any pilot, who provides position reports via data link and encounters significant meteorological phenomena (such as moderate/severe turbulence or icing, volcanic ash or thunderstorms), should report this information.	X									
(31)		State that all turbine-engined aeroplanes having a maximum certified take-off mass exceeding 5 700 kg or authorised to carry more than 19 passengers are required to carry and operate airborne collision avoidance system (ACAS) II in the NAT Region.	X									
(32)		State that even with the growing use of data-link communications, a significant volume of NAT air-ground communications are conducted using voice on single sideband (SSB) HF frequencies. To support air-ground ATC communications in the North Atlantic Region, 24 HF frequencies have been allocated, in bands ranging from 2.8 to 18 MHz.	X									
(33)		<b>Application of the Mach number technique (NAT HLA)</b> State that practical experience has shown that when two or more turbojet aircraft, operating along the same route at the same flight level, maintain the same Mach number, they are more likely to maintain a constant time interval between each other than when using other methods.	X									

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Syllabus reference	BK	Syllabus details and associated Learning Objectives	Aeroplane		Helicopter			IR	CB-IR(A)	BIR Exam	BIR BK	Remarks
			ATPL	CPL	ATPL/IR	ATPL	CPL					
(34)		State that after leaving oceanic airspace, pilots must maintain their assigned Mach number in domestic controlled airspace unless and until the appropriate ATC unit authorises a change.	X									
		<b><i>North Atlantic High Level Airspace (NAT HLA) flight operation and navigation procedures</i></b>										
(35)		<b><i>NAT HLA flight operation and navigation procedures</i></b> State that the pre-flight procedures for any NAT HLA flight must include a Universal Time Coordinated (UTC) time check.	X									
(36)		Describe the function and use of the master document.	X									
(37)		State the requirements for position plotting.	X									
(38)		Describe the pre-flight procedures for: — the alignment of IRS; — the satellite navigation availability prediction programme for flights using global navigation satellite long-range navigation system (GNSS LRNS); — loading of initial waypoints; and — flight plan check.	X									
(39)		Describe the strategic lateral offset procedure (SLOP) and state that along a route or track there will be three positions that an aircraft may fly: centre line, or up to 2 NM right.	X									



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Syllabus reference	BK	Syllabus details and associated Learning Objectives	Aeroplane		Helicopter			IR	CB-IR(A)	BIR Exam	BIR BK	Remarks
			ATPL	CPL	ATPL/IR	ATPL	CPL					
(40)		State that RNAV 10 retains the RNP 10 designation, as specified in the Performance-based Navigation Manual (ICAO Doc 9613) (ICAO Doc 7030, NAT Chapter 4).	X									
(41)		State that both aircraft and operators must be RNP 10- or RNP 4-approved by the State of the Operator or the State of Registry, as appropriate.	X									
(42)		State that RNP 10 is the minimum navigation specification for the application of 93 km (50 NM) lateral separation.	X									
(43)		<b>Reduced vertical separation minima (RVSM) flight in NAT HLA</b> State the altimeter cross-check to be performed before entering NAT HLA.	X									
(44)		State the altimeter cross-check to be performed when entering and flying in NAT HLA.	X									
(45)		State that pilots not using controller–pilot data-link communications (CPDLC)/ADS-C always report to ATC immediately on leaving the current cruising level and on reaching any new cruising level.	X									
(46)		State that flight crew should report when a 300-ft deviation or more occurs.	X									
(47)		Navigation planning procedures List the factors to be considered by the commander before commencing the flight.	X									
		<b>Navigation system degradation</b>										

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Syllabus reference	BK	Syllabus details and associated Learning Objectives	Aeroplane		Helicopter			IR	CB-IR(A)	BIR Exam	BIR BK	Remarks
			ATPL	CPL	ATPL/IR	ATPL	CPL					
(48)		For this part, consider aircraft equipped with only two operational LRNSs and state the requirements for the following situations: <ul style="list-style-type: none"> <li>– one system fails before take-off;</li> <li>– one system fails before the OCA boundary is reached;</li> <li>– one system fails after the OCA boundary is crossed; and</li> <li>– the remaining system fails after entering NAT HLA.</li> </ul>	X									
		<b><i>Special procedures for in-flight contingencies</i></b>										
(49)		State the general procedures and also state that the general concept of these NAT in-flight contingency procedures is, whenever operationally feasible, to offset the assigned route by 5 NM and climb or descend to a level which differs from those normally used by 500 ft if below FL 410 or by 1 000 ft if above FL 410.	X									
(50)		State all the factors which may affect the direction of turn including: <ul style="list-style-type: none"> <li>– direction to an alternate aerodrome;</li> <li>– terrain clearance;</li> <li>– levels allocated on adjacent routes or tracks and any known SLOP offsets adopted by other nearby traffic.</li> </ul>	X									

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Syllabus reference	BK	Syllabus details and associated Learning Objectives	Aeroplane		Helicopter			IR	CB-IR(A)	BIR Exam	BIR BK	Remarks
			ATPL	CPL	ATPL/IR	ATPL	CPL					
(51)		State that if the deviation around severe weather is to be greater than 5 NM, the assigned flight level must be changed by $\pm$ 300 ft depending on the followed track and the direction of the deviation.	X									
<b>071 01 03 04</b>		<b>Extended-range operations with two-engined aeroplanes (ETOPS)</b>										
(01)		State that ETOPS approval is part of an AOC.	X									
(02)		State that prior to conducting an ETOPS flight, an operator shall ensure that a suitable ETOPS en-route alternate is available, within either the approved diversion time or a diversion time based on the MEL-generated serviceability status of the aeroplane, whichever is shorter.	X									
(03)		State the requirements for take-off alternate.	X									
(04)		State the planning minima for ETOPS en-route alternate.	X									
(05)		Navigation-planning procedures. Describe the operator's responsibilities concerning ETOPS routes.	X									
(06)		Selection of a route. Describe the limitations on extended-range operations with two-engined aeroplanes with and without ETOPS approval.	X									
(07)		Selection of alternate aerodrome. State the maximum flight distance of a take-off alternate for:	X									

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Syllabus reference	BK	Syllabus details and associated Learning Objectives	Aeroplane		Helicopter			IR	CB-IR(A)	BIR Exam	BIR BK	Remarks
			ATPL	CPL	ATPL/IR	ATPL	CPL					
		<ul style="list-style-type: none"> <li>– two-engined aeroplanes;</li> <li>– ETOPS-approved aeroplanes;</li> <li>– three- or four-engined aeroplanes.</li> </ul>										
(08)		State the maximum distance from an adequate aerodrome for two-engined aeroplanes without an ETOPS approval.	X									
(09)		State the requirement for alternate aerodrome accessibility check for ETOPS operations.	X									
<b>071 02 00 00</b>		<b>SPECIAL OPERATIONAL PROCEDURES AND HAZARDS — GENERAL ASPECTS</b>										
<b>071 02 01 00</b>		<b>Operations manual</b>										
<b>071 02 01 01</b>		<b>Operating procedures</b>										
(01)		Explain the general rules for the operations manual.	X	X	X	X	X					
(02)		Explain the structure and subject headings of the operations manual.	X	X	X	X	X					
(03)		Explain the requirements for a journey log or equivalent.	X	X	X	X	X					
(04)		Describe the requirements regarding the operational flight plan.	X	X	X	X	X					
(05)		Explain the requirements for document-storage periods.	X	X	X	X	X					
(06)		Explain that all non-type-related operational policies, instructions and procedures required for a safe operation are included in Part A of the operations manual.	X	X	X	X	X					

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Syllabus reference	BK	Syllabus details and associated Learning Objectives	Aeroplane		Helicopter			IR	CB-IR(A)	BIR Exam	BIR BK	Remarks
			ATPL	CPL	ATPL/IR	ATPL	CPL					
(07)		State that the following items are included into Part A: — de-icing and anti-icing on the ground; — adverse and potentially hazardous atmospheric conditions; — wake turbulence; — incapacitation of crew members; — use of the minimum equipment list (MEL) and configuration deviation list(s) (CDL); — security; — handling of accidents and occurrences.	X	X	X	X	X					
(08)		State that the following items are included into Part A: — altitude alerting system procedures; — ground proximity warning system procedures; — policy and procedures for the use of traffic alert and collision avoidance system (TCAS)/airborne collision avoidance system (ACAS).	X	X								
(09)		State that rotor downwash is included into Part A.			X	X	X					
<b>071 02 01 02</b>		<b><i>Aeroplane/helicopter operating matters — type-related</i></b>										

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Syllabus reference	BK	Syllabus details and associated Learning Objectives	Aeroplane		Helicopter			IR	CB-IR(A)	BIR Exam	BIR BK	Remarks
			ATPL	CPL	ATPL/IR	ATPL	CPL					
(01)		State that all type-related instructions and procedures required for a safe operation are included in Part B of the operations manual. They take account of any differences between types, variants or individual aircraft used by an operator.	X	X	X	X	X					
(02)		State that the following items are included into Part B: – abnormal and emergency procedures; – configuration deviation list (CDL); – minimum equipment list (MEL); – emergency evacuation procedures.	X	X								
(03)		State that the following items are included into Part B: – emergency procedures; – configuration deviation list (CDL); – minimum equipment list (MEL); – emergency evacuation procedures.			X	X	X					
<b>071 02 01 03</b>		<b>Minimum equipment list (MEL) and master minimum equipment list (MMEL)</b>										
(01)		Describe the following terms: 'commencement of flight', 'inoperative', 'MEL', 'MMEL', 'rectification interval'.	X	X	X	X	X					

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Syllabus reference	BK	Syllabus details and associated Learning Objectives	Aeroplane		Helicopter			IR	CB-IR(A)	BIR Exam	BIR BK	Remarks
			ATPL	CPL	ATPL/IR	ATPL	CPL					
(02)		Explain the relation between MMEL and MEL.	X	X	X	X	X					
(03)		Define the 'extent of the MEL'.	X	X	X	X	X					
(04)		Explain the responsibilities of the operator and the Authority with regard to MEL and MMEL.	X	X	X	X	X					
(05)		Explain the responsibilities of the flight crew members with regard to MEL.	X	X	X	X	X					
(06)		Explain the responsibilities of the commander with regard to MEL.	X	X	X	X	X					
<b>071 02 02 00</b>		<b>Icing conditions</b>										
<b>071 02 02 01</b>		<b><i>On-ground de-icing/anti-icing procedures, types of de-icing/anti-icing fluids</i></b>										
(01)		Define the following terms: 'anti-icing', 'de-icing', 'one-step de-icing/anti-icing', 'two-step de-icing/anti-icing', 'holdover time'.	X	X								
(02)		Describe 'the clean aircraft concept' as presented in the relevant chapter of ICAO Doc 9640.	X	X								
(03)		List the types of de-icing/anti-icing fluids available.	X	X	X	X	X					
(04)		Explain the procedure to be followed when an aeroplane has exceeded the holdover time.	X	X								
(05)		Interpret the guidelines for fluid holdover times and list the factors which can reduce the fluid protection time.	X	X								
(06)		Explain how the pre-take-off check, which is the responsibility of the pilot-in-	X	X								

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Syllabus reference	BK	Syllabus details and associated Learning Objectives	Aeroplane		Helicopter			IR	CB-IR(A)	BIR Exam	BIR BK	Remarks
			ATPL	CPL	ATPL/IR	ATPL	CPL					
		command, ensures that the critical surfaces of the aircraft are free of ice, snow, slush or frost just prior to take-off. This check shall be accomplished as close to the time of take-off as possible and is normally made from within the aeroplane by visually checking the wings.										
(07)		Explain why an aircraft has to be treated symmetrically.	X	X								
(08)		Explain why an operator shall establish procedures to be followed when ground de-icing and anti-icing and related inspections of the aircraft are necessary.	X	X	X	X	X					
(09)		Explain why a commander shall not commence take-off unless the external surfaces are clear of any deposit which might adversely affect the performance or controllability of the aircraft except as permitted in the flight manual.	X	X	X	X	X					
(10)		Explain the requirements for operations in icing conditions.	X	X	X	X	X					
(11)		Explain why safety must come before commercial pressures in relation to de-icing and anti-icing of aircraft. (Consider time and financial cost versus direct and indirect effects of an incident/accident).	X	X	X	X	X					
<b>071 02 02 02</b>		<b><i>Procedure to apply in case of performance deterioration, on ground/in flight</i></b>										
(01)		Explain that the effects of icing are wide-ranging, unpredictable and dependent	X	X	X	X	X					



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Syllabus reference	BK	Syllabus details and associated Learning Objectives	Aeroplane		Helicopter			IR	CB-IR(A)	BIR Exam	BIR BK	Remarks
			ATPL	CPL	ATPL/IR	ATPL	CPL					
		upon individual aircraft design. The magnitude of these effects is dependent upon many variables, but the effects can be both significant and dangerous.										
(02)		Explain that in icing conditions, for a given speed and a given angle of attack, wing lift can be reduced by as much as 30 % and drag increased by up to 40 %. State that these changes in lift and drag will significantly increase stall speed, reduce controllability, and alter flight characteristics.	X	X	X	X	X					
(03)		Explain that ice on critical surfaces and on the airframe may also break away during take-off and be ingested into engines, possibly damaging fan and compressor blades.	X	X	X	X	X					
(04)		Explain that ice forming on pitot tubes and static ports or on angle-of-attack vanes may give false altitude, airspeed, angle-of-attack and engine-power information for air-data systems.	X	X	X	X	X					
(05)		Explain that ice, frost and snow formed on the critical surfaces on the ground can have a totally different effect on aircraft flight characteristics than ice, frost and snow formed in flight.	X	X	X	X	X					
(06)		Explain that flight in known icing conditions is subject to limitations that are contained in Part B of the operations manual.	X	X	X	X	X					

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Syllabus reference	BK	Syllabus details and associated Learning Objectives	Aeroplane		Helicopter			IR	CB-IR(A)	BIR Exam	BIR BK	Remarks
			ATPL	CPL	ATPL/IR	ATPL	CPL					
(07)		Explain where procedures and performances regarding flight in expected or actual icing conditions can be found.	X	X	X	X	X					
<b>071 02 03 00</b>		<b>Bird-strike risk</b>										
<b>071 02 03 01</b>		<b><i>Bird-strike risk and avoidance</i></b>										
(01)		Explain that the presence of birds that constitute a potential hazard to aircraft operations is part of the pre-flight information.	X	X	X	X	X					
(02)		Explain how information concerning the presence of birds observed by aircrews is made available to the aeronautical information service (AIS) for distribution as the circumstances dictate.	X	X	X	X	X					
(03)		Explain that the Aeronautical Information Publication (AIP) Section En-route (ENR) 5.6 contains information regarding bird migrations.	X	X	X	X	X					
(04)		Explain significant data regarding bird strikes contained in ICAO Doc 9137 'Airport Services Manual'.	X	X	X	X	X					
(05)		Explain why birds constitute a hazard to aircraft (damage to probes, sensors, engines, windscreens, airframes, degradation in vision, etc.).	X	X	X	X	X					
(06)		Define the commander's responsibilities regarding the reporting of bird hazards and bird strikes.	X	X	X	X	X					
(07)		State that birds tend to flock to areas where food is plentiful. Such areas include: rubbish (garbage) facilities; open sewage treatment works; recently	X	X	X	X	X					

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Syllabus reference	BK	Syllabus details and associated Learning Objectives	Aeroplane		Helicopter			IR	CB-IR(A)	BIR Exam	BIR BK	Remarks
			ATPL	CPL	ATPL/IR	ATPL	CPL					
		ploughed land; as well as their natural habitats.										
<b>071 02 04 00</b>		<b>Noise abatement</b>										
<b>071 02 04 01</b>		<b>Noise-abatement procedures</b>										
(01)		Define the operator's responsibilities regarding the establishment of noise-abatement procedures.	X	X	X	X	X					
(02)		State the main purpose of noise-abatement departure procedure (NADP) 1 and NADP 2.	X	X	X	X	X					
(03)		State that the PIC/commander has the authority to decide not to execute an NADP if conditions preclude the safe execution of the procedure.	X	X	X	X	X					
<b>071 02 04 02</b>		<b>Influence of the flight procedure (departure, cruise, approach)</b>										
(01)		List the main parameters for NADP 1 and NADP 2 (i.e. speeds, heights and configuration).	X	X								
(02)		State that a runway lead-in lighting system should be provided where it is desired to provide visual guidance along a specific approach path for noise-abatement purposes.	X	X	X	X	X					
(03)		State that detailed information about noise-abatement procedures is to be found in Part 'Aerodromes' (AD), Sections 2 and 3 of the AIP.	X	X	X	X	X					
<b>071 02 04 03</b>		<b>Influence by the pilot (power setting, low drag)</b>										

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Syllabus reference	BK	Syllabus details and associated Learning Objectives	Aeroplane		Helicopter			IR	CB-IR(A)	BIR Exam	BIR BK	Remarks
			ATPL	CPL	ATPL/IR	ATPL	CPL					
(01)		List the adverse operating conditions under which noise-abatement procedures in the form of reduced-power take-off should not be required.	X	X								
(02)		List the adverse operating conditions under which noise-abatement procedures during approach should not be required.	X	X								
(03)		State the rule regarding the use of reverse thrust on landing.	X	X								
<b>071 02 04 04</b>		<b><i>Influence by the pilot (power setting, track of helicopter)</i></b>										
(01)		List the adverse operating conditions under which noise-abatement procedures in the form of reduced-power take-off should not be required.			X	X	X					
<b>071 02 05 00</b>		<b>Fire and smoke</b>										
<b>071 02 05 01</b>		<b><i>Carburettor fire</i></b>										
(01)		Explain that the actions to be taken in the event of a carburettor fire may be type-specific and should be known by the pilot.	X	X	X	X	X					
<b>071 02 05 02</b>		<b><i>Engine fire</i></b>										
(01)		Explain that the actions to be taken in the event of an engine fire may be type-specific and should be known by the pilot.	X	X	X	X	X					
<b>071 02 05 03</b>		<b><i>Fire in the cabin, in the flight crew compartment and in the cargo compartment</i></b>										
(01)		Identify the different types of extinguishants used in handheld fire extinguishers	X	X	X	X	X					

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Syllabus reference	BK	Syllabus details and associated Learning Objectives	Aeroplane		Helicopter			IR	CB-IR(A)	BIR Exam	BIR BK	Remarks
			ATPL	CPL	ATPL/IR	ATPL	CPL					
		and the type of fire for which each one may be used.										
(02)		Describe the precautions to be considered when applying fire extinguishants.	X	X	X	X	X					
(03)		Identify the appropriate handheld fire extinguishers to be used in the flight crew compartment, the passenger cabin and lavatories, and in the cargo compartments.	X	X	X	X	X					
<b>071 02 05 04</b>		<b><i>Smoke in the flight crew compartment and in the cabin</i></b>										
(01)		Explain which actions should be taken in the event of smoke in the flight crew compartment or in the cabin, why these actions may be type-specific, and why they should be known by the pilot.	X	X	X	X	X					
<b>071 02 05 05</b>		<b><i>Actions in case of overheated brakes</i></b>										
(01)		Describe the problems and safety precautions in the event that brakes overheat after a heavy-weight landing or a rejected take-off.	X	X								
(02)		Explain the difference in the way steel and carbon brakes react to energy absorption and the operational consequences.	X	X								
<b>071 02 06 00</b>		<b><i>Decompression of pressurised cabin</i></b>										
<b>071 02 06 01</b>		<b><i>Slow decompression</i></b>										
(01)		Explain what can cause, and how to detect, a slow decompression or an automatic pressurisation system failure.	X	X								

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Syllabus reference	BK	Syllabus details and associated Learning Objectives	Aeroplane		Helicopter			IR	CB-IR(A)	BIR Exam	BIR BK	Remarks
			ATPL	CPL	ATPL/IR	ATPL	CPL					
(02)		Describe the actions required following a slow decompression.	X	X								
<b>071 02 06 02</b>		<b>Rapid and explosive decompression</b>										
(01)		Explain what can cause, and how to detect, a rapid or an explosive decompression.	X	X								
<b>071 02 06 03</b>		<b>Dangers and action to be taken</b>										
(01)		Describe the actions required following a rapid or explosive decompression.	X	X								
(02)		Describe the effects on aircraft occupants of a slow decompression and of a rapid or explosive decompression.	X	X								
<b>071 02 07 00</b>		<b>Wind shear and microburst</b>										
<b>071 02 07 01</b>		<b>Effects and recognition during departure and approach</b>										
(01)		Explain how to identify low-level wind shear.	X	X	X	X	X					
<b>071 02 07 02</b>		<b>Actions to avoid and actions to take when encountering wind shear</b>										
(01)		Describe the effects of wind shear and the actions required when wind shear is encountered at take-off and approach.	X	X	X	X	X					
(02)		Describe the precautions to be taken when wind shear is suspected at take-off and approach.	X	X	X	X	X					
(03)		Describe the effects of wind shear and the actions required following entry into a strong downdraft wind shear.	X	X	X	X	X					
(04)		Describe a microburst and its effects.	X	X	X	X	X					
<b>071 02 08 00</b>		<b>Wake turbulence</b>										
<b>071 02 08 01</b>		<b>Cause</b>										

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Syllabus reference	BK	Syllabus details and associated Learning Objectives	Aeroplane		Helicopter			IR	CB-IR(A)	BIR Exam	BIR BK	Remarks
			ATPL	CPL	ATPL/IR	ATPL	CPL					
(01)		Describe the term 'wake turbulence'.	X	X	X	X	X					
(02)		Describe tip vortex circulation.	X	X	X	X	X					
(03)		State when vortex generation begins and ends.	X	X	X	X	X					
(04)		Describe vortex circulation on the ground with and without crosswind.	X	X	X	X	X					
<b>071 02 08 02</b>		<b>List of relevant parameters</b>										
(01)		List the three main factors which, when combined, give the strongest vortices (heavy, clean, slow).	X	X	X	X	X					
(02)		Describe the wind conditions which are worst for wake turbulence near the ground.	X	X	X	X	X					
<b>071 02 08 03</b>		<b>Actions to be taken when crossing traffic, during take-off and landing</b>										
(01)		Describe the actions to be taken to avoid wake turbulence, specifically separations.	X	X	X	X	X					
<b>071 02 09 00</b>		<b>Security (unlawful events)</b>										
<b>071 02 09 01</b>		<b>ICAO Annex 17 and the Civil Aviation Security Regulations 2019</b>										
(01)		Define the following terms: 'aircraft security check', 'screening', 'security', 'security-restricted area', 'unidentified baggage'.	X	X	X	X	X					
(02)		State the objectives of security.	X	X	X	X	X					
<b>071 02 09 02</b>		<b>Use of secondary surveillance radar (SSR)</b>										
(01)		Describe the commander's responsibilities concerning notifying the appropriate ATS unit.	X	X	X	X	X					

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Syllabus reference	BK	Syllabus details and associated Learning Objectives	Aeroplane		Helicopter			IR	CB-IR(A)	BIR Exam	BIR BK	Remarks
			ATPL	CPL	ATPL/IR	ATPL	CPL					
(02)		Describe the commander's responsibilities concerning operation of SSR.	X	X	X	X	X					
(03)		Describe the commander's responsibilities concerning departing from assigned track or cruising level.	X	X	X	X	X					
(04)		Describe the commander's responsibilities concerning the action required or being requested by an ATS unit to confirm SSR code and ATS interpretation response.	X	X	X	X	X					
<b>071 02 09 03</b>		<b>ICAO Annex 17 and the Civil Aviation Security Regulations 2019</b>										
(01)		Describe the relationship between the Civil Aviation Security Regulations and ICAO Annex 17.	X	X	X	X	X					
(02)		Explain the requirements regarding training programmes.	X	X	X	X	X					
(03)		State the requirements regarding reporting acts of unlawful interference.	X	X	X	X	X					
(04)		State the requirements regarding aircraft search procedures.	X	X	X	X	X					
<b>071 02 10 00</b>		<b>Emergency and precautionary landing, and ditching</b>										
<b>071 02 10 01</b>		<b>Descriptions</b>										
(01)		Describe the meaning of: 'ditching', 'precautionary landing', and 'emergency landing'.	X	X	X	X	X					
(02)		Describe a ditching procedure.	X	X	X	X	X					
(03)		Describe a precautionary landing procedure.	X	X	X	X	X					



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Syllabus reference	BK	Syllabus details and associated Learning Objectives	Aeroplane		Helicopter			IR	CB-IR(A)	BIR Exam	BIR BK	Remarks
			ATPL	CPL	ATPL/IR	ATPL	CPL					
(04)		Describe an emergency landing procedure.	X	X	X	X	X					
(05)		Explain the factors to be considered when deciding to conduct a precautionary/emergency landing or ditching.	X	X	X	X	X					
<b>071 02 10 02</b>		<b>Cause</b>										
(01)		List some circumstances that may require a ditching, a precautionary landing or an emergency landing.	X	X	X	X	X					
<b>071 02 10 03</b>		<b>Passenger information</b>										
(01)		Describe the briefing to be given to passengers before conducting a precautionary/emergency landing or ditching (including evacuation).	X	X	X	X	X					
<b>071 02 10 04</b>		<b>Action after a precautionary/emergency landing or ditching</b>										
(01)		Describe the actions and responsibilities of crew members after landing.	X	X	X	X	X					
<b>071 02 10 05</b>		<b>Evacuation</b>										
(01)		Explain why the aircraft must be stopped and the engine(s) shut down before launching an emergency evacuation.	X	X	X	X	X					
(02)		Explain the CS-25 requirements regarding evacuation procedures.	X	X								
<b>071 02 11 00</b>		<b>Fuel jettisoning</b>										
<b>071 02 11 01</b>		<b>Safety aspects</b>										
(01)		Explain why an aircraft may need to jettison fuel so as to reduce its landing mass in order to make a safe landing.	X	X								
(02)		Explain that when an aircraft that operates within controlled airspace needs to	X	X								

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Syllabus reference	BK	Syllabus details and associated Learning Objectives	Aeroplane		Helicopter			IR	CB-IR(A)	BIR Exam	BIR BK	Remarks
			ATPL	CPL	ATPL/IR	ATPL	CPL					
		jettison fuel, the flight crew shall coordinate with ATC the following: — route to be flown which, if possible, should be clear of cities and towns, preferably over water and away from areas where thunderstorms have been reported or are expected; — the flight level to be used, which should be not less than 1 800 m (6 000 ft); and — the duration of fuel jettisoning.										
(03)		Explain how flaps and slats may adversely affect fuel jettisoning.	X	X								
<b>071 02 11 02</b>		<b>Requirements</b>										
(01)		Explain why a fuel-jettisoning system must be capable of jettisoning enough fuel within 15 minutes.	X	X								
<b>071 02 12 00</b>		<b>Transport of dangerous goods by air</b>										
<b>071 02 12 01</b>		<b>ICAO Annex 18</b>										
(01)		Define the following terms: 'dangerous goods', 'dangerous goods accident', 'dangerous goods incident', 'exemption', 'incompatible', 'packaging', 'UN number'.	X	X	X	X	X					
(02)		Explain that detailed provisions for the transport of dangerous goods by air are contained in the Technical Instructions for the Safe Transport of Dangerous Goods by Air.	X	X	X	X	X					

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Syllabus reference	BK	Syllabus details and associated Learning Objectives	Aeroplane		Helicopter			IR	CB-IR(A)	BIR Exam	BIR BK	Remarks
			ATPL	CPL	ATPL/IR	ATPL	CPL					
(03)		State that in the event of an in-flight emergency, the pilot-in-command must inform the ATC of the transport of dangerous goods by air.	X	X	X	X	X					
<b>071 02 12 02</b>		<b>Technical Instructions for the Safe Transport of Dangerous Goods by Air (ICAO Doc 9284)</b>										
(01)		Explain the principle of dangerous goods compatibility and segregation.	X	X	X	X	X					
(02)		Explain the special requirements for the loading of radioactive materials.	X	X	X	X	X					
(03)		Explain the use of the dangerous goods list.	X	X	X	X	X					
(04)		Identify the labels.	X	X	X	X	X					
<b>071 02 12 03</b>		<b>MCAR-Part-CAT and MCAR-Part-SPA</b>										
(01)		Explain the terminology relevant to dangerous goods.	X	X	X	X	X					
(02)		Explain the scope of that Regulation.	X	X	X	X	X					
(03)		Explain why the transport of dangerous goods by air is subject to operator approval.	X	X	X	X	X					
(04)		Explain the limitations on the transport of dangerous goods by air.	X	X	X	X	X					
(05)		Explain the requirements for the acceptance of dangerous goods.	X	X	X	X	X					
(06)		Explain the requirements regarding inspection for damage, leakage or contamination.	X	X	X	X	X					
(07)		Explain the requirement for the provision of information to flight crew.	X	X	X	X	X					

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Syllabus reference	BK	Syllabus details and associated Learning Objectives	Aeroplane		Helicopter			IR	CB-IR(A)	BIR Exam	BIR BK	Remarks
			ATPL	CPL	ATPL/IR	ATPL	CPL					
(08)		Explain the requirements for dangerous goods incident and accident reports.	X	X	X	X	X					
(09)		State that some articles and substances, which would otherwise be classed as dangerous goods, can be exempted if they are part of the aircraft equipment, or required for use during aeromedical flights.	X	X	X	X	X					
(10)		Explain why some articles and substances may be forbidden for transport by air.	X	X	X	X	X					
(11)		Explain why packing must comply with the specifications of the Technical Instructions.	X	X	X	X	X					
(12)		Explain the need for an inspection prior to loading dangerous goods on an aircraft.	X	X	X	X	X					
(13)		Explain why some dangerous goods are designated for carriage only on cargo aircraft.	X	X	X	X	X					
(14)		Explain how misdeclared or undeclared dangerous goods found in baggage are to be reported.	X	X	X	X	X					
<b>071 02 13 00</b>		<b>Contaminated runways</b>										
<b>071 02 13 01</b>		<b><i>Intentionally left blank</i></b>										
<b>071 02 13 02</b>		<b><i>Runway condition, braking action</i></b>										
(01)		<i>Intentionally left blank</i>										
(02)		State the runway condition codes for good braking action, and when a special air report is required.	X	X								
<b>071 02 13 03</b>		<b><i>Hydroplaning principles and effects</i></b>										

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Syllabus reference	BK	Syllabus details and associated Learning Objectives	Aeroplane		Helicopter			IR	CB-IR(A)	BIR Exam	BIR BK	Remarks
			ATPL	CPL	ATPL/IR	ATPL	CPL					
(01)		Define the different types of hydroplaning.	X	X								
(02)		Compute the two dynamic hydroplaning speeds using the following formulas: — spin-down speed (rotating tire) (kt) = 9 square root (pressure in PSI) — spin-up speed (non-rotating tire) (kt) = 7.7 square root (pressure in PSI).	X	X								
(03)		State that it is the spin-up speed rather than the spin-down speed which represents the actual tire situation for aircraft touchdown on flooded runways.	X	X								
<b>071 02 13 04</b>		<b><i>Intentionally left blank</i></b>										
<b>071 02 13 05</b>		<b><i>SNOWTAM and contamination on the aerodrome</i></b>										
(01)		Interpret from a SNOWTAM the contamination and braking action on a runway, taxiways and apron.	X	X								
(02)		Explain which hazards can be identified from the SNOWTAM/METAR and how to mitigate them.	X	X	X	X	X					
<b>071 02 14 00</b>		<b><i>Rotor downwash</i></b>										
<b>071 02 14 01</b>		<b><i>Describe downwash</i></b>										
(01)		Describe the downwash.			X	X	X					
<b>071 02 14 02</b>		<b><i>Effects</i></b>										
(01)		Explain its effects: soil erosion, water dispersal and spray, recirculation, damage to property, loose articles.			X	X	X					

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Syllabus reference	BK	Syllabus details and associated Learning Objectives	Aeroplane		Helicopter			IR	CB-IR(A)	BIR Exam	BIR BK	Remarks
			ATPL	CPL	ATPL/IR	ATPL	CPL					
<b>071 02 15 00</b>		<b>Operation influence by meteorological conditions (helicopter)</b>										
<b>071 02 15 01</b>		<b>White-out/sand/dust</b>										
(01)		Give the definition of 'white-out'.			X	X	X					
(02)		Describe loss of spatial orientation.			X	X	X					
(03)		Describe take-off and landing techniques.			X	X	X					
<b>071 02 15 02</b>		<b>Strong winds</b>										
(01)		Describe blade sailing.			X	X	X					
(02)		Describe wind operating envelopes.			X	X	X					
(03)		Describe vertical speed problems.			X	X	X					
<b>071 02 15 03</b>		<b>Mountain environment</b>										
(01)		Describe constraints associated with mountain environment.			X	X	X					
<b>071 03 00 00</b>		<b>EMERGENCY PROCEDURES (HELICOPTER)</b>										
<b>071 03 01 00</b>		<b>Influence of technical problems</b>										
<b>071 03 01 01</b>		<b>Engine failure</b>										
(01)		Describe recovery techniques in the event of engine failure during hover, climb, cruise, approach.			X	X	X					
<b>071 03 01 02</b>		<b>Fire in the cabin, in the flight crew compartment and in the engine(s)</b>										
(01)		Describe the basic actions when encountering fire in the cabin, flight deck or engine(s).			X	X	X					
<b>071 03 01 03</b>		<b>Tail-rotor directional control failure</b>										
(01)		Describe the basic actions following loss of tail rotor.			X	X	X					

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Syllabus reference	BK	Syllabus details and associated Learning Objectives	Aeroplane		Helicopter			IR	CB-IR(A)	BIR Exam	BIR BK	Remarks
			ATPL	CPL	ATPL/IR	ATPL	CPL					
(02)		Describe the basic actions following loss of directional control.			X	X	X					
<b>071 03 01 04</b>		<b>Ground resonance</b>										
(01)		Describe recovery actions.			X	X	X					
<b>071 03 01 05</b>		<b>Blade stall</b>										
(01)		Describe cause of and recovery actions when encountering retreating blade stall.			X	X	X					
<b>071 03 01 06</b>		<b>Settling with power (vortex ring)</b>										
(01)		Describe potential conditions for this event and recovery actions.			X	X	X					
<b>071 03 01 07</b>		<b>Overpitch</b>										
(01)		Describe recovery actions.			X	X	X					
<b>071 03 01 08</b>		<b>Overspeed: rotor/engine</b>										
(01)		Describe overspeed control.			X	X	X					
<b>071 03 01 09</b>		<b>Dynamic rollover</b>										
(01)		Describe potential conditions for this event and recovery action.			X	X	X					
<b>071 03 01 10</b>		<b>Mast bumping</b>										
(01)		Describe potential conditions of the 'conductive to' and 'avoidance of' effect.			X	X	X					
<b>071 04 01 00</b>		<b>SPECIALISED OPERATIONS</b> <b>MCAR- Part-SPO on air operations, as amended)</b>										
<b>071 04 01 01</b>		<b>Additional requirements for commercial specialised operations</b> <b>MCAR-Part-ORO, Subpart FC, Section 3)</b>										

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Syllabus reference	BK	Syllabus details and associated Learning Objectives	Aeroplane		Helicopter			IR	CB-IR(A)	BIR Exam	BIR BK	Remarks
			ATPL	CPL	ATPL/IR	ATPL	CPL					
(01)		Explain the requirements related to flight crew recurrent training and checking and operator proficiency check.	X	X	X	X	X					
<b>071 04 01 02</b>		<b>General requirements (MCAR-Part-SPO, Subpart A)</b>										
(01)		Explain the task specialist's responsibilities.	X	X	X	X	X					
<b>071 04 01 03</b>		<b>Helicopter external sling load operations (HESLO) (MCAR-Part-SPO, Subpart E)</b>			X	X	X					
(01)		Explain the standard operating procedures and equipment requirements.			X	X	X					
<b>071 04 01 04</b>		<b>Human external cargo operations (HEC) (MCAR-Part-SPO, Subpart E)</b>			X	X	X					
(01)		Explain the standard operating procedures and equipment requirements.			X	X	X					



## SUBJECT 081 – PRINCIPLES OF FLIGHT – AEROPLANES

- (1) The following standard symbols and their corresponding meanings are used for certain mathematical operations:
  - \* multiplication
  - $\geq$  greater than or equal to
  - $\leq$  less than or equal to
  - SQRT(...) square root of the function, symbol or number in round brackets
- (2) Normally, it should be assumed that the effect of a variable under review is the only variation that needs to be addressed, unless specifically stated otherwise.
- (3) Candidates are expected in simple calculations to be able to convert knots (kt) into metres/second (m/s), and know the appropriate conversion factors by heart.
- (4) In the subsonic range, as covered under Subject 081 01, compressibility effects normally are not considered, unless specifically mentioned.
- (5) For those questions related to propellers (Subject 081 07), as a simplification of the physical reality, the inflow speed into the propeller plane is taken as the aeroplane's true airspeed (TAS).
- (6) In addition, when discussing propeller rotational direction, it will always be specified as seen from behind the propeller plane.
- (7) Note that the term 'mass' is used to describe a quantity of matter, and 'weight' when describing the force. However, the term 'weight' is normally used in aviation to colloquially describe 'mass'. The professional pilot should always note the units to determine whether the term 'weight' is being used to describe a force (e.g. unit newton) or quantity of matter (e.g. unit kilogram).

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Syllabus reference	BK	Syllabus details and associated Learning Objectives	Aeroplane		Helicopter			IR	CB-IR(A)	BIR Exam	BIR BK	Remarks
			ATPL	CPL	ATPL/IR	ATPL	CPL					
<b>080 00 00 00</b>		<b>PRINCIPLES OF FLIGHT</b>										
<b>081 00 00 00</b>		<b>PRINCIPLES OF FLIGHT — AEROPLANES</b>										
<b>081 01 00 00</b>		<b>SUBSONIC AERODYNAMICS</b>										
<b>081 01 01 00</b>		<b>Basics, laws and definitions</b>										
<b>081 01 01 01</b>		<b><i>Laws and definitions</i></b>										
(01)		List the international system of units of measurement (SI) for mass, acceleration, weight, velocity, energy, density, temperature, pressure, force, wing loading, and power.	X	X								
(02)	X	Define 'mass', 'force', 'acceleration', and 'weight'.	X	X								
(03)		State and interpret Newton's three laws of motion.	X	X								
(04)	X	Explain air density.	X	X								
(05)	X	List the atmospheric properties that effect air density.	X	X								
(06)		Explain how temperature and pressure changes affect air density.	X	X								
(07)	X	Define 'static pressure'.	X	X								
(08)	X	Define 'dynamic pressure'.	X	X								
(09)	X	State the formula for 'dynamic pressure'.	X	X								
(10)		Describe dynamic pressure in terms of an indication of the energy in the system, and how it is related to indicated airspeed (IAS) and air density for a given altitude and speed.	X	X								
(11)		State Bernoulli's equation for incompressible flow.	X	X								

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Syllabus reference	BK	Syllabus details and associated Learning Objectives	Aeroplane		Helicopter			IR	CB-IR(A)	BIR Exam	BIR BK	Remarks
			ATPL	CPL	ATPL/IR	ATPL	CPL					
(12)		Define 'total pressure' and explain that the total pressure differs in different systems.	X	X								
(13)		Apply Bernoulli's equation to flow through a venturi stream tube for incompressible flow.	X	X								
(14)		Describe how IAS is acquired from the pitot static system.	X	X								
(15)		Describe the relationship between density, temperature, and pressure for air.	X	X								
(16)		Explain the equation of continuity and its application to the flow through a stream tube.	X	X								
(17)	X	Define 'IAS', 'CAS', 'EAS', and 'TAS'.	X	X								
<b>081 01 01 02</b>		<b>Basics of airflow</b>										
(01)	X	Describe steady and unsteady airflow.	X	X								
(02)	X	Explain the concept of a streamline and a stream tube.	X	X								
(03)	X	Describe and explain airflow through a stream tube.	X	X								
(04)	X	Explain the difference between two- and three-dimensional airflow.	X	X								
<b>081 01 01 03</b>		<b>Aerodynamic forces on aerofoils</b>										
(01)		Describe the originating point and direction of the resultant force caused by the pressure distribution around an aerofoil.	X	X								
(02)	X	Resolve the resultant force into the components 'lift' and 'drag'.	X	X								
(03)		Describe the direction of lift and drag.	X	X								

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Syllabus reference	BK	Syllabus details and associated Learning Objectives	Aeroplane		Helicopter			IR	CB-IR(A)	BIR Exam	BIR BK	Remarks
			ATPL	CPL	ATPL/IR	ATPL	CPL					
(04)	X	Define the 'aerodynamic moment'.	X	X								
(05)	X	List the factors that affect the aerodynamic moment.	X	X								
(06)		Describe the aerodynamic moment for a symmetrical aerofoil.	X	X								
(07)		Describe the aerodynamic moment for a positively and negatively cambered aerofoil.	X	X								
(08)	X	Define 'angle of attack' ( $\alpha$ ).	X	X								
<b>081 01 01 04</b>		<b>Shape of an aerofoil section</b>										
(01)	X	Describe the following parameter of an aerofoil section: leading edge.	X	X								
(02)	X	Describe the following parameter of an aerofoil section: trailing edge.	X	X								
(03)		Describe the following parameter of an aerofoil section: chord line.	X	X								
(04)		Describe the following parameter of an aerofoil section: thickness-to-chord ratio or relative thickness.	X	X								
(05)		Describe the following parameter of an aerofoil section: location of maximum thickness.	X	X								
(06)		Describe the following parameter of an aerofoil section: camber line.	X	X								
(07)		Describe the following parameter of an aerofoil section: camber.	X	X								
(08)	X	Describe the following parameter of an aerofoil section: nose radius.	X	X								

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Syllabus reference	BK	Syllabus details and associated Learning Objectives	Aeroplane		Helicopter			IR	CB-IR(A)	BIR Exam	BIR BK	Remarks
			ATPL	CPL	ATPL/IR	ATPL	CPL					
(09)	X	Describe a symmetrical and an asymmetrical aerofoil section.	X	X								
<b>081 01 01 05</b>		<b>Wing shape</b>										
(01)	X	Describe the following parameter of a wing: span.	X	X								
(02)	X	Describe the following parameter of a wing: tip and root chord.	X	X								
(03)		Describe the following parameter of a wing: taper ratio.	X	X								
(04)	X	Describe the following parameter of a wing: wing area.	X	X								
(05)		Describe the following parameter of a wing: wing planform.	X	X								
(06)	X	Describe the following parameter of a wing: mean geometric chord.	X	X								
(07)		Describe the following parameter of a wing: mean aerodynamic chord (MAC).	X	X								
(08)		Describe the following parameter of a wing: aspect ratio.	X	X								
(09)	X	Describe the following parameter of a wing: dihedral angle.	X	X								
(10)	X	Describe the following parameter of a wing: sweep angle.	X	X								
(11)	X	Describe the following parameter of a wing: wing twist, geometric and aerodynamic.	X	X								
(12)		Describe the following parameter of a wing: angle of incidence. <i>Remark: In certain textbooks, angle of incidence is used as angle of attack</i>	X	X								

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Syllabus reference	BK	Syllabus details and associated Learning Objectives	Aeroplane		Helicopter			IR	CB-IR(A)	BIR Exam	BIR BK	Remarks
			ATPL	CPL	ATPL/IR	ATPL	CPL					
		<i>(α). For MCAR-Part-FCL theoretical knowledge examination purposes, this use is discontinued, and the angle of incidence is defined as the angle between the aeroplane longitudinal axis and the wing-root chord line.</i>										
<b>081 01 02 00</b>		<b>Two-dimensional airflow around an aerofoil</b>										
<b>081 01 02 01</b>		<b>Streamline pattern</b>										
(01)	X	Describe the streamline pattern around an aerofoil.	X	X								
(02)		Describe converging and diverging streamlines, and their effect on static pressure and velocity.	X	X								
(03)	X	Describe upwash and downwash.	X	X								
<b>081 01 02 02</b>		<b>Stagnation point</b>										
(01)		Describe the stagnation point.	X	X								
(02)		Describe the movement of the stagnation point as the $\alpha$ changes.	X	X								
<b>081 01 02 03</b>		<b>Pressure distribution</b>										
(01)		Describe pressure distribution and local speeds around an aerofoil including effects of camber and $\alpha$ .	X	X								
(02)		<i>Intentionally left blank</i>										
<b>081 01 02 04</b>		<b>Centre of pressure (CP) and aerodynamic centre (AC)</b>										
(01)		Explain CP and AC.	X	X								
<b>081 01 02 05</b>		<i>Intentionally left blank</i>										
<b>081 01 02 06</b>		<b>Drag and wake</b>										

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Syllabus reference	BK	Syllabus details and associated Learning Objectives	Aeroplane		Helicopter			IR	CB-IR(A)	BIR Exam	BIR BK	Remarks
			ATPL	CPL	ATPL/IR	ATPL	CPL					
(01)	X	List two physical phenomena that cause drag.	X	X								
(02)		Describe skin friction drag.	X	X								
(03)		Describe form (pressure) drag.	X	X								
(04)	X	Explain why drag and wake cause loss of energy (momentum).	X	X								
<b>081 01 02 07</b>		<b>Influence of angle of attack (<math>\alpha</math>)</b>										
(01)		Explain the influence of $\alpha$ on lift.	X	X								
<b>081 01 02 08</b>		<b>Intentionally left blank</b>										
<b>081 01 02 09</b>		<b>The lift coefficient (<math>C_L</math>) – angle of attack (<math>\alpha</math>) graph</b>										
(01)		Describe the $C_L$ – $\alpha$ graph.	X	X								
(02)		Explain the significant points: — point where the curve crosses the horizontal axis (zero lift); — point where the curve crosses the vertical axis ( $\alpha = 0$ ); — point where the curve reaches its maximum ( $C_{LMAX}$ ).	X	X								
<b>081 01 03 00</b>		<b>Coefficients</b>										
<b>081 01 03 01</b>		<b>General use of coefficients</b>										
(01)	X	Explain why coefficients are used in general.	X	X								
<b>081 01 03 02</b>		<b>The lift coefficient (<math>C_L</math>)</b>										
(01)		Explain the lift formula, the factors that affect lift, and perform simple calculations.	X	X								

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Syllabus reference	BK	Syllabus details and associated Learning Objectives	Aeroplane		Helicopter			IR	CB-IR(A)	BIR Exam	BIR BK	Remarks
			ATPL	CPL	ATPL/IR	ATPL	CPL					
(02)		Describe the effect of camber on the $C_L$ - $\alpha$ graph (symmetrical and positively/negatively cambered aerofoils).	X	X								
(03)		Describe the typical difference in the $C_L$ - $\alpha$ graph for fast and slow aerofoil design.	X	X								
(04)	X	Define 'C <sub>LMAX</sub> ' (maximum lift coefficient) and ' $\alpha_{CRIT}$ ' (stalling $\alpha$ ) on the graph.	X	X								
(05)		Describe $C_L$ and explain the variables that affect it in low subsonic flight.	X	X								
<b>081 01 03 03</b>		<b>Drag</b>										
(01)		Describe the two-dimensional drag formula.	X	X								
(02)		Discuss the effect of the shape of a body, cross-sectional area, and surface roughness on the drag coefficient.	X	X								
<b>081 01 04 00</b>		<b>Three-dimensional airflow around an aeroplane</b>										
<b>081 01 04 01</b>		<b>Angle of attack (<math>\alpha</math>)</b>										
(01)	X	Define 'angle of attack' ( $\alpha$ ). <i>Remark: For theoretical knowledge examination purposes, the angle-of-attack definition requires a reference line. This reference line for 3D has been chosen to be the longitudinal axis and for 2D the chord line.</i>	X	X								
(02)		Explain the difference between the $\alpha$ and the attitude of an aeroplane.	X	X								
<b>081 01 04 02</b>		<b>Streamline pattern</b>										



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Syllabus reference	BK	Syllabus details and associated Learning Objectives	Aeroplane		Helicopter			IR	CB-IR(A)	BIR Exam	BIR BK	Remarks
			ATPL	CPL	ATPL/IR	ATPL	CPL					
(01)		Describe the general streamline pattern around the wing, tail section, and fuselage.	X	X								
(02)		Explain and describe the causes of spanwise flow over top and bottom surfaces.	X	X								
(03)		Describe wing tip vortices and their contribution to downwash behind the wing.	X	X								
(04)		Explain why wing tip vortices vary with $\alpha$ .	X	X								
(05)		Describe spanwise lift distribution including the effect of wing planform.	X	X								
(06)		Describe the causes, distribution and duration of the wake turbulence behind an aeroplane.	X	X								
(07)		Describe the influence of flap deflection on the wing tip vortex.	X	X								
(08)		Describe the parameters that influence wake turbulence.	X	X								
<b>081 01 04 03</b>		<b>Induced drag</b>										
(01)		Explain the factors that cause induced drag.	X	X								
(02)		Describe the approximate formula for the induced drag coefficient (including variables but excluding constants).	X	X								
(03)		Describe the relationship between induced drag and total drag in straight and level flight with variable speed.	X	X								
(04)		Describe the effect of mass on induced drag at a given IAS.	X	X								

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Syllabus reference	BK	Syllabus details and associated Learning Objectives	Aeroplane		Helicopter			IR	CB-IR(A)	BIR Exam	BIR BK	Remarks
			ATPL	CPL	ATPL/IR	ATPL	CPL					
(05)		Describe the means to reduce induced drag: — aspect ratio; — winglets; — tip tanks; — wing twist; — camber change.	X	X								
(06)		Describe the influence of lift distribution on induced drag.	X	X								
(07)		Describe the influence of downwash on the effective airflow.	X	X								
(08)		Explain induced and effective local $\alpha$ .	X	X								
(09)		Explain the influence of the induced $\alpha$ on the direction of the lift vector.	X	X								
(10)		Explain the relationship between induced drag and: — speed; — aspect ratio; — wing planform; — bank angle in a horizontal coordinated turn.	X	X								
(11)		Explain the induced drag coefficient and its relationship with the lift coefficient and aspect ratio.	X	X								
(12)		Explain the influence of induced drag on: — the CL– $\alpha$ graph, and show the effect on the graph when comparing high- and low-aspect ratio wings;	X	X								

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Syllabus reference	BK	Syllabus details and associated Learning Objectives	Aeroplane		Helicopter			IR	CB-IR(A)	BIR Exam	BIR BK	Remarks
			ATPL	CPL	ATPL/IR	ATPL	CPL					
		<ul style="list-style-type: none"> <li>the <math>C_L</math>-<math>C_D</math> (aeroplane polar), and show the effect on the graph when comparing high- and low-aspect ratio wings;</li> <li>the parabolic aeroplane polar in a graph and as a formula [<math>C_D = C_{PD} + kC_L^2</math>], where <math>C_D</math> = coefficient of drag and <math>C_{PD}</math> = coefficient of parasite drag.</li> </ul>										
(13)		Describe the $C_L$ - $C_D$ graph (polar).	X	X								
(14)		Indicate minimum drag on the graph.	X	X								
(15)		Explain why the $C_L$ - $C_D$ ratio is important as a measure of performance.	X	X								
(16)		<b>Intentionally left blank</b>										
<b>081 01 05 00</b>		<b>Total drag</b>										
<b>081 01 05 01</b>		<b>Total drag in relation to parasite drag and induced drag</b>										
(01)	X	State that total drag consists of parasite drag and induced drag.	X	X								
<b>081 01 05 02</b>		<b>Parasite drag</b>										
(01)		Describe the types of drag that are included in parasite drag.	X	X								
(02)		Describe form (pressure) drag and the factors which affect its magnitude.	X	X								
(03)		Describe interference drag and the factors which affect its magnitude.	X	X								
(04)		Describe friction drag and the factors which affect its magnitude.	X	X								
<b>081 01 05 03</b>		<b>Parasite drag and speed</b>										

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Syllabus reference	BK	Syllabus details and associated Learning Objectives	Aeroplane		Helicopter			IR	CB-IR(A)	BIR Exam	BIR BK	Remarks
			ATPL	CPL	ATPL/IR	ATPL	CPL					
(01)		Describe the relationship between parasite drag and speed.	X	X								
<b>081 01 05 04</b>		<b><i>Induced drag and speed</i></b> <i>(Refer to 081 01 04 03)</i>										
<b>081 01 05 05</b>		<b><i>Total drag</i></b>										
(01)		Explain the total drag–speed graph and the constituent drag components.	X	X								
(02)		Indicate the speed for minimum drag.	X	X								
<b>081 01 05 06</b>		<b><i>Intentionally left blank</i></b>										
<b>081 01 05 07</b>		<b><i>Variables affecting the total drag–speed graph</i></b>										
(01)		Describe the effect of aeroplane gross mass on the graph.	X	X								
(02)		Describe the effect of pressure altitude on: — drag–IAS graph; — drag–TAS graph.	X	X								
(03)		Describe speed stability from the graph.	X	X								
(04)		Describe non-stable, neutral, and stable IAS regions.	X	X								
(05)		Explain what happens to the IAS and drag in the non-stable region if speed suddenly decreases and why this could occur.	X	X								
<b>081 01 06 00</b>		<b><i>Ground effect</i></b>										
<b>081 01 06 01</b>		<b><i>Influence of ground effect</i></b>										
(01)		Explain the influence of ground effect on wing tip vortices, downwash, air-flow pattern, lift, and drag.	X	X								

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Syllabus reference	BK	Syllabus details and associated Learning Objectives	Aeroplane		Helicopter			IR	CB-IR(A)	BIR Exam	BIR BK	Remarks
			ATPL	CPL	ATPL/IR	ATPL	CPL					
(02)		Describe the influence of ground effect on induced $\alpha$ and the coefficient of induced drag ( $C_{Di}$ ).	X	X								
(03)		Explain the effects of entering and leaving ground effect.	X	X								
<b>081 01 06 02</b>		<b>Effect on stalling angle of attack (<math>\alpha_{CRIT}</math>)</b>										
(01)		Describe the influence of ground effect on $\alpha_{CRIT}$ .	X	X								
<b>081 01 06 03</b>		<b>Effect on lift coefficient (<math>C_L</math>)</b>										
(01)		Describe the influence of ground effect on the effective $\alpha$ and $C_L$ .	X	X								
<b>081 01 06 04</b>		<b>Effect on take-off and landing characteristics of an aeroplane</b>										
(01)		Describe the influence of ground effect on take-off and landing characteristics and performance of an aeroplane.	X	X								
(02)		Describe the difference in take-off and landing characteristics of high- and low-wing aeroplanes.	X	X								
<b>081 01 07 00</b>		<b>The relationship between lift coefficient and speed in steady, straight, and level flight</b>										
<b>081 01 07 01</b>		<b>Represented by an equation</b>										
(01)		Explain the effect on $C_L$ during speed increase/decrease in steady, straight, and level flight, and perform simple calculations.	X	X								
<b>081 01 07 02</b>		<b>Represented by a graph</b>										

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			ATPL	CPL	ATPL/IR	ATPL	CPL					
(01)		Explain, by using a graph, the effect on speed of $C_L$ changes at a given weight.	X	X								
<b>081 01 08 00</b>		<b>Intentionally left blank</b>										
<b>081 01 09 00</b>		<b>CLMAX augmentation</b>										
<b>081 01 09 01</b>		<b><i>Trailing-edge flaps and the reasons for their use in take-off and landing</i></b>										
(01)		From the given relevant diagrams, describe or identify the following types of trailing-edge flaps: — split flaps; — plain flaps; — slotted flaps; — Fowler flaps.	X	X								
(02)		Describe how the wing's effective camber increases the $C_L$ and $C_D$ , and the reasons why this can be beneficial.	X	X								
(03)		Describe their effect on: — the location of CP; — pitching moments (due to wing CP movement); — stall speed.	X	X								
(04)		Compare their influence on the $C_L$ - $\alpha$ graph: — indicate the variation in $C_L$ at any given $\alpha$ ; — indicate their effect on $C_{LMAX}$ ; — indicate their effect on critical $\alpha$ ;	X	X								

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			ATPL	CPL	ATPL/IR	ATPL	CPL					
		— indicate their effect on the $\alpha$ at a given $C_L$ .										
(05)		Compare their influence on the $C_L$ – $C_D$ graph: — indicate how the $(C_L/C_D)_{MAX}$ differs from that of a clean wing.	X	X								
(06)		Explain the influence of trailing-edge flap deflection on the glide angle.	X	X								
(07)		Describe flap asymmetry: — explain the effect on aeroplane controllability.	X	X								
(08)		Describe trailing-edge flap effect on take-off and landing: — explain the advantages of lower-nose attitudes; — explain why take-off and landing speeds/distances are reduced.	X	X								
(09)		Explain the effects of flap-setting errors, such as mis-selection and premature/late extension or retraction of flaps, on: — take-off and landing distance and speeds; — climb and descent performance; — stall buffet margins.	X	X								
<b>081 01 09 02</b>		<b>Leading-edge devices and the reasons for their use in take-off and landing</b>										

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Syllabus reference	BK	Syllabus details and associated Learning Objectives	Aeroplane		Helicopter			IR	CB-IR(A)	BIR Exam	BIR BK	Remarks
			ATPL	CPL	ATPL/IR	ATPL	CPL					
(01)		From the given relevant diagrams, describe or identify the different types of leading-edge high-lift devices: — Krueger flaps; — variable camber flaps; — slats.	X	X								
(02)		Describe the function of the slot.	X	X								
(03)		Describe how the wing's effective camber increases with a leading-edge flap.	X	X								
(04)		Explain the effect of leading-edge flaps on the stall speed, also in comparison with trailing-edge flaps.	X	X								
(05)		Compare their influence on the $C_L$ - $\alpha$ graph, compared with trailing-edge flaps and a clean wing: — indicate the effect of leading-edge devices on $C_{LMAX}$ ; — explain how the $C_L$ curve differs from that of a clean wing; — indicate the effect of leading-edge devices on $\alpha_{CRIT}$ .	X	X								
(06)		Compare their influence on the $C_L$ - $C_D$ graph.	X	X								
(07)		Describe slat asymmetry: — describe the effect on aeroplane controllability.	X	X								
(08)		Explain the reasons for using leading-edge high-lift devices on take-off and landing:	X	X								



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			ATPL	CPL	ATPL/IR	ATPL	CPL					
		<ul style="list-style-type: none"> <li>explain the disadvantage of increased nose-up attitudes;</li> <li>explain why take-off and landing speeds/distances are reduced.</li> </ul>										
<b>081 01 09 03</b>		<b>Vortex generators</b>										
(01)		Explain the purpose of vortex generators.	X	X								
(02)		Describe the basic operating principle of vortex generators.	X	X								
(03)		State their advantages and disadvantages.	X	X								
<b>081 01 10 00</b>		<b>Means to reduce the <math>C_L-C_D</math> ratio</b>										
<b>081 01 10 01</b>		<b>Spoilers and the reasons for their use in the different phases of flight</b>										
(01)		Describe the aerodynamic functioning of spoilers: <ul style="list-style-type: none"> <li>roll spoilers;</li> <li>flight spoilers (speed brakes);</li> <li>ground spoilers (lift dumpers).</li> </ul>	X	X								
(02)		Describe the effect of spoilers on the $C_L-\alpha$ graph and stall speed.	X	X								
(03)		Describe the influence of spoilers on the $C_L-C_D$ graph and lift-drag ratio.	X	X								
<b>081 01 10 02</b>		<b>Speed brakes and the reasons for their use in the different phases of flight</b>										

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Syllabus reference	BK	Syllabus details and associated Learning Objectives	Aeroplane		Helicopter			IR	CB-IR(A)	BIR Exam	BIR BK	Remarks
			ATPL	CPL	ATPL/IR	ATPL	CPL					
(01)		Describe speed brakes and the reasons for using them in the different phases of flight.	X	X								
(02)		State their influence on the $C_L-C_D$ graph and lift-drag ratio.	X	X								
(03)		Explain how speed brakes increase parasite drag.	X	X								
(04)		Describe how speed brakes affect the minimum drag speed.	X	X								
(05)		Describe their effect on rate and angle of descent.	X	X								
<b>081 01 11 00</b>		<b>Intentionally left blank</b>										
<b>081 01 12 00</b>		<b>Aerodynamic degradation</b>										
<b>081 01 12 01</b>		<b>Ice and other contaminants</b>										
(01)		Describe the locations on an aeroplane where ice build-up will occur during flight.	X	X								
(02)		Explain the aerodynamic effects of ice and other contaminants on: — lift (maximum $C_L$ ); — drag; — stall speed; — $\alpha_{CRIT}$ ; — stability and controllability.	X	X								
(03)		Explain the aerodynamic effects of icing during take-off.	X	X								
<b>081 01 12 02</b>		<b>Deformation and modification of airframe, ageing aeroplanes</b>										

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			ATPL	CPL	ATPL/IR	ATPL	CPL					
(01)		Describe the effect of airframe deformation and modification of an ageing aeroplane on aeroplane performance.	X	X								
(02)		Explain the effect on boundary layer condition of an ageing aeroplane.	X	X								
<b>081 02 00 00</b>		<b>HIGH-SPEED AERODYNAMICS</b>										
<b>081 02 01 00</b>		<b>Speeds</b>										
<b>081 02 01 01</b>		<b>Speed of sound</b>										
(01)	X	Define 'speed of sound'.	X									
(02)		Explain the variation of the speed of sound with altitude.	X									
(03)		Explain the influence of temperature on the speed of sound.	X									
<b>081 02 01 02</b>		<b>Mach number</b>										
(01)		Define 'Mach number' as a function of TAS and speed of sound.	X									
<b>081 02 01 03</b>		<b>Influence of temperature and altitude on Mach number</b>										
(01)		Explain the absence of change of Mach number with varying temperature at constant flight level and calibrated airspeed.	X									
(02)		Explain the relationship between Mach number, TAS and IAS during climb and descent at constant Mach number or IAS, and explain variation of lift coefficient, $\alpha$ , pitch and flight-path angle.	X									
(03)		Explain: — risk of exceeding the maximum operation speed	X									

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			ATPL	CPL	ATPL/IR	ATPL	CPL					
		(VMO) when descending at constant Mach number; — risk of exceeding the maximum operating Mach number ( $M_{MO}$ ) when climbing at constant IAS; — risk of a low-speed stall at high altitude when climbing at a too low Mach number.										
<b>081 02 01 04</b>		<b>Compressibility</b>										
(01)		State that compressibility means that density can change along a stream-line, and that this occurs in the high subsonic (from Mach 0.4), transonic, and supersonic flow.	X									
(02)	X	State that compressibility negatively affects the pressure gradient, leading to an overall reduction of the $C_L$ .	X									
(03)	X	State that Mach number is a measure of compressibility.	X									
(04)		Describe that compressibility increases low-speed stall speed and decreases $\alpha_{CRIT}$ .	X									
<b>081 02 01 05</b>		<b>Subdivision of aerodynamic flow</b>										
(01)	X	List the subdivision of aerodynamic flow: — subsonic flow below compressibility; — subsonic flow above compressibility; — transonic flow;	X									

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			ATPL	CPL	ATPL/IR	ATPL	CPL					
		— supersonic flow.										
(02)		Describe the characteristics of the flow regimes listed above.	X									
(03)		Explain why some transport aeroplanes cruise at Mach numbers above the critical Mach number ( $M_{CRIT}$ ).	X									
<b>081 02 02 00</b>		<b>Shock waves</b>										
<b>081 02 02 01</b>		<b>Definition of shock wave</b>										
(01)	X	Define a 'shock wave'.	X									
<b>081 02 02 02</b>		<b>Normal shock waves</b>										
(01)		Describe a normal shock wave with respect to changes in: — static temperature; — static and total pressure; — velocity; — local speed of sound; — Mach number; — density.	X									
(02)		Describe a normal shock wave with respect to orientation relative to the wing surface.	X									
(03)		Explain the influence of increasing Mach number on a normal shock wave, at positive lift, with respect to: — strength; — position relative to the wing; — second shock wave at the lower surface.	X									

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			ATPL	CPL	ATPL/IR	ATPL	CPL					
(04)		Explain the influence of $\alpha$ on shock-wave intensity and shock-wave location at constant Mach number.	X									
<b>081 02 03 00</b>		<b>Effects of exceeding the critical Mach number (<math>M_{CRIT}</math>)</b>										
<b>081 02 03 01</b>		<b>Critical Mach number (<math>M_{CRIT}</math>)</b>										
(01)		Define ' $M_{CRIT}$ '.	X									
(02)		Explain how a change in $\alpha$ , aeroplane weight, manoeuvres, and centre-of-gravity (CG) position influences $M_{CRIT}$ .	X									
<b>081 02 03 02</b>		<b>Effect on lift</b>										
(01)		Describe the behaviour of $C_L$ versus Mach number at constant $\alpha$ .	X									
(02)		Explain the consequences of exceeding $M_{CRIT}$ with respect to $C_L$ and $C_{LMAX}$ .	X									
(03)		Explain the change in stall indicated airspeed (IAS) with altitude.	X									
(04)		Discuss the effect on $\alpha_{CRIT}$ .	X									
(05)		Explain the advantages of exceeding $M_{CRIT}$ in aeroplanes with supercritical aerofoils with respect to: — speed versus drag ratio; — specific range; — optimum altitude.	X									
<b>081 02 03 03</b>		<b>Effect on drag</b>										
(01)		Describe wave drag.	X									
(02)		Describe the behaviour of $C_D$ versus Mach number at constant $\alpha$ .	X									

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			ATPL	CPL	ATPL/IR	ATPL	CPL					
(03)		Explain the effect of Mach number on the $C_L$ - $C_D$ graph.	X									
(04)		Describe the effects and hazards of exceeding $M_{DRAG DIVERGENCE}$ , namely: — drag rise; — instability; — Mach tuck; — shock stall.	X									
(05)		State the relation between $M_{CRIT}$ and $M_{DRAG DIVERGENCE}$ .	X									
<b>081 02 03 04</b>		<b>Effect on pitching moment</b>										
(01)		Discuss the effect of Mach number on the CP location.	X									
(02)		Describe the overall change in pitching moment above $M_{CRIT}$ and explain the 'tuck under' or 'Mach tuck' effect.	X									
(03)	X	State the requirement for a Mach trim system to compensate for the effect of the CP movement and 'tuck under' effect.	X									
(04)	X	Discuss the aerodynamic functioning of the Mach trim system.	X									
(05)		Discuss the corrective measures if the Mach trim fails.	X									
<b>081 02 03 05</b>		<b>Effect on control effectiveness</b>										
(01)		Discuss the effects on the effectiveness of control surfaces.	X									
<b>081 02 04 00</b>		<b>Intentionally left blank</b>										
<b>081 02 05 00</b>		<b>Means to influence critical Mach number (<math>M_{CRIT}</math>)</b>										
<b>081 02 05 01</b>		<b>Wing sweep</b>										

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Syllabus reference	BK	Syllabus details and associated Learning Objectives	Aeroplane		Helicopter			IR	CB-IR(A)	BIR Exam	BIR BK	Remarks
			ATPL	CPL	ATPL/IR	ATPL	CPL					
(01)		Explain the influence of the angle of sweep on: — $M_{CRIT}$ ; — effective thickness/chord change or velocity component perpendicular to the quarter chord line.	X									
(02)		Describe the influence of the angle of sweepback at subsonic speed on: — $C_{LMAX}$ ; — efficiency of and requirement for high-lift devices; — pitch-up stall behaviour.	X									
(03)		Discuss the effect of wing sweepback on drag.	X									
<b>081 02 05 02</b>		<b>Aerofoil shape</b>										
(01)		Explain the use of thin aerofoils with reduced camber.	X									
(02)		Explain the main purpose of supercritical aerofoils.	X									
(03)		<i>Intentionally left blank</i>										
(04)		Explain the advantages and disadvantages of supercritical aerofoils for wing design.	X									
<b>081 02 05 03</b>		<b>Vortex generators</b>										
(01)		Explain the use of vortex generators as a means to avoid or restrict flow separation caused by the presence of a normal shock wave.	X									
<b>081 03 00 00</b>		<b>Stall, Mach tuck, and upset prevention and recovery</b>										



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			ATPL	CPL	ATPL/IR	ATPL	CPL					
<b>081 03 01 00</b>		<b>The stall</b>										
<b>081 03 01 01</b>		<b>Flow separation at increasing <math>\alpha</math></b>										
(01)	X	Define the 'boundary layer'.	X	X								
(02)	X	Describe the thickness of a typical laminar and turbulent boundary layer.	X	X								
(03)		Describe the properties, advantages and disadvantages of the laminar boundary layer.	X	X								
(04)		Describe the properties, advantages and disadvantages of the turbulent boundary layer.	X	X								
(05)		Define the 'transition point'.	X	X								
(06)		Explain why the laminar boundary layer separates easier than the turbulent boundary layer does.	X	X								
(07)		Describe why the airflow over the aft part of a wing slows down as the $\alpha$ increases.	X	X								
(08)		Define the 'separation point' and describe its location as a function of $\alpha$ .	X	X								
(09)	X	Define $\alpha_{CRIT}$ .	X	X								
(10)		Describe in straight and level flight the influence of increasing the $\alpha$ and the phenomenon that may occur regarding: — the forward stagnation point; — the pressure distribution; — the CP location (straight and swept-back wing); — $C_L$ ; — $C_D$ and D (drag);	X	X								

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			ATPL	CPL	ATPL/IR	ATPL	CPL					
		<ul style="list-style-type: none"> <li>the pitching moment (straight and swept-back wing);</li> <li>buffet onset;</li> <li>deterrent buffet for a clean wing at high Mach number;</li> <li>lack of pitch authority;</li> <li>uncommanded pitch down;</li> <li>uncommanded roll.</li> </ul>										
(11)		Explain what causes the possible natural buffet on the aeroplane in a pre-stall condition.	X	X								
(12)		Describe the effectiveness of the flight controls in a pre-stall condition.	X	X								
(13)		Describe and explain the normal post-stall behaviour of a straight-wing aeroplane.	X	X								
(14)		Describe the effect and dangers of using the controls close to the stall.	X	X								
(15)		Describe the deterrent buffet.	X	X								
(16)		Explain the occurrence of the deterrent buffet and why this phenomenon is considered to be a stall limit.	X	X								
<b>081 03 01 02</b>		<b>The stall speed</b>										
(01)		Explain $V_{S0}$ , $V_{S1}$ , $V_{SR}$ , and $V_{S1G}$ .	X	X								
(02)		Solve $V_{S1G}$ from the lift formula given varying $C_L$ .	X	X								

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Syllabus reference	BK	Syllabus details and associated Learning Objectives	Aeroplane		Helicopter			IR	CB-IR(A)	BIR Exam	BIR BK	Remarks
			ATPL	CPL	ATPL/IR	ATPL	CPL					
(03)		Describe and explain the influence of the following parameters on stall speed: — CG; — thrust component; — slipstream; — wing loading; — mass; — wing contamination; — angle of sweep; — altitude (for compressibility effects, see 081 02 03 02).	X	X								
(04)	X	Define the 'load factor n'.	X	X								
(05)		Explain why the load factor increases in a turn.	X	X								
(06)		Explain why the load factor increases in a pull-up and decreases in a push-over manoeuvre.	X	X								
(07)		Describe and explain the influence of the 'load factor n' on stall speed.	X	X								
(08)	X	Explain the expression 'accelerated stall'. <i>Remark: Sometimes, accelerated stall is also erroneously referred to as high-speed stall. This latter expression will not be used for Subject 081.</i>	X	X								
(09)		Calculate the change of stall speed as a function of the load factor.	X	X								
(10)		Calculate the increase of stall speed in a horizontal coordinated turn as a function of bank angle.	X	X								

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Syllabus reference	BK	Syllabus details and associated Learning Objectives	Aeroplane		Helicopter			IR	CB-IR(A)	BIR Exam	BIR BK	Remarks
			ATPL	CPL	ATPL/IR	ATPL	CPL					
(11)		Calculate the change of stall speed as a function of the gross mass.	X	X								
<b>081 03 01 03</b>		<b><i>The initial stall in spanwise direction</i></b>										
(01)		Explain the initial stall sequence on the following planforms: — elliptical; — rectangular; — moderate and high taper; — sweepback or delta.	X	X								
(02)		Explain the purpose of aerodynamic and geometric twist (washout).	X	X								
(03)		<i>Intentionally left blank</i>										
(04)		Explain the influence of fences, vortilons, saw teeth, vortex generators, and strakes on engine nacelles.	X	X								
<b>081 03 01 04</b>		<b><i>Stall warning</i></b>										
(01)	X	Explain why stall warning is necessary.	X	X								
(02)	X	Explain when aerodynamic and artificial stall warnings are used.	X	X								
(03)		Explain why CS-23 and CS-25 require a margin to stall speed for take-off and landing speeds.	X	X								
(04)	X	Describe: — buffet; — stall strip; — flapper switch (leading-edge stall-warning vane); — angle-of-attack vane;	X	X								

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Syllabus reference	BK	Syllabus details and associated Learning Objectives	Aeroplane		Helicopter			IR	CB-IR(A)	BIR Exam	BIR BK	Remarks
			ATPL	CPL	ATPL/IR	ATPL	CPL					
		— angle-of-attack probe; — stick shaker.										
(05)		Describe the recovery after: — stall warning; — stall; — stick-pusher actuation.	X	X								
<b>081 03 01 05</b>		<b>Special phenomena of stall</b>										
(01)		<i>Intentionally left blank</i>										
(02)		Explain the difference between power-off and power-on stalls and recovery.	X	X								
(03)		Describe stall and recovery in a climbing and descending turn.	X	X								
(04)		Describe the pitch-up effect on a swept wing aeroplane and also an aeroplane with a T-tail.	X	X								
(05)		Describe super stall or deep stall.	X	X								
(06)		Describe the philosophy behind the stick-pusher system.	X	X								
(07)		Describe the factors that can lead to the absence of stall warning and explain the associated risks.	X	X								
(08)		Describe the indications and explain the consequences of premature stabiliser stall due to ice contamination (negative tail stall).	X	X								
(09)		Describe when to expect in-flight icing.	X	X								
(10)		Explain how the effect is changed when retracting/extending lift-augmentation devices.	X	X								

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Syllabus reference	BK	Syllabus details and associated Learning Objectives	Aeroplane		Helicopter			IR	CB-IR(A)	BIR Exam	BIR BK	Remarks
			ATPL	CPL	ATPL/IR	ATPL	CPL					
(11)		<i>Intentionally left blank</i>										
(12)		Explain the effect of a contaminated wing on the stall speed and $\alpha_{CRIT}$ .	X	X								
(13)		Explain the hazards associated with airframe contamination when parked and during ground operations in winter conditions, and the aerodynamic effects when attempting a take-off.	X	X								
(14)		Explain de-icing/anti-icing holdover time and the likely hazards after it has expired.	X	X								
(15)		Describe the aerodynamic effects of heavy tropical rain on stall speed and drag, and the appropriate mitigation in such conditions.	X	X								
<b>081 03 01 06</b>		<b><i>The spin</i></b>										
(01)		Explain how to avoid spins.	X	X								
(02)		List the factors that cause a spin to develop.	X	X								
(03)		Describe an 'incipient' and 'developed' spin, recognition and recovery.	X	X								
(04)		Describe the differences in spin attitude with forward and aft CG.	X	X								
<b>081 03 02 00</b>		<b>Buffet onset boundary</b>										
<b>081 03 02 01</b>		<b><i>Mach buffet</i></b>										
(01)		Explain shock-induced separation, and describe its relationship with Mach buffet (high speed buffet) and Mach tuck.	X									
(02)		<i>Intentionally left blank</i>										
<b>081 03 02 02</b>		<b><i>Buffet onset</i></b>										

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Syllabus reference	BK	Syllabus details and associated Learning Objectives	Aeroplane		Helicopter			IR	CB-IR(A)	BIR Exam	BIR BK	Remarks
			ATPL	CPL	ATPL/IR	ATPL	CPL					
(01)		Explain the concept of buffet margin, and describe the influence of the following parameters on the concept of buffet margin: — $\alpha$ ; — Mach number; — pressure altitude; — mass; — load factor; — angle of bank; — CG location.	X									
(02)		Explain how the buffet onset boundary chart can be used to determine: — manoeuvrability; — buffet margin.	X									
(03)		Describe the consequences of exceeding $M_{MO}$ : light buffet, buffet onset.	X									
(04)		Explain 'aerodynamic ceiling' and 'coffin corner'.	X									
(05)		Explain the concept of the '1.3g' buffet margin altitude.	X									
(06)		Find (using an example graph): — buffet free range; — aerodynamic ceiling at a given mass; — load factor and bank angle at which buffet occurs at a given mass, Mach number, and pressure altitude.	X									
(07)		Explain why descent increases the buffet free range.	X									

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			ATPL	CPL	ATPL/IR	ATPL	CPL					
<b>081 03 03 00</b>		<b>Situations in which buffet or stall could occur</b>										
<b>081 03 03 01</b>		<b>Explain why buffet or stall occurs</b>										
(01)		Explain why buffet or stall could occur in the following pilot-induced situations, and the methods to mitigate them: — inappropriate take-off configuration, detailing the consequences of errors associated with leading-edge devices; — steep turns; — go-around using take-off/go-around (TOGA) setting (underslung engines).	X	X								
(02)		Explain why buffet or stall could occur in the following environmental conditions at low altitude, and how to mitigate them: — thunderstorms; — wind shear and microburst; — turbulence; — wake turbulence; — icing conditions.	X	X								
(03)		Explain why buffet or stall could occur in the following environmental conditions at high altitude, and how to mitigate them: — thunderstorms in the intertropical convergence zone (ITCZ); — jet streams; — clear-air turbulence.	X									



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			ATPL	CPL	ATPL/IR	ATPL	CPL					
(04)		Explain why buffet or stall could occur in the following situations, and how to mitigate them: — inappropriate autopilot climb mode; — loss of, or unreliable, airspeed indication.	X	X								
<b>081 03 04 00</b>		<b>Recognition of stalled condition</b>										
<b>081 03 04 01</b>		<b>Recognition and explanation of stalled condition</b>										
(01)		Explain why a stalled condition can occur at any airspeed, or attitude or altitude.	X	X								
(02)		Explain that a stall may be recognised by continuous stall-warning activation accompanied by at least one of the following: — buffet, that can be heavy; — lack of pitch authority; — uncommanded pitch down and uncommanded roll; — inability to arrest the descent rate.	X	X								
(03)		Explain that 'stall warning' means a natural or synthetic indication provided when approaching the stall that may include one or more of the following indications: — aerodynamic buffeting; — reduced roll stability and aileron effectiveness;	X	X								

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			ATPL	CPL	ATPL/IR	ATPL	CPL					
		<ul style="list-style-type: none"> <li>— visual or aural clues and warnings;</li> <li>— reduced elevator (pitch) authority;</li> <li>— inability to maintain altitude or arrest a rate of descent;</li> <li>— stick-shaker activation.</li> </ul>										
<b>081 04 00 00</b>		<b>STABILITY</b>										
<b>081 04 01 00</b>		<b>Static and dynamic stability</b>										
<b>081 04 01 01</b>		<b>Basics and definitions</b>										
(01)		Define 'static stability': <ul style="list-style-type: none"> <li>— describe/identify a statically stable, neutral, and unstable condition (positive, neutral, and negative static stability), and</li> <li>— explain why aeroplanes are statically stable.</li> </ul>	X	X								
(02)		Explain manoeuvrability.	X	X								
(03)		Explain the relationship between static stability and manoeuvrability.	X	X								
(04)		Define 'dynamic stability': <ul style="list-style-type: none"> <li>— describe/identify a dynamically stable, neutral, and unstable motion (positive, neutral, and negative dynamic stability);</li> <li>— describe/identify periodic and aperiodic motion.</li> </ul>	X	X								
(05)		<i>Intentionally left blank</i>										
<b>081 04 01 02</b>		<b>Precondition for static stability</b>										

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Syllabus reference	BK	Syllabus details and associated Learning Objectives	Aeroplane		Helicopter			IR	CB-IR(A)	BIR Exam	BIR BK	Remarks
			ATPL	CPL	ATPL/IR	ATPL	CPL					
(01)	X	Explain an equilibrium of forces and moments as the initial condition for static stability.	X	X								
<b>081 04 01 03</b>		<b>Sum of forces</b>										
(01)	X	Identify the forces considered in the equilibrium of forces.	X	X								
<b>081 04 01 04</b>		<b>Sum of moments</b>										
(01)		Identify the moments about all three axes considered in the equilibrium of moments.	X	X								
(02)		Discuss the effect of sum of moments not being zero.	X	X								
<b>081 04 02 00</b>		<b>Intentionally left blank</b>										
<b>081 04 03 00</b>		<b>Static and dynamic longitudinal stability</b>										
<b>081 04 03 01</b>		<b>Methods for achieving balance</b>										
(01)	X	Explain the stabiliser as the means to satisfy the condition of nullifying the total sum of the moments about the lateral axis.	X	X								
(02)		Explain the influence of the location of the wing CP relative to the CG on the magnitude and direction of the balancing force on the stabiliser.	X	X								
(03)		Explain the influence of the indicated airspeed on the magnitude and direction of the balancing force on the stabiliser.	X	X								

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			ATPL	CPL	ATPL/IR	ATPL	CPL					
(04)		Explain the use of the elevator deflection or stabiliser angle for the generation of the balancing force and its direction.	X	X								
(05)		Explain the elevator deflection required to balance thrust change as a function of engine position.	X	X								
<b>081 04 03 02</b>		<b>Static longitudinal stability</b>										
(01)		Discuss the effect of the CG location on pitch manoeuvrability and longitudinal stability.	X	X								
<b>081 04 03 03</b>		<b>Neutral point</b>										
(01)	X	Define 'neutral point'.	X	X								
(02)	X	Explain why the location of the neutral point is only dependent on the aerodynamic design of the aeroplane.	X	X								
<b>081 04 03 04</b>		<b>Factors affecting neutral point</b>										
(01)		Describe the location of the neutral point relative to the locations of the aerodynamic centre of the wing and tail.	X	X								
<b>081 04 03 05</b>		<b>Location of centre of gravity (CG)</b>										
(01)		Explain the influence of the CG location on the static longitudinal stability of the aeroplane.	X	X								
(02)		Explain the CG forward and aft limits with respect to: — longitudinal control forces; — elevator effectiveness; — stability.	X	X								
(03)		Define 'static margin'.	X	X								

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			ATPL	CPL	ATPL/IR	ATPL	CPL					
<b>081 04 03 06</b>		<b><i>The <math>C_m-\alpha</math> graph</i></b>										
(01)	X	Describe the $C_m-\alpha$ graph with respect to the relationship between the slope of the graph and static stability.	X	X								
<b>081 04 03 07</b>		<b><i>Factors affecting the <math>C_m-\alpha</math> graph</i></b>										
(01)		Explain: — the effect on the $C_m-\alpha$ graph of a shift of CG in the forward and aft direction; — the effect on the $C_m-\alpha$ graph when the elevator is moved up or down; — the effect on the $C_m-\alpha$ graph when the trim is moved; — the effect of the wing contribution; — the tail contribution.	X	X								
<b>081 04 03 08</b>		<b><i>Intentionally left blank</i></b>										
<b>081 04 03 09</b>		<b><i>Intentionally left blank</i></b>										
<b>081 04 03 10</b>		<b><i>The stick force versus speed graph (IAS)</i></b>										
(01)		Explain how a pilot perceives stable static longitudinal stick force stability regarding changes in: — speed; — altitude; — mass distribution (CG location).	X	X								
<b>081 04 03 11</b>		<b><i>Intentionally left blank</i></b>										
<b>081 04 03 12</b>		<b><i>The manoeuvring stability/stick force per g</i></b>										

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			ATPL	CPL	ATPL/IR	ATPL	CPL					
(01)	X	Define the 'stick force per g', and describe that the stick force increases linearly with increase in g.	X	X								
(02)		Explain why: — the stick force per g has a prescribed minimum and maximum value; — the stick force per g decreases with pressure altitude.	X	X								
<b>081 04 03 13</b>		<b><i>Intentionally left blank</i></b>										
<b>081 04 03 14</b>		<b><i>Factors affecting the manoeuvring stability/stick force per g</i></b>										
(01)		Explain the influence on stick force per g of: — CG location; — trim setting.	X	X								
<b>081 04 03 15</b>		<b><i>Intentionally left blank</i></b>										
<b>081 04 03 16</b>		<b><i>Dynamic longitudinal stability</i></b>										
(01)		Describe the phugoid and short-period motion in terms of period, damping, variations (if applicable) in speed, altitude, and $\alpha$ .	X	X								
(02)		Explain why the short-period motion is more hazardous than the phugoid.	X	X								
(03)		Describe 'pilot-induced oscillations'.	X	X								
(04)		Explain the effect of high altitude on dynamic stability.	X	X								
(05)		Describe the influence of the CG location on the dynamic longitudinal stability of the aeroplane.	X	X								

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			ATPL	CPL	ATPL/IR	ATPL	CPL					
<b>081 04 04 00</b>		<b>Static directional stability</b>										
<b>081 04 04 01</b>		<b>Definition and effects of static directional stability</b>										
(01)	X	Define 'static directional stability'.	X	X								
(02)		Explain the effects of static directional stability being too weak or too strong.	X	X								
<b>081 04 04 02</b>		<b>Sideslip angle</b>										
(01)		Define 'sideslip angle'.	X	X								
(02)		Identify $\beta$ as the symbol used for the sideslip angle.	X	X								
<b>081 04 04 03</b>		<b>Yaw-moment coefficient <math>C_n</math></b>										
(01)	X	Define the 'yawing-moment coefficient $C_n$ '.	X	X								
(02)	X	Define the relationship between $C_n$ and $\beta$ for an aeroplane with static directional stability.	X	X								
081 04 04 04		$C_n$ - $\beta$ graph										
(01)	X	Explain why: — $C_n$ depends on $\beta$ ; — $C_n$ equals zero for that $\beta$ that provides static equilibrium about the aeroplane's normal axis; — if no asymmetric engine thrust, flight control or loading condition prevails, the equilibrium $\beta$ equals zero.	X	X								
(02)	X	Identify how the slope of the $C_n$ - $\beta$ graph is a measure for static directional stability.	X	X								

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			ATPL	CPL	ATPL/IR	ATPL	CPL					
(03)	X	Identify how the slope of the $C_n-\beta$ graph is affected by altitude.	X	X								
<b>081 04 04 05</b>		<b>Factors affecting static directional stability</b>										
(01)		Describe how the following aeroplane components contribute to static directional stability: — wing; — fin; — dorsal fin; — ventral fin; — angle of sweep of the wing; — angle of sweep of the fin; — fuselage at high $\alpha$ ; — strakes.	X	X								
(02)		Explain the reduction in static directional stability when the CG moves aft.	X	X								
<b>081 04 05 00</b>		<b>Static lateral stability</b>										
<b>081 04 05 01</b>		<b>Definition and effects of static lateral stability</b>										
(01)	X	Define 'static lateral stability'.	X	X								
(02)		Explain the effects of static lateral stability being too weak or too strong.	X	X								
<b>081 04 05 02</b>		<b>Bank angle <math>\emptyset</math></b>										
(01)	X	Define 'bank angle $\emptyset$ '.	X	X								
<b>081 04 05 03</b>		<b>The roll-moment coefficient <math>C_l</math></b>										
(01)	X	Define the 'roll-moment coefficient $C_l$ '.	X	X								
<b>081 04 05 04</b>		<b>Contribution of sideslip angle (<math>\beta</math>)</b>										



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			ATPL	CPL	ATPL/IR	ATPL	CPL					
(01)		Explain how without coordination the bank angle ( $\phi$ ) creates sideslip angle ( $\beta$ ).	X	X								
<b>081 04 05 05</b>		<b>The <math>C_l</math>-<math>\beta</math> graph</b>										
(01)	X	Describe the $C_l$ - $\beta$ graph.	X	X								
(02)	X	Identify the slope of the $C_l$ - $\beta$ graph as a measure for static lateral stability.	X	X								
(03)	X	Identify how the slope of the $C_l$ - $\beta$ graph is affected by altitude.	X	X								
<b>081 04 05 06</b>		<b>Factors affecting static lateral stability</b>										
(01)		Explain the contribution to the static lateral stability of: — dihedral, anhedral; — high wing, low wing; — sweep angle of the wing; — ventral fin; — vertical tail.	X	X								
<b>081 04 06 00</b>		<b>Dynamic lateral/directional stability</b>										
<b>081 04 06 01</b>		<b>Intentionally left blank</b>										
<b>081 04 06 02</b>		<b>Tendency to spiral dive</b>										
(01)		Explain how lateral and directional stability are coupled.	X	X								
(02)		Explain how high static directional stability and low static lateral stability may cause spiral divergence (unstable spiral dive), and under which conditions the spiral dive mode is neutral or stable.	X	X								
(03)		Describe an unstable spiral dive mode with respect to deviations in	X	X								

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Syllabus reference	BK	Syllabus details and associated Learning Objectives	Aeroplane		Helicopter			IR	CB-IR(A)	BIR Exam	BIR BK	Remarks
			ATPL	CPL	ATPL/IR	ATPL	CPL					
		speed, bank angle, nose low-pitch attitude, and decreasing altitude.										
<b>081 04 06 03</b>		<b><i>Dutch roll</i></b>										
(01)		Describe Dutch roll.	X	X								
(02)		Explain: — why Dutch roll occurs when the static lateral stability is higher than static directional stability; — the conditions for a stable, neutral or unstable Dutch roll motion; — the function of the yaw damper; — the actions to be taken when the yaw damper is not available.	X	X								
(03)		Describe how the asymmetric nature of shock waves on both wings, at high Mach numbers, can lead to Dutch roll.	X									
<b>081 04 06 04</b>		<b><i>Effects of altitude on dynamic stability</i></b>										
(01)		Explain that increased pressure altitude reduces dynamic lateral/directional stability.	X	X								
<b>081 05 00 00</b>		<b>CONTROL</b>										
<b>081 05 01 00</b>		<b>General</b>										
<b>081 05 01 01</b>		<b><i>Basics — The three planes and three axes</i></b>										
(01)	X	Define: — lateral axis; — longitudinal axis; — normal axis.	X	X								

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			ATPL	CPL	ATPL/IR	ATPL	CPL					
(02)	X	— Define: — pitch angle; — bank angle ( $\emptyset$ ); — yaw angle.	X	X								
(03)		Describe the motion about the three axes.	X	X								
(04)		Name and describe the devices that control these motions.	X	X								
<b>081 05 01 02</b>		<b>Camber change</b>										
(01)		State that camber is changed by movement of a control surface and explain the effect.	X	X								
<b>081 05 01 03</b>		<b>Angle-of-attack (<math>\alpha</math>) change</b>										
(01)	X	Explain the influence of local $\alpha$ change by movement of a control surface.	X	X								
<b>081 05 02 00</b>		<b>Pitch (longitudinal) control</b>										
<b>081 05 02 01</b>		<b>Elevator/all-flying tails</b>										
(01)		Explain the working principle of the elevator/all-flying tail and describe its function.	X	X								
<b>081 05 02 02</b>		<b>Downwash effects</b>										
(01)		Explain the effect of downwash on the tailplane $\alpha$ .	X	X								
(02)		<i>Intentionally left blank</i>										
<b>081 05 02 03</b>		<b>Intentionally left blank</b>										
<b>081 05 02 04</b>		<b>Location of centre of gravity (CG)</b>										
(01)		Explain the relationship between elevator deflection and CG location to produce a given aeroplane response.	X	X								

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			ATPL	CPL	ATPL/IR	ATPL	CPL					
(02)		Explain the effect of forward CG limit on pitch control.	X	X								
<b>081 05 02 05</b>		<b><i>Moments due to engine thrust</i></b>										
(01)		Describe the effect of engine thrust on pitching moments for different engine locations.	X	X								
<b>081 05 03 00</b>		<b>Yaw (directional) control</b>										
<b>081 05 03 01</b>		<b><i>The rudder</i></b>										
(01)		Explain the working principle of the rudder and describe its function. State the relationship between rudder deflection and the moment about the normal axis. Describe the effect of sideslip on the moment about the normal axis.	X	X								
<b>081 05 03 02</b>		<b><i>Rudder limiting</i></b>										
(01)		Explain why and how rudder deflection is limited on CAT aeroplanes.	X									
<b>081 05 04 00</b>		<b>Roll (lateral) control</b>										
<b>081 05 04 01</b>		<b><i>Ailerons</i></b>										
(01)		Explain the functioning of ailerons.	X	X								
(02)		Describe the adverse effects of aileron deflection. <i>(Refer to Subjects 081 05 04 04 and 081 06 01 02)</i>	X	X								
(03)		Explain why some aeroplanes have inboard and outboard ailerons.	X	X								
(04)		State that the outboard ailerons are locked beyond a given speed to prevent: — over-control;	X	X								

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Syllabus reference	BK	Syllabus details and associated Learning Objectives	Aeroplane		Helicopter			IR	CB-IR(A)	BIR Exam	BIR BK	Remarks
			ATPL	CPL	ATPL/IR	ATPL	CPL					
		<ul style="list-style-type: none"> <li>— exceeding structural limitations;</li> <li>— aeroelastic phenomena (flutter, divergence and aileron reversal).</li> </ul>										
(05)		Describe the use of aileron deflection in normal flight, flight with sideslip, crosswind landings, horizontal turns, flight with one-engine-inoperative.	X	X								
(06)	X	Define 'roll rate'.	X	X								
(07)	X	List the factors that affect roll rate.	X	X								
(08)		Describe flaperons and aileron droop.	X	X								
<b>081 05 04 02</b>		<b>Intentionally left blank</b>										
<b>081 05 04 03</b>		<b>Spoilers</b>										
(01)		Explain how spoilers can be used to control the rolling movement in combination with or instead of the ailerons.	X	X								
<b>081 05 04 04</b>		<b>Adverse yaw</b>										
(01)		Explain why the use of ailerons induces adverse yaw.	X	X								
<b>081 05 04 05</b>		<b>Means to avoid adverse yaw</b>										
(01)		Explain how the following reduce adverse yaw: <ul style="list-style-type: none"> <li>— Frise ailerons;</li> <li>— differential aileron deflection;</li> <li>— rudder aileron cross-coupling;</li> <li>— roll spoilers.</li> </ul>	X	X								
<b>081 05 05 00</b>		<b>Roll/yaw interaction</b>										
<b>081 05 05 01</b>		<b>Explain roll/yaw interaction</b>										
(01)		Explain the secondary effect of roll.	X	X								

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Syllabus reference	BK	Syllabus details and associated Learning Objectives	Aeroplane		Helicopter			IR	CB-IR(A)	BIR Exam	BIR BK	Remarks
			ATPL	CPL	ATPL/IR	ATPL	CPL					
(02)		Explain the secondary effect of yaw.	X	X								
<b>081 05 06 00</b>		<b>Means to reduce control forces</b>										
<b>081 05 06 01</b>		<b><i>Aerodynamic balance</i></b>										
(01)		Describe the purpose of aerodynamic balance.	X	X								
(02)		Describe the working principle of the horn balance.	X	X								
(03)		Describe the working principle of the internal balance.	X	X								
(04)		Describe the working principle and application of: — balance tab; — anti-balance tab; — spring tab; — servo tab.	X	X								
<b>081 05 06 02</b>		<b><i>Artificial means</i></b>										
(01)		State the differences between fully powered controls and power-assisted controls.	X	X								
(02)		Describe power-assisted controls.	X	X								
(03)		Describe the advantages of artificial feel in fully powered control.	X	X								
<b>081 05 07 00</b>		<b>Fly-by-wire (FBW)</b>										
<b>081 05 07 01</b>		<b><i>Control laws</i></b>										
(01)		Explain which parameters may be controlled in level flight with the pitch control law.	X									
(02)		Explain the advantages of using the CG position in the FBW system.	X									

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Syllabus reference	BK	Syllabus details and associated Learning Objectives	Aeroplane		Helicopter			IR	CB-IR(A)	BIR Exam	BIR BK	Remarks
			ATPL	CPL	ATPL/IR	ATPL	CPL					
(03)		Explain what type of flight-degraded control laws may be available in case of failure.	X									
(04)		Explain what are hard and soft protections.	X									
<b>081 05 08 00</b>		<b>Trimming</b>										
<b>081 05 08 01</b>		<b>Reasons to trim</b>										
(01)		State the reasons for using trimming devices.	X	X								
(02)		Explain the difference between a trim tab and the various balance tabs.	X	X								
<b>081 05 08 02</b>		<b>Trim tabs</b>										
(01)		Describe the working principle of a trim tab including cockpit indications.	X	X								
<b>081 05 08 03</b>		<b>Stabiliser trim</b>										
(01)		Describe the working principle of a stabiliser trim including the flight deck indications.	X	X								
(02)		Explain the advantages and disadvantages of a stabiliser trim compared to a trim tab.	X	X								
(03)		Explain the relationship between CG position, take-off trim setting, and stabiliser trim position.	X	X								
(04)		Explain the effect of errors in the take-off stabiliser trim setting on the rotation characteristics and stick force during take-off rotation.	X	X								
(05)		Discuss the effects of jammed and runaway stabiliser.	X	X								

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Syllabus reference	BK	Syllabus details and associated Learning Objectives	Aeroplane		Helicopter			IR	CB-IR(A)	BIR Exam	BIR BK	Remarks
			ATPL	CPL	ATPL/IR	ATPL	CPL					
(06)		Explain the consequences of a jammed stabiliser during take-off, landing, and go-around.	X	X								
<b>081 06 00 00</b>		<b>LIMITATIONS</b>										
<b>081 06 01 00</b>		<b>Operating limitations</b>										
<b>081 06 01 01</b>		<b>Flutter</b>										
(01)		Describe the phenomenon of flutter and how IAS and mass distribution affects the likelihood of flutter occurrence.	X	X								
(02)		Describe the use of mass balance to alleviate the flutter problem by adjusting the mass distribution: — wing-mounted engines on pylons; — control surface mass balance.	X	X								
(03)		Explain what is the flight envelope free of flutter.	X	X								
<b>081 06 01 02</b>		<b>Intentionally left blank</b>										
(01)		<i>Intentionally left blank</i>										
<b>081 06 01 03</b>		<b>Landing gear/flap operating</b>										
(01)		Describe the reason for flap/landing gear limitations. Define 'V <sub>LO</sub> '. Define 'V <sub>LE</sub> '.	X	X								
(02)		Explain why there is a difference between V <sub>LO</sub> and V <sub>LE</sub> in the case of some aeroplane types.	X	X								
(03)		Define 'V <sub>FE</sub> ' and describe flap limiting speeds.	X	X								



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			ATPL	CPL	ATPL/IR	ATPL	CPL					
(04)		Describe flap design features, procedures and warnings to prevent overload.	X	X								
<b>081 06 01 04</b>		<b><i>V<sub>MO</sub>, V<sub>NO</sub>, and V<sub>NE</sub></i></b>										
(01)	X	Define 'V <sub>MO</sub> ', 'V <sub>NO</sub> ', and 'V <sub>NE</sub> '.	X	X								
(02)		Explain the significance of V <sub>MO</sub> , V <sub>NO</sub> and V <sub>NE</sub> , and the differences between these airspeeds.	X	X								
(03)		Explain the hazards of flying at speeds above V <sub>NE</sub> and V <sub>MO</sub> .	X	X								
<b>081 06 01 05</b>		<b><i>M<sub>MO</sub></i></b>										
(01)		Define 'M <sub>MO</sub> ' and state its limiting factors.	X									
<b>081 06 02 00</b>		<b>Manoeuvring envelope</b>										
<b>081 06 02 01</b>		<b><i>Manoeuvring-load diagram</i></b>										
(01)		Describe the manoeuvring-load diagram.	X	X								
(02)		Define limit and ultimate load factor, and explain what can happen if these values are exceeded.	X	X								
(03)		Define 'V <sub>A</sub> ', 'V <sub>B</sub> ', 'V <sub>C</sub> ', and 'V <sub>D</sub> '.	X	X								
(04)		Identify and explain the varying features on the V <sub>N</sub> diagram: — load factor 'n'; — speed scale, equivalent airspeed; — equivalent airspeed envelope; — 1g stall speed;	X	X								

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			ATPL	CPL	ATPL/IR	ATPL	CPL					
		— stall boundary (refer to 081 03 01 02).										
(05)		Describe the relationship between $V_{MO}$ or $V_{NE}$ and $V_C$ .	X	X								
(06)		State all the manoeuvring load-factors limits applicable to CS-23 and CS-25 aeroplanes.	X	X								
(07)		Explain the relationship between $V_A$ and $V_S$ in a formula, and calculate the values.	X	X								
(08)		Explain the significance of $V_A$ and the adverse consequences of applying full, abrupt nose-up elevator deflection when exceeding $V_A$ .	X	X								
<b>081 06 02 02</b>		<b>Factors affecting the manoeuvring-load diagram</b>										
(01)		State the relationship of mass to load-factor limits and accelerated stall speed boundary limit.	X	X								
(02)		Calculate the change of $V_A$ with changing mass.	X	X								
(03)		Explain why $V_A$ loses significance at higher altitude.	X									
(04)	X	Define 'M <sub>C</sub> ' and 'M <sub>D</sub> '.	X									
<b>081 06 03 00</b>		<b>Gust envelope</b>										
<b>081 06 03 01</b>		<b>Gust-load diagram</b>										
(01)		Recognise a typical gust-load diagram, and state the minimum gust speeds in ft/s, m/s and kt that the aeroplane must be designed to withstand at $V_B$ to $V_C$ and $V_D$ .	X	X								

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			ATPL	CPL	ATPL/IR	ATPL	CPL					
(02)		Discuss considerations for the selection of $V_{RA}$ .	X	X								
(03)		Explain the adverse effects on the aeroplane when flying in turbulence.	X	X								
<b>081 06 03 02</b>		<b>Factors affecting the gust-load diagram</b>										
(01)		Describe and explain the relationship between the gust-load factor and the following: lift-curve slope, aspect ratio, angle of sweep, altitude, wing loading, weight, wing area, equivalent airspeed (EAS), and speed of vertical gust. (Note: For examination purposes, the ECQB questions will not be calculation based.)	X	X								
<b>081 07 00 00</b>		<b>PROPELLERS</b>										
<b>081 07 01 00</b>		<b>Conversion of engine torque to thrust</b>										
<b>081 07 01 01</b>		<b>Explain conversion of aerodynamic force on a propeller blade</b>										
(01)		Explain the resolution of aerodynamic force on a propeller blade element into lift and drag or into thrust and torque.	X	X								
(02)		Describe how propeller thrust and aerodynamic torque vary with IAS.	X	X								
<b>081 07 01 02</b>		<b>Relevant propeller parameters</b>										
(01)		Describe the geometry of a typical propeller blade element at the reference section:	X	X								

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Syllabus reference	BK	Syllabus details and associated Learning Objectives	Aeroplane		Helicopter			IR	CB-IR(A)	BIR Exam	BIR BK	Remarks
			ATPL	CPL	ATPL/IR	ATPL	CPL					
		<ul style="list-style-type: none"> <li>— blade chord line;</li> <li>— propeller rotational velocity vector;</li> <li>— true airspeed vector;</li> <li>— blade angle of attack;</li> <li>— pitch or blade angle;</li> <li>— advance or helix angle.</li> </ul> Define 'geometric pitch', 'effective pitch', and 'propeller slip'. <i>Remark: For theoretical knowledge examination purposes, the following definition is used for geometric pitch: the theoretical distance a propeller would advance in one revolution at zero blade angle of attack.</i>										
(02)		Describe how the terms 'fine pitch' and 'coarse pitch' can be used to express blade angle.	X	X								
<b>081 07 01 03</b>		<b>Blade twist</b>										
(01)	X	Define 'blade twist'.	X	X								
(02)		Explain why blade twist is necessary.	X	X								
<b>081 07 01 04</b>		<b>Fixed pitch and variable pitch/constant speed</b>										
(01)	X	List the different types of propellers: <ul style="list-style-type: none"> <li>— fixed pitch;</li> <li>— adjustable pitch or variable pitch (non-governing);</li> <li>— variable pitch (governing)/constant speed.</li> </ul>	X	X								

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Syllabus reference	BK	Syllabus details and associated Learning Objectives	Aeroplane		Helicopter			IR	CB-IR(A)	BIR Exam	BIR BK	Remarks
			ATPL	CPL	ATPL/IR	ATPL	CPL					
(02)		Discuss the advantages and disadvantages of fixed-pitch and constant-speed propellers.	X	X								
(03)		Discuss climb and cruise propellers.	X	X								
(04)		Explain the relationship between blade angle, blade angle of attack, and airspeed for fixed and variable pitch propellers.	X	X								
(05)		Describe and explain the forces that act on a rotating blade element in normal, feathered, windmilling, and reverse operation.	X	X								
(06)		Explain the effects of changing propeller pitch at constant IAS.	X	X								
<b>081 07 01 05</b>		<b>Propeller efficiency versus speed</b>										
(01)		Define 'propeller efficiency'.	X	X								
(02)		Explain and describe the relationship between propeller efficiency and speed (TAS) for different types of propellers.	X	X								
(03)		Explain the relationship between blade angle and thrust.	X	X								
<b>081 07 01 06</b>		<b>Effects of ice on propeller</b>										
(01)		Describe the effects and hazards of ice on a propeller.	X	X								
<b>081 07 02 00</b>		<b>Engine failure</b>										
<b>081 07 02 01</b>		<b>Windmilling drag</b>										
(01)		Describe the effects of an inoperative engine on the performance and controllability of an aeroplane: — thrust loss/drag increase;	X	X								

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Syllabus reference	BK	Syllabus details and associated Learning Objectives	Aeroplane		Helicopter			IR	CB-IR(A)	BIR Exam	BIR BK	Remarks
			ATPL	CPL	ATPL/IR	ATPL	CPL					
		— influence on yaw moment during asymmetric power.										
<b>081 07 02 02</b>		<b><i>Feathering</i></b>										
(01)		Explain the reasons for feathering a propeller, including the effect on the yaw moment, performance and controllability.	X	X								
<b>081 07 03 00</b>		<b>Design features for power absorption</b>										
<b>081 07 03 01</b>		<b><i>Propeller design characteristics that increase power absorption</i></b>										
(01)	X	Name the propeller design characteristics that increase power absorption.	X	X								
<b>081 07 03 02</b>		<b><i>Diameter of propeller</i></b>										
(01)		Explain the reasons for restricting propeller diameter.	X	X								
<b>081 07 03 03</b>		<b><i>Number of blades</i></b>										
(01)	X	Define 'solidity'.	X	X								
(02)		Describe the advantages and disadvantages of increasing the number of blades.	X	X								
<b>081 07 03 04</b>		<b><i>Propeller noise</i></b>										
(01)	X	Describe how propeller noise can be minimised.	X	X								
<b>081 07 04 00</b>		<b>Secondary effects of propellers</b>										
<b>081 07 04 01</b>		<b><i>Torque reaction</i></b>										
(01)		Describe the effects of engine/propeller torque.	X	X								
(02)		Describe the following methods for counteracting engine/propeller torque:	X	X								

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Syllabus reference	BK	Syllabus details and associated Learning Objectives	Aeroplane		Helicopter			IR	CB-IR(A)	BIR Exam	BIR BK	Remarks
			ATPL	CPL	ATPL/IR	ATPL	CPL					
		— counter-rotating propellers; — contra-rotating propellers.										
<b>081 07 04 02</b>		<b>Gyroscopic precession</b>										
(01)	X	Describe what causes gyroscopic precession.	X	X								
(02)	X	Describe the effect on the aeroplane due to the gyroscopic effect.	X	X								
<b>081 07 04 03</b>		<b>Slipstream effect</b>										
(01)		Describe the possible effects of the rotating propeller slipstream.	X	X								
<b>081 07 04 04</b>		<b>Asymmetric blade effect</b>										
(01)		Explain the asymmetric blade effect (also called P factor).	X	X								
(02)		Explain the influence of direction of rotation on the critical engine on twin-engine aeroplanes.	X	X								
<b>081 07 04 05</b>		<b>Consideration of propeller effects</b>										
(01)		Describe, given direction of propeller rotation, the propeller effects during take-off run, rotation and initial climb, and their consequence on controllability.	X	X								
(02)		Describe, given the direction of propeller rotation, the propeller effects during a go-around and their consequence on controllability.	X	X								
(03)		Explain how propeller effects during go-around can be affected by: — high engine performance conditions and their effect on the VMC speeds;	X	X								

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			ATPL	CPL	ATPL/IR	ATPL	CPL					
		<ul style="list-style-type: none"> <li>— loss of the critical engine;</li> <li>— crosswind;</li> <li>— high flap setting;</li> </ul>										
<b>081 08 00 00</b>		<b>FLIGHT MECHANICS</b>										
<b>081 08 01 00</b>		<b>Forces acting on an aeroplane</b>										
<b>081 08 01 01</b>		<b><i>Straight, horizontal, steady flight</i></b>										
(01)	X	Describe the forces that act on an aeroplane in straight, horizontal, and steady flight.	X	X								
(02)	X	List the four forces and state where they act on.	X	X								
(03)		Explain how the four forces are balanced, including the function of the tailplane.	X	X								
<b>081 08 01 02</b>		<b><i>Straight, steady climb</i></b>										
(01)	X	Define 'flight-path angle' ( $\gamma$ ).	X	X								
(02)		Describe the relationship between pitch attitude, $\gamma$ and $\alpha$ for zero-wind and zero-bank conditions.	X	X								
(03)	X	Describe the forces that act on an aeroplane in a straight, steady climb.	X	X								
(04)		Name the forces parallel and perpendicular to the direction of flight. <ul style="list-style-type: none"> <li>— Apply the formula relating to the parallel forces (<math>T = D + W \sin \gamma</math>).</li> <li>— Apply the formula relating to the perpendicular forces (<math>L = W \cos \gamma</math>).</li> </ul>	X	X								



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			ATPL	CPL	ATPL/IR	ATPL	CPL					
(05)		Explain why thrust is greater than drag.	X	X								
(06)		Explain why lift is less than weight.	X	X								
(07)		Explain the formula (for small angles) that gives the relationship between $\gamma$ , thrust, weight, and lift–drag ratio, and use this formula for simple calculations.	X	X								
(08)		Explain how IAS, $\alpha$ , and $\gamma$ change in a climb performed with constant vertical speed and constant thrust setting.	X	X								
<b>081 08 01 03</b>		<b><i>Straight, steady descent</i></b>										
(01)	X	Describe the forces that act on an aeroplane in a straight, steady descent.	X	X								
(02)		Name the forces parallel and perpendicular to the direction of flight. — Apply the formula for forces parallel to the direction of flight ( $T = D - W \sin \gamma$ ). — Apply the formula relating to the perpendicular forces ( $L = W \cos \gamma$ ).	X	X								
(03)		Explain why lift is less than weight.	X	X								
(04)		Explain why thrust is less than drag.	X	X								
<b>081 08 01 04</b>		<b><i>Straight, steady glide</i></b>										
(01)	X	Describe the forces that act on an aeroplane in a straight, steady glide.	X	X								
(02)		Name the forces parallel and perpendicular to the direction of flight.	X	X								

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			ATPL	CPL	ATPL/IR	ATPL	CPL					
		<ul style="list-style-type: none"> <li>Apply the formula for forces parallel to the direction of flight (<math>D = W \sin \gamma</math>).</li> <li>Apply the formula for forces perpendicular to the direction of flight (<math>L = W \cos \gamma</math>).</li> </ul>										
(03)		Describe the relationship between the glide gradient and the lift–drag ratio, and calculate glide range given: <ul style="list-style-type: none"> <li>initial height;</li> <li>L–D ratio;</li> <li>glide speed and wind speed.</li> </ul>	X	X								
(04)		Define $V_{MD}$ (speed for minimum drag) and explain the relationship between $\alpha$ , $V_{MD}$ and the best lift–drag ratio.	X	X								
(05)		Explain the effect of wind component on glide angle, duration, and distance.	X	X								
(06)		Explain the effect of mass change on glide angle, duration, and distance, given that the aeroplane remains at either the same airspeed or at $V_{MD}$ .	X	X								
(07)		Explain the effect of configuration change on glide angle and duration.	X	X								
(08)		Describe the relation between TAS, gradient of descent, and rate of descent.	X	X								
(09)		Define $V_{MP}$ (speed for minimum power) and describe that the minimum rate of descent in the glide will be at $V_{MP}$ , and explain the relationship	X	X								

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Syllabus reference	BK	Syllabus details and associated Learning Objectives	Aeroplane		Helicopter			IR	CB-IR(A)	BIR Exam	BIR BK	Remarks
			ATPL	CPL	ATPL/IR	ATPL	CPL					
		of this speed to the optimum speed for minimum glide angle.										
(10)		Discuss when a pilot could elect to fly for minimum glide rate of descent or minimum glide angle, and why speed stability or headwinds/tailwinds may favour a speed that is faster or slower than the optimum airspeed in still air.	X	X								
<b>081 08 01 05</b>		<b>Steady, coordinated turn</b>										
(01)		Describe the forces that act on an aeroplane in a steady, coordinated turn.	X	X								
(02)		Resolve the forces that act horizontally and vertically during a coordinated turn $(\tan \phi = \frac{V^2}{gR})$ .	X	X								
(03)		Describe the difference between a coordinated and an uncoordinated turn, and describe how to correct an uncoordinated turn using turn and slip indicator or turn coordinator.	X	X								
(04)		Explain why the angle of bank is independent of mass, and that it only depends on TAS and radius of turn.	X	X								
(05)		Resolve the forces to show that for a given angle of bank the radius of turn is determined solely by airspeed $(\tan \phi = \frac{V^2}{gR})$ .	X	X								

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			ATPL	CPL	ATPL/IR	ATPL	CPL					
(06)		Calculate the turn radius of a steady turn given TAS and angle of bank.	X	X								
(07)		Explain the effects of bank angle on: <ul style="list-style-type: none"> <li>– load factor (<math>LF = 1/\cos \phi</math>);</li> <li>– <math>\alpha</math>;</li> <li>– thrust;</li> <li>– drag.</li> </ul>	X	X								
(08)	X	Define 'angular velocity'.	X	X								
(09)	X	Define 'rate of turn' and 'rate-1 turn'.	X	X								
(10)		Explain the influence of TAS on rate of turn at a given bank angle.	X	X								
(11)		Calculate the load factor and stall speed in a turn given angle of bank and 1g stall speed.	X	X								
(12)		Explain situations in which turn radius is relevant for safety, such as maximum speed limits on departure or arrival plates, or outbound speed categories on approach plates, and the implications/hazards of exceeding given speeds.	X	X								
(13)		Describe the hazards of excessive use of rudder to increase the rate of turn in a swept-wing aeroplane.	X	X								
<b>081 08 02 00</b>		<b>Asymmetric thrust</b>										
<b>081 08 02 01</b>		<b>Jet-engined and propeller-driven aeroplanes</b>										
(01)		Describe the effects on the aeroplane of asymmetric thrust during flight, for	X	X								

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Syllabus reference	BK	Syllabus details and associated Learning Objectives	Aeroplane		Helicopter			IR	CB-IR(A)	BIR Exam	BIR BK	Remarks
			ATPL	CPL	ATPL/IR	ATPL	CPL					
		both jet-engined and propeller-driven aeroplanes.										
(02)		Explain critical engine, and explain, for a propeller-driven aeroplane, the effect of the direction of propeller rotation.	X	X								
(03)	X	Explain the effect of steady, asymmetric flight on a conventional (ball) slip indicator/turn indicator.	X	X								
(04)		Explain the effect of a crosswind on asymmetric flight.	X	X								
<b>081 08 02 02</b>		<b>Balanced moments about the normal axis</b>										
(01)		Explain the yaw moments about the CG.	X	X								
(02)		Explain the change to the yaw moment caused by the effect of air density on thrust.	X	X								
(03)		Describe the changes to the yaw moment caused by engine distance from CG.	X	X								
(04)		Describe the methods to achieve directional balance following engine loss.	X	X								
<b>081 08 02 03</b>		<b>Forces parallel to the lateral axis</b>										
(01)		Explain: — the force on the vertical fin; — the fuselage side force due to sideslip (using wing-level method);	X	X								

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Syllabus reference	BK	Syllabus details and associated Learning Objectives	Aeroplane		Helicopter			IR	CB-IR(A)	BIR Exam	BIR BK	Remarks
			ATPL	CPL	ATPL/IR	ATPL	CPL					
		— the use of bank angle to tilt the lift vector (in wing-down method).										
(02)		Explain the flight hazards at VMC: — $\alpha$ ; — side slip; — loads on the fin; — $\alpha$ on the fin.	X	X								
(03)		Explain the effect on fin $\alpha$ due to side-slip.	X	X								
<b>081 08 02 04</b>		<b><i>Influence of aeroplane mass</i></b>										
(01)		Explain why controllability with one-engine-inoperative is a typical problem arising from the low speeds associated with low aeroplane mass.	X	X								
<b>081 08 02 05</b>		<b><i>Intentionally left blank</i></b>										
<b>081 08 02 06</b>		<b><i>Intentionally left blank</i></b>										
<b>081 08 02 07</b>		<b><i>Intentionally left blank</i></b>										
<b>081 08 02 08</b>		<b><i>Minimum control speed (<math>V_{MC}</math>)</i></b>										
(01)		Define ' $V_{MC}$ '.	X	X								
(02)		Describe how $V_{MC}$ is determined.	X	X								
(03)		Explain the influence of the CG location.	X	X								
<b>081 08 02 09</b>		<b><i>Minimum control speed during approach and landing (<math>V_{MCL}</math>)</i></b>										
(01)		Define ' $V_{MCL}$ '.	X	X								
(02)		Describe how $V_{MCL}$ is determined.	X	X								
(03)		Explain the influence of the CG location.	X	X								

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Syllabus reference	BK	Syllabus details and associated Learning Objectives	Aeroplane		Helicopter			IR	CB-IR(A)	BIR Exam	BIR BK	Remarks
			ATPL	CPL	ATPL/IR	ATPL	CPL					
<b>081 08 02 10</b>		<b>Minimum control speed on the ground (<math>V_{MCG}</math>)</b>										
(01)		Define ' $V_{MCG}$ '.	X	X								
(02)		Describe how $V_{MCG}$ is determined.	X	X								
(03)		Explain the influence of the CG location.	X	X								
<b>081 08 02 11</b>		<b>Influence of density</b>										
(01)		Describe the influence of density on thrust during asymmetric flight.	X	X								
(02)		Explain why $V_{MC}$ , $V_{MCL}$ and $V_{MCG}$ reduce with a reduction in thrust.	X	X								
<b>081 08 03 00</b>		<b>Significant points on a polar curve</b>										
<b>081 08 03 01</b>		<b>Identify and explain</b>										
(01)		Identify and explain the significant points on a polar curve.	X	X								

## SUBJECT 082 – PRINCIPLES OF FLIGHT – HELICOPTERS

### (1) VOCABULARY OF MECHANICS

Speed is a scalar quantity; it has only magnitude.

Velocity is a vector quantity with magnitude and direction.

The velocity of a point on a rotor blade, when rotating around an axis, is the 'linear' or 'tangential' velocity which can be expressed in revolutions per minute (rpm).

Density is the mass of the fluid per unit volume ( $\text{kg/m}^3$ ) in the international system of units of measurement (SI (Système International)).

### (2) AERONAUTICAL DEFINITIONS

A rotor blade is a high-aspect ratio aerofoil attached by its root to the rotor hub with hinges or flexible elements.

A blade element is a spanwise slice of the blade, so thin that the aerodynamic forces involved may be assumed not to vary. The forces produce lift (L), drag (D), and a pitching moment. Such a cross section has a contour, a leading and trailing edge, a chord line, a mean camber line, a maximum thickness or depth, and a thickness-to-chord ratio.

The centre of pressure (CP) is defined as the point on the chord line where the resultant of all aerodynamic forces acts.

The planform is the shape of a blade as seen from above.

The pitch angle (of a blade or an element) is the angle between the chord line and the plane of rotation.

The blade is not twisted when the pitch angle is constant from root to tip.



A blade is twisted when the pitch angle of its elements' sections varies with their distance from the root (in other words, the chord lines of the elements involved are not parallel). Washout exists when the pitch angle decreases towards the blade tip.

The vector sum of the undisturbed upstream velocity (i.e. that found in the plane of rotation of the blades) and the induced velocity is the relative airflow.

The angle between the relative airflow and the chord line of a blade element is the angle of attack ( $\alpha$ ).

Lift is the component of the aerodynamic force on a blade element that is perpendicular to the relative airflow.

Profile drag is the component of the aerodynamic force on a blade element that is parallel to the plane of rotation. Induced drag is the component of the aerodynamic force on a blade element that is parallel to the relative airflow.

Profile drag consists of pressure forces and skin friction acting on the surface of the blade element. The component of profile drag that arises from pressure forces (between the leading and trailing edges) is pressure or form drag. The component of profile drag due to shear forces over the surface is skin friction.

The total rotor thrust is the vertical upwards force from the rotor disc as a whole, as the sum of all the blade thrusts. This term has been reinstated because there is already the term 'rotor thrust' that is used to denote the thrust along the axis of rotation that acts directly opposite the weight of the helicopter in a blade element.

### (3) HELICOPTER CHARACTERISTICS

Disc loading is the mass (M) of the helicopter divided by the area of the disc.

Blade loading is the mass divided by the total planform area of the blades.

The area of a rectangular blade is given by the chord multiplied by the blade tip radius. For tapered blades, the mean geometric chord is taken as an approximately equivalent chord.

Rotor solidity is the ratio of the total blade area to the disc area.

(4) PLANES, AXES AND REFERENCE SYSTEMS OF THE ROTOR

- Shaft axis: The physical axis of the rotor shaft (mast).
- Hub plane: A plane perpendicular to the shaft axis through the centre of the hub.
- Tip path plane: The plane traced out by the blade tips.
- Virtual rotation axis: The axis through the centre of the hub and perpendicular to the tip path plane.
- Rotor disc: The disc traced out by the blade tips in the tip path plane.
- Plane of rotation: The plane parallel to the tip path plane that acts through the hub centre.

(5) ANGLES OF THE BLADES, INDUCED VELOCITY

- Pitch angle of a blade element: The angle between the chord line of the element and its plane of rotation, sometimes called 'local pitch angle'.
- Blade pitch angle: Taken to be equivalent to the pitch angle of the blade element found at 75 % of the blade radius.
- Flapping angle: The angle between the longitudinal axis of the blade and the hub plane.
- Coning angle: The angle between the longitudinal axis of the blade and the tip path plane. Induced velocity is that induced by the engine power perpendicular to the plane of rotation.

Aerodynamic forces on the blades and the rotor

The thrust from a blade (blade thrust) is the sum of the thrusts from each blade element.

The sum of the thrusts from all blades is the (total) rotor thrust acting perpendicular to the tip path in the direction of the virtual rotation axis.

The result of the induced drag forces on all the blade elements of all blades is a torque on the shaft which, multiplied by the angular velocity of the blade, gives the required induced power.

The result of the profile drag forces is a torque on the shaft which, multiplied by the angular velocity of the blade, gives the required profile power.

#### (6) TYPES OF ROTOR HUBS

There are basically four types of rotor hubs in use:

1. Teetering rotor or seesaw rotor: The two blades are connected together; the 'hinge' is on the shaft axis, and the head is underslung. A variation is the gimballed hub; the blades and the hub are attached to the rotor shaft by means of a gimbal or universal joint (Bell 47). It is sometimes called semi-rigid because there is no movement of the blade in a drag-wise sense.
2. Fully articulated rotor: There are more than two rotor blades and each has a flapping hinge, a lead-lag (drag) hinge, and a feathering hinge or bearing.
3. Hingeless rotor: There are no flapping or dragging hinges. They are replaced by flexible elements (virtual hinges) at some part of the blade radius which allow such movements. A feathering bearing allows feathering of the blade.
4. Bearingless rotor: There are no hinges or rotating bearings. Flapping and dragging movements are obtained with flexible elements called elastomeric hinges. Feathering is obtained by twisting the element.

When referring to their equipment, Airbus call this a 'semi-articulated head' (ref.: their training material).

Two remarks:

1. Hinge offset and equivalent hinge offset

The hinge offset is the distance between the shaft axis and the axis of the hinge. Hingeless and bearingless rotors have an equivalent hinge offset.

2. Elastomeric hinges

This bearing consists of alternate layers of elastomer and metal. The flexibility of the elastomer allows flapping, dragging and feathering.

(7) DRAG AND POWERS

Induced power is that required to generate the induced velocity in the rotor disc for the production of lift. For any given thrust, induced power is minimum when the induced velocity is uniform over the rotor disc. This can be approximated by using washout and ensuring that the blades are in track (a truly uniform velocity cannot be obtained).

Rotor profile drag results from those components acting in the opposite direction to the blade velocities (i.e. the sum of all the profile drags from each blade element). The power required to overcome it is rotor profile power (the sum of the powers required to overcome the torque).

Parasite drag is the drag from the helicopter fuselage including that from the rotor hub and all external equipment such as wheels, the winch, external loads, etc. (any drag from the tail rotor is included, but not from the rotor blades, which produce profile drag). The power to overcome this drag is parasite power.

In level flight at constant speed, induced power, rotor profile power and parasite power are summed to give the total power required to drive the main rotor.

Induced power and profile power for the tail rotor are summed to give the power required to drive the tail rotor.

The power required to drive auxiliary services, such as oil pumps and electrical generators, is called accessory or ancillary power. It includes the power required to overcome mechanical friction in transmissions.

The total power required in level flight at constant speed is the sum of all the above.

When transitioning from the hover, the power required decreases as speed increases. This is called translational lift.

The term limited power means that the total power required to hover out of ground effect (HOGE) is greater than the available power.

**(8) PHASE ANGLE IN FLAPPING MOVEMENT OF THE BLADE**

The movement of the cyclic control tilts the rotor disc in the direction of the intended movement of the helicopter.

For teetering heads, the flapping response is  $90^\circ$  later than the applied cyclic control movement (less than  $90^\circ$  for rotors with offset hinges).

The pitch mechanism consists of the swash plate, and for each blade the pitch mechanism consists of a pitch link attached to the swash plate and a pitch horn attached to the blade.

**(9) AXES THROUGH THE CENTRE OF THE HELICOPTER**

Longitudinal axis or roll axis: A straight line through the centre of gravity (CG) of the helicopter from the nose to the tail about which the helicopter can roll left or right.

Lateral axis, transverse axis or pitch axis: A straight line through the CG of the helicopter about which the helicopter can pitch its nose up or down (this axis is also perpendicular to the reference plane of the aircraft, which is the plane either side of which the components that constitute the major part of the aircraft are symmetrically disposed in the port and starboard sense).

Normal axis or yaw axis: A straight line perpendicular to the plane defined by the longitudinal and lateral axes and about which the helicopter can yaw.

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Note that the term ‘mass’ is used to describe a quantity of matter, and ‘weight’ when describing the force. However, the term ‘weight’ is normally used in aviation to colloquially describe mass. The professional pilot should always note the units to determine whether the term ‘weight’ is being used to describe a force (e.g. unit newton) or quantity of matter (e.g. unit kilogram).

Syllabus reference	BK	Syllabus details and associated Learning Objectives	Aeroplane		Helicopter			IR	CB-IR(A)	BIR Exam	BIR BK	Remarks
			ATPL	CPL	ATPL/IR	ATPL	CPL					
<b>080 00 00 00</b>		<b>PRINCIPLES OF FLIGHT</b>										
<b>082 00 00 00</b>		<b>PRINCIPLES OF FLIGHT — HELICOPTERS</b>										
<b>082 01 00 00</b>		<b>SUBSONIC AERODYNAMICS</b>										
<b>082 01 01 00</b>		<b>Basic concepts, laws and definitions</b>										
<b>082 01 01 01</b>		<b><i>International system of units of measurement (SI) and conversion of SI units</i></b>										
(01)	X	List the fundamental quantities and units in SI, such as mass (kg), length (m), time (s).			X	X	X					
(02)	X	Be able to convert imperial units to SI units and vice versa.			X	X	X					
<b>082 01 01 02</b>		<b><i>Definitions and basic concepts of air</i></b>										
(01)	X	Describe air temperature and pressure as functions of height.			X	X	X					
(02)	X	Define the International Standard Atmosphere (ISA).			X	X	X					
(03)	X	Define air density, and explain the relationship between air density, pressure, and temperature.			X	X	X					
(04)	X	Explain the influence of moisture content on air density.			X	X	X					

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Syllabus reference	BK	Syllabus details and associated Learning Objectives	Aeroplane		Helicopter			IR	CB-IR(A)	BIR Exam	BIR BK	Remarks
			ATPL	CPL	ATPL/IR	ATPL	CPL					
(05)	X	Define pressure altitude and air density altitude.			X	X	X					
<b>082 01 01 03</b>		<b>Newton's laws</b>										
(01)	X	State and interpret Newton's three laws of motion.			X	X	X					
(02)	X	Distinguish between mass and weight, and their units.			X	X	X					
<b>082 01 01 04</b>		<b>Basic concepts of airflow</b>										
(01)	X	Describe steady and unsteady air-flow.			X	X	X					
(02)	X	Define 'streamline' and 'stream tube'.			X	X	X					
(03)	X	Explain the principle of the continuity equation or the conservation of mass.			X	X	X					
(04)	X	Describe the mass flow rate through a stream tube section.			X	X	X					
(05)		State Bernoulli's equation and use it to explain and define the relationship between static, dynamic and total pressure.			X	X	X					
(06)		Define the stagnation point in the flow around an aerofoil, and explain the pressure obtained at the stagnation point.			X	X	X					
(07)		Use the pitot system to explain the measurement of airspeed (no compressibility effects).			X	X	X					
(08)		Define 'TAS', 'IAS', and 'CAS'.			X	X	X					

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Syllabus reference	BK	Syllabus details and associated Learning Objectives	Aeroplane		Helicopter			IR	CB-IR(A)	BIR Exam	BIR BK	Remarks
			ATPL	CPL	ATPL/IR	ATPL	CPL					
(09)	X	Define two-dimensional airflow and its relationship to an aerofoil of infinite span (i.e. no blade tip vortices and, therefore, no induced drag). Explain the difference between two- and three-dimensional airflows.			X	X	X					
(10)	X	Explain that viscosity is a feature of any fluid (gas or liquid).			X	X	X					
(11)		Explain the tangential friction between air and the surface of an aerofoil, and the development of a boundary layer.			X	X	X					
(12)		Describe laminar and turbulent boundary layers and the transition from laminar to turbulent. Show the influence of the roughness of the surface on the position of the transition point.			X	X	X					
<b>082 01 02 00</b>		<b>Two-dimensional airflow</b>										
<b>082 01 02 01</b>		<b>Aerofoil section geometry</b>										
(01)	X	Define the terms: 'aerofoil section', 'aerofoil element', 'chord line', 'chord', 'thickness', 'thickness-to-chord ratio', 'camber line', 'camber', and 'leading-edge radius'.			X	X	X					
(02)		Describe symmetrical and asymmetrical aerofoil sections.			X	X	X					
<b>082 01 02 02</b>		<b>Aerodynamic forces on aerofoil elements</b>										
(01)		Define the angle of attack ( $\alpha$ ).			X	X	X					



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Syllabus reference	BK	Syllabus details and associated Learning Objectives	Aeroplane		Helicopter			IR	CB-IR(A)	BIR Exam	BIR BK	Remarks
			ATPL	CPL	ATPL/IR	ATPL	CPL					
(02)		Describe: — the resultant force from the pressure distribution and the friction at the element; — the resultant force from the boundary layers and the velocities in the wake; and — the loss of momentum due to friction forces.			X	X	X					
(03)		Resolve the aerodynamic force into the components of lift (L) and drag (D).			X	X	X					
(04)		Define the lift coefficient ( $C_L$ ) and the drag coefficient ( $C_D$ ).			X	X	X					
(05)		Show that the $C_L$ is a function of the $\alpha$ .			X	X	X					
(06)		Explain how drag is caused by pressure forces on the surfaces of an aerofoil and by friction in the boundary layers. Define the term 'profile drag'.			X	X	X					
(07)		Define the L–D ratio.			X	X	X					
(08)		Use the lift and drag equations to show the influence of speed and density on lift and drag for a given $\alpha$ .			X	X	X					
(09)		Define the action line of the aerodynamic force and the CP.			X	X	X					
(10)		Know that symmetrical aerofoils have a CP that is approximately a quarter chord behind the leading edge.			X	X	X					

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Syllabus reference	BK	Syllabus details and associated Learning Objectives	Aeroplane		Helicopter			IR	CB-IR(A)	BIR Exam	BIR BK	Remarks
			ATPL	CPL	ATPL/IR	ATPL	CPL					
<b>082 01 02 03</b>		<b><i>Stall</i></b>										
(01)		Explain the boundary layer separation when $\alpha$ increases beyond the onset of stall and the decrease of lift and the increase of drag. Define the 'separation point'.			X	X	X					
<b>082 01 02 04</b>		<b><i>Disturbances due to profile contamination</i></b>										
(01)		Explain ice contamination, the modification of the section profile and surfaces due to ice and snow, the influence on L and D and the L-D ratio, the influence on $\alpha$ (at stall onset), and the effect of the increase in weight.			X	X	X					
(02)		Explain the effect of erosion by heavy rain on the blade and subsequent increase in profile drag.			X	X	X					
<b>082 01 03 00</b>		<b><i>Three-dimensional airflow around a blade</i></b>										
<b>082 01 03 01</b>		<b><i>The blade</i></b>										
(01)		Describe the various blade plan-forms.			X	X	X					
(02)		Define aspect ratio and blade twist.			X	X	X					
<b>082 01 03 02</b>		<b><i>Airflow pattern and influence on lift (L)</i></b>										
(01)		Explain the spanwise flow around a blade and the appearance of blade tip vortices which are a loss of energy.			X	X	X					

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Syllabus reference	BK	Syllabus details and associated Learning Objectives	Aeroplane		Helicopter			IR	CB-IR(A)	BIR Exam	BIR BK	Remarks
			ATPL	CPL	ATPL/IR	ATPL	CPL					
(02)		Show that the strength of the vortices increases as $\alpha$ and L increase.			X	X	X					
(03)		Show that downwash causes vortices.			X	X	X					
(04)		Define the relative airflow as the resultant of the undisturbed air velocity and induced velocity, and define $\alpha$ .			X	X	X					
(05)		Explain the spanwise L distribution and the way in which it can be modified by twist (washout).			X	X	X					
<b>082 01 03 03</b>		<b>Induced drag</b>										
(01)		Explain induced drag and the influence of $\alpha$ and aspect ratio.			X	X	X					
<b>082 01 03 04</b>		<b>The airflow around the fuselage</b>										
(01)		Describe the fuselage and the external components that cause (parasite) drag, the airflow around the fuselage, and the influence of the pitch angle of the fuselage. Describe fuselage shapes that minimise drag.			X	X	X					
(02)		Define profile drag as the sum of pressure (form) drag and skin friction drag.			X	X	X					
(03)		Define 'interference drag'.			X	X	X					
(04)		Know the drag formula.			X	X	X					
<b>082 02 00 00</b>		<b>TRANSONIC AERODYNAMICS and COMPRESSIBILITY EFFECTS</b>										
<b>082 02 01 00</b>		<b>Airflow speeds and velocities</b>										

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Syllabus reference	BK	Syllabus details and associated Learning Objectives	Aeroplane		Helicopter			IR	CB-IR(A)	BIR Exam	BIR BK	Remarks
			ATPL	CPL	ATPL/IR	ATPL	CPL					
<b>082 02 01 01</b>		<b>Speeds and Mach number</b>										
(01)		Define the speed of sound in air.			X	X	X					
(02)		State that the speed of sound is proportional to the square root of the absolute temperature (in Kelvins).			X	X	X					
(03)		Explain the variation in the speed of sound with altitude.			X	X	X					
(04)		Define Mach number.			X	X	X					
(05)		Explain the meaning of incompressibility and compressibility of air; relate this to the value of the Mach number.			X	X	X					
(06)		Define high subsonic, transonic and supersonic flows in relation to the value of the Mach number.			X	X	X					
<b>082 02 01 02</b>		<b>Shock waves</b>										
(01)		Describe shock waves in a supersonic flow and the changes in pressure and speed.			X	X	X					
(02)		Describe the appearance of local supersonic flows on the surfaces of a blade.			X	X	X					
<b>082 02 01 03</b>		<b>Influence of aerofoil section and blade planform</b>										
(01)		Explain the different shapes that allow higher Mach numbers without generating a shock wave on the upper surface, such as: – reducing the section thickness-to-chord ratio;			X	X	X					

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Syllabus reference	BK	Syllabus details and associated Learning Objectives	Aeroplane		Helicopter			IR	CB-IR(A)	BIR Exam	BIR BK	Remarks
			ATPL	CPL	ATPL/IR	ATPL	CPL					
		– a planform with a sweep angle.										
<b>082 03 00 00</b>		<b>ROTORCRAFT TYPES</b>										
<b>082 03 01 00</b>		<b>Rotorcraft</b>										
<b>082 03 01 01</b>		<b><i>Rotorcraft types</i></b>										
(01)		Explain the difference between an autogyro and a helicopter.			X	X	X					
<b>082 03 02 00</b>		<b>Helicopters</b>										
<b>082 03 02 01</b>		<b><i>Helicopter configurations</i></b>										
(01)		Describe (briefly) the single-main-rotor helicopter and other configurations: tandem, coaxial, side-by-side, synchrocopter (with intermeshing blades), the compound helicopter and tilt rotor.			X	X	X					
<b>082 03 02 02</b>		<b><i>The helicopter, characteristics and associated terminology</i></b>										
(01)		Mention the tail rotor, the Fenestron, and the no tail rotor (NOTAR).			X	X	X					
(02)		Define the rotor disc area and the blade area.			X	X	X					
(03)		Describe the teetering rotor with its hinge axis on the shaft axis, and rotors with more than two blades with offset hinge axes.			X	X	X					
(04)		Define the fuselage centre line and the three axes: roll, pitch, and normal (yaw).			X	X	X					

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Syllabus reference	BK	Syllabus details and associated Learning Objectives	Aeroplane		Helicopter			IR	CB-IR(A)	BIR Exam	BIR BK	Remarks
			ATPL	CPL	ATPL/IR	ATPL	CPL					
(05)		Define gross weight and gross mass (and the units involved), disc and blade loading.			X	X	X					
<b>082 04 00 00</b>		<b>MAIN-ROTOR AERODYNAMICS</b>										
<b>082 04 01 00</b>		<b>Hover flight outside ground effect</b>										
<b>082 04 01 01</b>		<b><i>Airflow through the rotor disc and around the blades</i></b>										
(01)	X	Based on Newton's second law (momentum), explain that the upward vertical force from the disc, i.e. the rotor thrust, is the result of vertical downward velocities inside the rotor disc.			X	X	X					
(02)		Explain why the production of the induced flow requires power applied to the shaft, i.e. induced power. Induced power is least if the induced velocities have the same value on the whole disc (i.e. there is uniformity of flow over the disc).			X	X	X					
(03)		Explain why vertical rotor thrust must be higher than the weight of the helicopter because of the vertical drag on the fuselage.			X	X	X					
(04)		Define the pitch angle and the $\alpha$ of a blade element.			X	X	X					
(05)		Explain L and D relating to a blade element (including induced and profile drag).			X	X	X					

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Syllabus reference	BK	Syllabus details and associated Learning Objectives	Aeroplane		Helicopter			IR	CB-IR(A)	BIR Exam	BIR BK	Remarks
			ATPL	CPL	ATPL/IR	ATPL	CPL					
(06)		Explain the necessity for collective pitch angle changes, the influence on the $\alpha$ and rotor thrust, and the need for blade feathering.			X	X	X					
(07)		Describe the different blade shapes (as viewed from above).			X	X	X					
(08)		Explain how profile drag on the blade elements generates a torque on the main shaft, and define the resulting rotor profile power.			X	X	X					
(09)		Explain the influence of air density on the required powers.			X	X	X					
<b>082 04 01 02</b>		<b>Anti-torque force and tail rotor</b>										
(01)		Using Newton's third law (motion), explain the need for tail-rotor thrust, the required value being proportional to main-rotor torque. Show that tail-rotor power is proportional to tail-rotor thrust.			X	X	X					
(02)		Explain the necessity for feathering of the tail-rotor blades and their control by the yaw pedals, and the maximum and minimum values of the pitch angles of the blades.			X	X	X					
<b>082 04 01 03</b>		<b>Total power required and hover outside ground effect (HOGE)</b>										
(01)		Define ancillary equipment and its power requirement.			X	X	X					
(02)		Define the total power required.			X	X	X					
(03)	X	Describe the influence of ambient pressure, temperature and moisture on the required power.			X	X	X					

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Syllabus reference	BK	Syllabus details and associated Learning Objectives	Aeroplane		Helicopter			IR	CB-IR(A)	BIR Exam	BIR BK	Remarks
			ATPL	CPL	ATPL/IR	ATPL	CPL					
<b>082 04 02 00</b>		<b>Vertical climb</b>										
<b>082 04 02 01</b>		<b>Relative airflow and angles of attack (<math>\alpha</math>)</b>										
(01)	X	Describe the dependence of the vertical climb speed on the opposite vertical air velocity relative to the rotor disk.			X	X	X					
(02)		Explain how $\alpha$ is controlled by the collective pitch angle control.			X	X	X					
<b>082 04 02 02</b>		<b>Power and vertical speed</b>										
(01)		Define total main-rotor power as the sum of parasite power, induced power, climb power, and rotor profile power.			X	X	X					
(02)		Explain why the total main-rotor power required increases when the rate of climb increases.			X	X	X					
<b>082 04 03 00</b>		<b>Forward flight</b>										
<b>082 04 03 01</b>		<b>Airflow and forces in uniform inflow distribution</b>										
(01)		Explain the assumption of a uniform inflow distribution on the rotor disc.			X	X	X					
(02)		Show the upstream air velocities relative to the blade elements and the different effects on the advancing and retreating blades. Define the area of reverse flow. Explain the influence of forward speed on the circumferential speed of the blade tip.			X	X	X					



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			ATPL	CPL	ATPL/IR	ATPL	CPL					
(03)		Assuming constant pitch angles and rigid blade attachments, explain the roll moment from the asymmetric distribution of L.			X	X	X					
(04)		Show that through cyclic feathering this imbalance could be eliminated by a low $\alpha$ (accomplished by a low pitch angle) on the advancing blade, and a high $\alpha$ (accomplished by a high pitch angle) on the retreating blade.			X	X	X					
(05)		Describe the high air velocity at the advancing blade tip and the compressibility effects which limit maximum speed.			X	X	X					
(06)		Describe the low air velocity on the retreating blade tip resulting from the difference between the circumferential speed and forward speed, the need for high $\alpha$ , and the onset of stall.			X	X	X					
(07)		Define the blade tip speed ratio.			X	X	X					
(08)		Explain the total rotor thrust that is perpendicular to the rotor disc and the need for tilting the thrust vector forward.			X	X	X					
(09)		Explain the conditions of equilibrium in steady straight and level flight.			X	X	X					
<b>082 04 03 02</b>		<b><i>The flare (powered flight)</i></b>										
(01)		Explain the flare in powered flight, the rearward tilt of the rotor disc			X	X	X					

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Syllabus reference	BK	Syllabus details and associated Learning Objectives	Aeroplane		Helicopter			IR	CB-IR(A)	BIR Exam	BIR BK	Remarks
			ATPL	CPL	ATPL/IR	ATPL	CPL					
		and the thrust vector. Show the horizontal thrust component that is in the opposite direction to forward velocity.										
(02)		State the increase in thrust due to the upward inflow, and show the modifications in the $\alpha$ .			X	X	X					
(03)		Explain the increase in rotor rpm for a non-governed rotor.			X	X	X					
<b>082 04 03 03</b>		<b><i>Non-uniform inflow distribution in relation to inflow roll</i></b>										
(01)		Describe the inflow distribution which modifies $\alpha$ and L especially on the advancing and retreating blades.			X	X	X					
<b>082 04 03 04</b>		<b><i>Power and maximum speed</i></b>										
(01)		Explain that the induced velocities and power values decrease as the speed of the helicopter increases.			X	X	X					
(02)		Define profile drag and profile power, and the increase in their values with the speed of the helicopter.			X	X	X					
(03)		Define parasite drag and parasite power, and the increase in their values with the speed of the helicopter.			X	X	X					
(04)		Define total drag and its increase with the speed of the helicopter.			X	X	X					
(05)		Describe the power required for the tail rotor and the power required by ancillary equipment.			X	X	X					

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			ATPL	CPL	ATPL/IR	ATPL	CPL					
(06)		Define the total power requirement as a sum of the above partial powers, and explain how it varies with the speed of the helicopter.			X	X	X					
(07)		Explain the influence of helicopter mass, air density, and additional external equipment on the partial powers and the total power required.			X	X	X					
(08)		Describe translational lift and show the decrease in required total power as the helicopter increases its speed from the hover.			X	X	X					
<b>082 04 04 00</b>		<b>Hover and forward flight in ground effect</b>										
<b>082 04 04 01</b>		<b><i>Airflow in ground effect, down-wash</i></b>										
(01)		Explain how the vicinity of the ground changes the downward flow pattern and the consequences on lift (thrust) at constant rotor power. Show that ground effect depends on the height of the rotor above the ground and the rotor diameter. Show the required rotor power at constant all-up mass (AUM) as a function of height above the ground. Describe the influence of forward speed.			X	X	X					
<b>082 04 05 00</b>		<b>Vertical descent</b>										
<b>082 04 05 01</b>		<b><i>Vertical descent, power on</i></b>										

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Syllabus reference	BK	Syllabus details and associated Learning Objectives	Aeroplane		Helicopter			IR	CB-IR(A)	BIR Exam	BIR BK	Remarks
			ATPL	CPL	ATPL/IR	ATPL	CPL					
(01)		Describe the airflow around the rotor disc in a trouble-free vertical descent, power on, the airflow opposing the helicopter's velocity, the relative airflow, and $\alpha$ .			X	X	X					
(02)		Explain the vortex-ring state, also known as settling with power. State the approximate vertical descent speeds that allow the formation of vortex ring, related to the values of the induced velocities.			X	X	X					
(03)		Describe the airflow relative to the blades, the root stall, the loss of lift at the blade tip, and the turbulence. Show the effect of raising the lever and describe the effects on the controls.			X	X	X					
<b>082 04 05 02</b>		<b>Autorotation</b>										
(01)		State the need for early recognition and for a quick initiation of recovery. Describe the recovery actions.			X	X	X					
(02)		Explain that the collective lever must be lowered quickly enough to avoid a rapid decay of rotor rpm due to drag on the blades, and explain the influence of rotational inertia of the rotor on the rate of decay.			X	X	X					
(03)		Show the induced flow through the rotor disc, the rotational velocity			X	X	X					

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			ATPL	CPL	ATPL/IR	ATPL	CPL					
		and relative airflow, the inflow and inflow angles.										
(04)		Show how the aerodynamic forces on the blade elements vary from root to tip and distinguish three zones: the inner stalled region, the middle driving region, and the driven region.			X	X	X					
(05)		Explain the control of the rotor rpm with collective pitch.			X	X	X					
(06)		Show the need for negative tail-rotor thrust with yaw control.			X	X	X					
(07)		Explain the final increase in rotor thrust caused by raising the collective pitch to decrease the vertical descent speed and the decay in rotor rpm.			X	X	X					
<b>082 04 06 00</b>		<b>Forward flight — autorotation</b>										
<b>082 04 06 01</b>		<b>Airflow at the rotor disc</b>										
(01)		Explain the factors that affect inflow angle and $\alpha$ , the autorotative power distribution, and the dissymmetry over the rotor disc in forward flight.			X	X	X					
<b>082 04 06 02</b>		<b>Flight and landing</b>										
(01)		Show the effect of forward speed on the vertical descent speed.			X	X	X					
(02)		Explain the effects of gross weight, rotor rpm, and altitude (density) on endurance and range.			X	X	X					

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			ATPL	CPL	ATPL/IR	ATPL	CPL					
(03)		Explain the manoeuvres for turning and touchdown.			X	X	X					
(04)		Explain the height-velocity curves.			X	X	X					
<b>082 05 00 00</b>		<b>MAIN-ROTOR MECHANICS</b>										
<b>082 05 01 00</b>		<b>Flapping of the blade in hover</b>										
<b>082 05 01 01</b>		<b><i>Intentionally left blank</i></b>										
<b>082 05 01 02</b>		<b><i>Centrifugal turning moment (CTM)</i></b>										
(01)		Describe the centrifugal forces on the mass elements of a blade with pitch applied and the components of those forces. Show how the forces generate a moment that tries to reduce the blade pitch angle.			X	X	X					
(02)		Explain the methods of counteracting CTM with hydraulics, bias springs, and balance masses.			X	X	X					
<b>082 05 01 03</b>		<b><i>Coning angle in the hover</i></b>										
(01)		Define the tip path plane and the coning angle.			X	X	X					
(02)		Show how the equilibrium of the moments about the flapping hinge of lift (thrust) and of the centrifugal force determine the coning angle of the blade (the blade mass being negligible).			X	X	X					
(03)		Justify the lower limit of rotor rpm.			X	X	X					
(04)		Explain the effect of the mass of a blade on the tip path and the tracking.			X	X	X					

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			ATPL	CPL	ATPL/IR	ATPL	CPL					
<b>082 05 02 00</b>		<b>Flapping angles of the blade in forward flight</b>										
<b>082 05 02 01</b>		<b><i>Forces on the blade in forward flight without cyclic feathering</i></b>										
(01)		Assume rigid attachments of the blade to the hub and show the periodic lift, moment and stresses on the attachment, the ensuing metal fatigue, the roll moment on the helicopter, and justify the necessity for a flapping hinge.			X	X	X					
(02)		Assume no cyclic pitch and describe the lift on the advancing and retreating blades.			X	X	X					
(03)		State the azimuthal phase lag (90° or less) between the input (applied pitch) and the output (flapping angle). Explain flapback (the rearward tilting of the tip path plane and total rotor thrust).			X	X	X					
<b>082 05 02 02</b>		<b><i>Cyclic pitch (feathering) in forward flight</i></b>										
(01)		Show that in order to assume and maintain forward flight, the total rotor thrust vector must obtain a forward component by tilting the tip path plane.			X	X	X					
(02)		Show how the applied cyclic pitch modifies the lift on the advancing and retreating blades and produces the required forward tilting			X	X	X					

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			ATPL	CPL	ATPL/IR	ATPL	CPL					
		of the tip path plane and the total rotor thrust.										
(03)		Show the cone described by the blades and define the virtual axis of rotation. Define the plane of rotation.			X	X	X					
(04)		Define the reference system in which the movements are defined: the shaft axis and the hub plane.			X	X	X					
(05)		Describe the swash plates, the pitch links and horns. Explain how the collective lever moves the non-rotating swash plate up or down the shaft axis.			X	X	X					
(06)		Describe the mechanism by which the desired cyclic blade pitch can be produced by tilting the swash plate with the cyclic stick.			X	X	X					
(07)		Explain the translational lift effect when the speed increases.			X	X	X					
(08)	X	Justify the increase of the tilt angle of the thrust vector and of the disc in order to increase the speed.			X	X	X					
<b>082 05 03 00</b>		<b>Blade-lag motion in forward flight</b>										
<b>082 05 03 01</b>		<b>Forces on the blade in the disc plane (tip path plane) in forward flight</b>										
(01)		Explain the Coriolis force due to flapping, the resulting periodic moments in the hub plane, and the resulting periodic stresses which			X	X	X					



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			ATPL	CPL	ATPL/IR	ATPL	CPL					
		make lead-lag hinges necessary to avoid material fatigue.										
(02)		Describe the profile drag forces on the blade elements and the periodic variation of these forces.			X	X	X					
<b>082 05 03 02</b>		<b>Intentionally left blank</b>										
<b>082 05 03 03</b>		<b>Ground resonance</b>										
(01)		Explain the movement of the CG of the blades due to lead-lag movements in the multi-bladed rotor.			X	X	X					
(02)		Show the effect on the fuselage and the danger of resonance between this force and the fuselage and undercarriage when the gear touches the ground.			X	X	X					
<b>082 05 04 00</b>		<b>Rotor systems</b>										
<b>082 05 04 01</b>		<b>See-saw or teetering rotor</b>										
(01)		Explain that a teetering rotor is prone to mast bumping in low-G situations, and that it is difficult to counteract because there is no lift force to provide sideways movement.			X	X	X					
<b>082 05 04 02</b>		<b>Intentionally left blank</b>										
<b>082 05 04 03</b>		<b>Hingeless rotor, bearingless rotor</b>										
(01)		Show the forces on the flapping hinges with a large offset (virtual hinge) and the resulting moments,			X	X	X					

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			ATPL	CPL	ATPL/IR	ATPL	CPL					
		and compare them with other rotor systems.										
<b>082 05 05 00</b>		<b>Blade sailing</b>										
<b>082 05 05 01</b>		<b>Blade sailing and causes</b>										
(01)		Define blade sailing, the influence of low rotor rpm and of a head-wind.			X	X	X					
<b>082 05 05 02</b>		<b>Minimising the danger</b>										
(01)		Describe actions that minimise danger and the demonstrated wind envelope for engaging and disengaging rotors.			X	X	X					
<b>082 05 05 03</b>		<b>Droop stops</b>										
(01)		Explain the purpose of droop stops, and their retraction.			X	X	X					
<b>082 05 06 00</b>		<b>Vibrations due to main rotor</b>										
<b>082 05 06 01</b>		<b>Intentionally left blank</b>										
<b>082 05 06 02</b>		<b>Intentionally left blank</b>										
<b>082 06 00 00</b>		<b>TAIL ROTORS</b>										
<b>082 06 01 00</b>		<b>Conventional tail rotor</b>										
<b>082 06 01 01</b>		<b>Intentionally left blank</b>										
<b>082 06 01 02</b>		<b>Tail-rotor aerodynamics</b>										
(01)		Explain the airflow around the blades in the hover and in forward flight, and the effects of the tip speeds on noise production and compressibility.			X	X	X					
(02)		Explain the effect of wind on tail-rotor aerodynamics and thrust in the hover, and any problems.			X	X	X					

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			ATPL	CPL	ATPL/IR	ATPL	CPL					
(03)		Explain tail-rotor thrust and the control through pitch alterations (feathering).			X	X	X					
(04)		Explain tail-rotor flapback, and the effects of Delta 3.			X	X	X					
(05)		Describe the roll moment and drift as side effects of the tail rotor.			X	X	X					
(06)		Explain the effects of tail-rotor failure.			X	X	X					
(07)		Explain the loss of tail-rotor effectiveness (LTE), tail-rotor vortexing state, causes, crosswind, and yaw speed.			X	X	X					
<b>082 06 01 03</b>		<b>Strakes on the tail boom</b>										
(01)		Describe the strake and explain its function.			X	X	X					
<b>082 07 00 00</b>		<b>EQUILIBRIUM, STABILITY AND CONTROL</b>										
<b>082 07 01 00</b>		<b>Equilibrium and helicopter attitudes</b>										
<b>082 07 01 01</b>		<b>Hover</b>										
(01)		Explain why the vector sum of forces and moments must be zero in any acceleration-free situation.			X	X	X					
(02)		Indicate the forces and the moments about the lateral axis in a steady hover.			X	X	X					
(03)		Indicate the forces and the moments about the longitudinal axis in a steady hover.			X	X	X					

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Syllabus reference	BK	Syllabus details and associated Learning Objectives	Aeroplane		Helicopter			IR	CB-IR(A)	BIR Exam	BIR BK	Remarks
			ATPL	CPL	ATPL/IR	ATPL	CPL					
(04)		Deduce how the roll angle in a steady hover without wind results from the moments about the longitudinal axis.			X	X	X					
(05)		Explain how the cyclic is used to equalise moments about the lateral axis in a steady hover.			X	X	X					
(06)		Explain the consequence of the cyclic stick reaching its forward or aft limit during an attempt to take off to the hover.			X	X	X					
(07)		Explain the influence of density altitude on the equilibrium of forces and moments in a steady hover.			X	X	X					
<b>082 07 01 02</b>		<b>Forward flight</b>										
(01)		Explain why the vector sum of forces and of moments must be zero in unaccelerated flight.			X	X	X					
(02)		Indicate the forces and the moments about the lateral axis in steady straight and level flight.			X	X	X					
(03)		Explain the influence of AUM on the forces and moments about the lateral axis in forward flight.			X	X	X					
(04)		Explain the influence of the CG position on the forces and moments about the lateral axis in forward flight.			X	X	X					
(05)		Explain the role of the cyclic stick position in creating equilibrium of forces and moments about the lateral axis in forward flight.			X	X	X					

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Syllabus reference	BK	Syllabus details and associated Learning Objectives	Aeroplane		Helicopter			IR	CB-IR(A)	BIR Exam	BIR BK	Remarks
			ATPL	CPL	ATPL/IR	ATPL	CPL					
(06)		Explain how forward speed influences the fuselage attitude.			X	X	X					
(07)		Describe and explain the inflow roll effect.			X	X	X					
<b>082 07 02 00</b>		<b>Stability</b>										
<b>082 07 02 01</b>		<b>Static longitudinal, roll and directional stability</b>										
(01)		Define static stability; give an example of static stability and of static instability.			X	X	X					
(02)		Explain the contribution of the main rotor to speed stability.			X	X	X					
(03)		Describe the influence of the horizontal stabiliser on static longitudinal stability.			X	X	X					
(04)		Explain the effect of hinge offset on static stability.			X	X	X					
(05)		Describe the influence of the tail rotor on static directional stability.			X	X	X					
(06)		Describe the influence of the vertical stabiliser on static directional stability.			X	X	X					
(07)		Explain the influence of the main rotor on static roll stability.			X	X	X					
(08)		Describe the influence of the longitudinal position of the CG on static longitudinal stability.			X	X	X					
<b>082 07 02 02</b>		<b>Static stability in the hover</b>										
(01)		Describe the initial movements of a hovering helicopter after the occurrence of a horizontal gust.			X	X	X					

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			ATPL	CPL	ATPL/IR	ATPL	CPL					
<b>082 07 02 03</b>		<b>Dynamic stability</b>										
(01)		Define dynamic stability; give an example of dynamic stability and of dynamic instability.			X	X	X					
(02)		Explain why static stability is a pre-condition for dynamic stability.			X	X	X					
<b>082 07 02 04</b>		<b>Longitudinal stability</b>										
(01)		Explain the individual contributions of $\alpha$ and speed stability together with the stabiliser and fuselage to dynamic longitudinal stability.			X	X	X					
<b>082 07 02 05</b>		<b>Roll stability and directional stability</b>										
(01)		Know that a large static roll stability together with a small directional stability may lead to a Dutch roll.			X	X	X					
<b>082 07 03 00</b>		<b>Control</b>										
<b>082 07 03 01</b>		<b>Manoeuvre stability</b>										
(01)		Explain how helicopter control can be limited because of available stick travel.			X	X	X					
(02)		Explain how the CG position influences the remaining stick travel.			X	X	X					
<b>082 07 03 02</b>		<b>Control power</b>										
(01)		Explain the meaning of the control moment.			X	X	X					
(02)		Explain the importance of the CG position on the control moment.			X	X	X					
(03)		Explain the influence of hinge offset on controllability.			X	X	X					

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Syllabus reference	BK	Syllabus details and associated Learning Objectives	Aeroplane		Helicopter			IR	CB-IR(A)	BIR Exam	BIR BK	Remarks
			ATPL	CPL	ATPL/IR	ATPL	CPL					
<b>082 07 03 03</b>		<b><i>Static and dynamic rollover</i></b>										
(01)		Explain the mechanism which causes dynamic rollover.			X	X	X					
(02)		Explain the required pilot action when dynamic rollover is starting to develop.			X	X	X					
<b>082 08 00 00</b>		<b>HELICOPTER FLIGHT MECHANICS</b>										
<b>082 08 01 00</b>		<b>Flight limits</b>										
<b>082 08 01 01</b>		<b><i>Hover and vertical flight</i></b>										
(01)		Show the power required for HOGE and HIGE, and the power available.			X	X	X					
(02)		Explain the effects of AUM, ambient temperature and pressure, density altitude, and moisture.			X	X	X					
(03)		Describe the rate of climb in a vertical flight.			X	X	X					
<b>082 08 01 02</b>		<b><i>Forward flight</i></b>										
(01)		Compare the power required and the power available as a function of speed in straight and level flight.			X	X	X					
(02)		Define the maximum speed limited by power and the value relative to VNE and VNO.			X	X	X					
(03)		Use the power graph to determine the speeds of maximum rate of climb and the maximum angle of climb.			X	X	X					
(04)		Use the power graph to define true airspeed (TAS) for maximum			X	X	X					

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Syllabus reference	BK	Syllabus details and associated Learning Objectives	Aeroplane		Helicopter			IR	CB-IR(A)	BIR Exam	BIR BK	Remarks
			ATPL	CPL	ATPL/IR	ATPL	CPL					
		range and maximum endurance, and consider the case of piston engine and turbine engine. Explain the effects of tailwind or headwind on the speed for maximum range.										
(05)		Explain the effects of AUM, pressure and temperature, density altitude, and humidity.			X	X	X					
<b>082 08 01 03</b>		<b>Manoeuvring</b>										
(01)		Define the load factor, the radius, and the rate of turn.			X	X	X					
(02)		Explain the relationship between the angle of bank, the airspeed and the radius of turn, and between the angle of bank and the load factor.			X	X	X					
(03)		Explain the influence of AUM, pressure and temperature, density altitude, and humidity.			X	X	X					
<b>082 08 02 00</b>		<b>Special conditions</b>										
<b>082 08 02 01</b>		<b>Operating with limited power</b>										
(01)		Explain operations with limited power, use the power graph to show the limitations on vertical and level flight, and describe power checks and procedures for take-off and landing.			X	X	X					
(02)		Describe manoeuvres with limited power.			X	X	X					
<b>082 08 02 02</b>		<b>Overpitch, overtorque</b>										



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Syllabus reference	BK	Syllabus details and associated Learning Objectives	Aeroplane		Helicopter			IR	CB-IR(A)	BIR Exam	BIR BK	Remarks
			ATPL	CPL	ATPL/IR	ATPL	CPL					
(01)		Describe overpitching and show the consequences.			X	X	X					
(02)		Describe situations likely to lead to overpitching.			X	X	X					
(03)		Describe overtorquing and show the consequences.			X	X	X					
(04)		Describe situations likely to lead to overtorquing.			X	X	X					

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**SUBJECT 090 – COMMUNICATIONS**

Syllabus reference	BK	Syllabus details and associated Learning Objectives	Aeroplane		Helicopter			IR	CBIR(A)	BIR Exam	BIR BK	Remarks
			ATPL	CPL	ATPL/IR	ATPL	CPL					
<b>090 00 00 00</b>		<b>COMMUNICATIONS</b>										
<b>090 01 00 00</b>		<b>CONCEPTS</b>										
<b>090 01 01 00</b>		<b>Associated terms</b>										
<b>090 01 01 01</b>		<b><i>Meanings and significance</i></b>										
(01)		Define commonly used air traffic services (ATS) terms for stations.	X	X	X	X	X	X	X			
(02)		Define commonly used ATS terms for communication methods.	X	X	X	X	X	X	X			
(03)		Recognise the terms used in conjunction with the approach and holding procedures.	X	X	X	X	X	X	X	3		
<b>090 01 01 02</b>		<b><i>Air traffic services (ATS) abbreviations</i></b>										
(01)		Define commonly used ATS abbreviations: – flight conditions; – airspace; – services; – time; – VFR-related terms; – IFR-related terms; – miscellaneous.	X	X	X	X	X	X	X	3		
<b>090 01 01 03</b>		<b><i>Q-code groups commonly used in radiotelephony (RT) air-ground communications</i></b>										
(01)		Define Q-code groups commonly used in RT air-ground communications:	X	X	X	X	X	X	X	3		

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Syllabus reference	BK	Syllabus details and associated Learning Objectives	Aeroplane		Helicopter			IR	CBIR(A)	BIR Exam	BIR BK	Remarks
			ATPL	CPL	ATPL/IR	ATPL	CPL					
		– pressure settings; – directions and bearings.										
(02)		State the procedure for obtaining bearing information in flight.	X	X	X	X	X	X	X	3		
<b>090 01 01 04</b>		<b>Categories of messages</b>										
(01)		Identify to which category of messages a type of message belongs and identify the associated priority indicator.	X	X	X	X	X	X	X	3	2	
<b>090 02 00 00</b>		<b>GENERAL OPERATING PROCEDURES</b>										
<b>090 02 01 00</b>		<b>Transmission standards</b>										
<b>090 02 01 01</b>		<b>Transmission of letters</b>										
(01)		Know the phonetic alphabet used in RT.	X	X	X	X	X	X	X		3	
(02)		Identify the circumstances when words should be spelt out.	X	X	X	X	X	X	X		3	
<b>090 02 01 02</b>		<b>Transmission of numbers</b>										
(01)		Describe the method of transmission of numbers: – pronunciation; – single digits, whole hundreds and whole thousands; – state how numbers are transmitted in different circumstances.	X	X	X	X	X	X	X		3	
<b>090 02 01 03</b>		<b>Transmission of time</b>										
(01)		Describe the ways of transmitting time:	X	X	X	X	X	X	X		3	

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Syllabus reference	BK	Syllabus details and associated Learning Objectives	Aeroplane		Helicopter			IR	CBIR(A)	BIR Exam	BIR BK	Remarks
			ATPL	CPL	ATPL/IR	ATPL	CPL					
		<ul style="list-style-type: none"> <li>the standard time reference is the Coordinated Universal Time (UTC);</li> <li>using only minutes, or minutes and hours, when required.</li> </ul>										
(02)		Describe the different ways in which time is to be transmitted.	X	X	X	X	X	X	X			
<b>090 02 01 04</b>		<b>Transmission techniques</b>										
(01)	X	Explain the techniques used for making good RT transmissions.	X	X	X	X	X	X	X			
<b>090 02 01 05</b>		<b>Standard words and phrases</b>										
(01)		Define the meaning of standard words and phrases.	X	X	X	X	X	X	X		3	
(02)		Recognise, describe and use the correct standard phraseology for each phase of a VFR flight (consider communication with each type of aeronautical station): <ul style="list-style-type: none"> <li>before taxi;</li> <li>taxi;</li> <li>departure;</li> <li>en route;</li> <li>circuit;</li> <li>final;</li> <li>landing;</li> <li>after landing.</li> </ul>	X	X	X	X	X	X	X	3		
(03)		Recognise, describe and use the correct standard phraseology for each phase of an IFR flight, including PBN operations (consider	X	X	X	X	X	X	X	3		

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Syllabus reference	BK	Syllabus details and associated Learning Objectives	Aeroplane		Helicopter			IR	CBIR(A)	BIR Exam	BIR BK	Remarks
			ATPL	CPL	ATPL/IR	ATPL	CPL					
		communication with each type of aeronautical station): – before pushback or taxi; – pushback; – taxi; – departure; – en route; – approach; – final approach; – landing; – after landing.										
(04)		Explain phraseology for the selective calling system (SELCAL) and aircraft communications addressing and reporting system (ACARS).	X	X	X	X	X	X	X			
(05)		Explain traffic alert and collision avoidance system (TCAS) phraseology.	X	X	X	X	X	X	X			
<b>090 02 01 06</b>		<b>RT call signs for aeronautical stations including use of abbreviated call signs</b>										
(01)		Name the two parts of the call sign of an aeronautical station.	X	X	X	X	X	X	X	3		
(02)		Identify the call-sign suffixes for aeronautical stations.	X	X	X	X	X	X	X	3		
(03)		Explain when the call sign may be omitted or abbreviated to the use of suffix only.	X	X	X	X	X	X	X	3		
<b>090 02 01 07</b>		<b>RT call signs for aircraft including use of abbreviated call signs</b>										

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Syllabus reference	BK	Syllabus details and associated Learning Objectives	Aeroplane		Helicopter			IR	CBIR(A)	BIR Exam	BIR BK	Remarks
			ATPL	CPL	ATPL/IR	ATPL	CPL					
(01)		Describe the three different ways to compose an aircraft call sign.	X	X	X	X	X	X	X			
(02)		Describe the abbreviated forms for aircraft call signs.	X	X	X	X	X	X	X			
(03)		Explain when aircraft call signs may be abbreviated.	X	X	X	X	X	X	X			
(04)		Explain when the suffix 'HEAVY' or 'SUPER' is used with an aircraft call sign.	X	X	X	X	X	X	X	3	2	
(05)		Explain the use of the phrase 'Change your call sign to...'. '	X	X	X	X	X	X	X	3		
(06)		Explain the use of the phrase 'Revert to flight plan call sign'. '	X	X	X	X	X	X	X	3		
<b>090 02 01 08</b>		<b>Transfer of communication</b>										
(01)		Describe the procedure for transfer of communication: – by ground station; – by aircraft.	X	X	X	X	X	X	X	3		
<b>090 02 01 09</b>		<b>Test procedures including readability scale</b>										
(01)		Explain how to test radio transmission and reception.	X	X	X	X	X	X	X	3	2	
(02)		State the readability scale and explain its meaning.	X	X	X	X	X	X	X	3	2	
<b>090 02 01 10</b>		<b>Read-back and acknowledgement requirements</b>										
(01)		Describe the requirement to read back ATC route clearances.	X	X	X	X	X	X	X	3	2	
(02)		Describe the requirement to read back clearances related to the runway in use.	X	X	X	X	X	X	X	3	2	

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Syllabus reference	BK	Syllabus details and associated Learning Objectives	Aeroplane		Helicopter			IR	CBIR(A)	BIR Exam	BIR BK	Remarks
			ATPL	CPL	ATPL/IR	ATPL	CPL					
(03)		Describe the requirement to read back other clearances including conditional clearances.	X	X	X	X	X	X	X	3	2	
(04)		Describe the requirement to read back other data such as runway, secondary surveillance radar (SSR) codes, etc.	X	X	X	X	X	X	X	3	2	
<b>090 02 01 11</b>		<b>Radar procedural phraseology</b>										
(01)		Use the correct phraseology for an aircraft receiving a radar service: – radar identification; – radar vectoring; – traffic information and avoidance; – SSR procedures.	X	X	X	X	X	X	X	3	2	
<b>090 02 01 12</b>		<b>Level changes and reports</b>										
(01)		Use the correct term to describe vertical position in relation to: – flight level (standard pressure setting); – altitude (metres/feet on QNH); – height (metres/feet on QFE).	X	X	X	X	X	X	X	3		
<b>090 02 01 13</b>		<b>Data link messages</b>										
(01)		List the different types of messages of the controller–pilot data link communications (CPDLC) function and give examples of data link messages.	X	X	X	X	X	X	X			
(02)		Describe a notification phase (LOG ON) and state its purpose.	X	X	X	X	X	X	X			

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Syllabus reference	BK	Syllabus details and associated Learning Objectives	Aeroplane		Helicopter			IR	CBIR(A)	BIR Exam	BIR BK	Remarks
			ATPL	CPL	ATPL/IR	ATPL	CPL					
(03)		Explain the phrases to be used: – when voice communication is used to correct a CPDLC message; – in case of single CPDLC message failure; – when CPDLC has failed; – when reverting from CPDLC to voice communication.	X	X	X	X	X	X	X			
<b>090 03 00 00</b>		<b>RELEVANT WEATHER INFORMATION</b>										
<b>090 03 01 00</b>		<b>Aerodrome weather</b>										
<b>090 03 01 01</b>		<b>Aerodrome weather terms</b>										
(01)		List the contents of aerodrome weather reports and state units of measurement used for each item: – wind direction and speed; – variation of wind direction and speed; – visibility; – present weather; – cloud amount and type (including the definition of cloud and visibility OK (CAVOK); – air temperature and dew point; – pressure values (QNH, QFE); – supplementary information (aerodrome warnings, landing runway, runway conditions, restrictions, obstructions, wind-shear warnings, etc.).	X	X	X	X	X	X	X	3		



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Syllabus reference	BK	Syllabus details and associated Learning Objectives	Aeroplane		Helicopter			IR	CBIR(A)	BIR Exam	BIR BK	Remarks
			ATPL	CPL	ATPL/IR	ATPL	CPL					
<b>090 03 01 02</b>		<b>Weather broadcast</b>										
(01)		List the sources (VOLMET and ATIS units) of weather information available for aircraft in flight, and describe situation(s) in which a pilot would normally obtain each.	X	X	X	X	X	X	X			
(02)	X	Explain the meaning of the acronyms 'D-ATIS', 'ATIS', and 'VOLMET'.	X	X	X	X	X	X	X			
(03)		Explain and demonstrate how to decode ATIS messages.	X	X	X	X	X	X	X	3		
(04)		Explain and demonstrate how to decode D-ATIS messages.	X	X	X	X	X	X	X			
<b>090 04 00 00</b>		<b>VOICE COMMUNICATION FAILURE</b>										
<b>090 04 01 00</b>		<b>Required action</b>										
<b>090 04 01 01</b>		<b>Action required to be taken in case of communication failure</b>										
(01)		State the action to be taken in case of communication failure on a controlled VFR flight.	X	X	X	X	X	X	X			
(02)		Identify the frequencies to be used in an attempt to establish communication.	X	X	X	X	X	X	X			
(03)		State the additional information that should be transmitted in the event of receiver failure.	X	X	X	X	X	X	X			
(04)		Identify the SSR code that may be used to indicate communication failure.	X	X	X	X	X	X	X			

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Syllabus reference	BK	Syllabus details and associated Learning Objectives	Aeroplane		Helicopter			IR	CBIR(A)	BIR Exam	BIR BK	Remarks
			ATPL	CPL	ATPL/IR	ATPL	CPL					
(05)		Explain the action to be taken by a pilot that experiences a communication failure in the aerodrome traffic pattern at controlled aerodromes.	X	X	X	X	X	X	X			
(06)		Describe the action to be taken in case of communication failure on an IFR flight.	X	X	X	X	X	X	X	3		
(07)		Describe the action to be taken in case of communication failure on an IFR flight when flying in visual meteorological conditions (VMC) and the flight will be terminated in VMC.	X	X	X	X	X	X	X	3		
(08)		Describe the action to be taken in case of communication failure on an IFR flight when flying in instrument meteorological conditions (IMC).	X	X	X	X	X	X	X	3		
(09)		Explain the causes and possible safety impacts of a blocked frequency.	X	X	X	X	X	X	X	3		
<b>090 05 00 00</b>		<b>DISTRESS AND URGENCY PROCEDURES</b>										
<b>090 05 01 00</b>		<b>Signals and procedures</b>										
<b>090 05 01 01</b>		<b>Distress</b>										
(01)		State the DISTRESS signal(s) and DISTRESS procedure(s).	X	X	X	X	X	X	X		3	
(02)		Define 'DISTRESS'.	X	X	X	X	X	X	X		3	
(03)		Identify the frequencies that should be used by aircraft in DISTRESS.	X	X	X	X	X	X	X	3		

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Syllabus reference	BK	Syllabus details and associated Learning Objectives	Aeroplane		Helicopter			IR	CBIR(A)	BIR Exam	BIR BK	Remarks
			ATPL	CPL	ATPL/IR	ATPL	CPL					
(04)		Specify the emergency SSR codes that may be used by aircraft, and the meaning of the codes.	X	X	X	X	X	X	X	3		
(05)		Describe the action to be taken by the station which receives a DISTRESS message.	X	X	X	X	X	X	X	3		
(06)		Describe the action to be taken by all other stations when a DISTRESS procedure is in progress.	X	X	X	X	X	X	X	3		
(07)		List the correctly sequenced elements of a DISTRESS signal/message and describe the message content.	X	X	X	X	X	X	X		3	
(08)		Describe the use of discrete frequencies (DEF) in case of distress or urgency.	X	X	X	X	X	X	X			
(09)		State that DISTRESS messages take priority over all other messages.	X	X	X	X	X	X	X	3		
<b>090 05 01 02</b>		<b>Urgency</b>										
(01)		State the URGENCY signal(s) and URGENCY procedure(s).	X	X	X	X	X	X	X		3	
(02)		Define 'URGENCY'.	X	X	X	X	X	X	X		3	
(03)		Identify the frequencies that should be used by aircraft in URGENCY.	X	X	X	X	X	X	X	3		
(04)		Describe the action to be taken by the station which receives an URGENCY message.	X	X	X	X	X	X	X	3		
(05)		Describe the action to be taken by all other stations when an	X	X	X	X	X	X	X			

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Syllabus reference	BK	Syllabus details and associated Learning Objectives	Aeroplane		Helicopter			IR	CBIR(A)	BIR Exam	BIR BK	Remarks
			ATPL	CPL	ATPL/IR	ATPL	CPL					
		URGENCY procedure is in progress.										
(06)		List the correctly sequenced elements of an URGENCY signal/message and describe the message content.	X	X	X	X	X	X	X		3	
(07)		State that URGENCY messages take priority over all other messages except DISTRESS.	X	X	X	X	X	X	X	3		
<b>090 06 00 00</b>		<b>VHF PROPAGATION AND ALLOCATION OF FREQUENCIES</b>										
<b>090 06 01 00</b>		<b>General principles</b>										
<b>090 06 01 01</b>		<b><i>Spectrum, bands, range</i></b>										
(01)		Describe the radio-frequency spectrum with particular reference to VHF.	X	X	X	X	X	X	X		3	
(02)		Describe the radio-frequency spectrum of the bands into which the radio-frequency spectrum is divided.	X	X	X	X	X	X	X		3	
(03)		Identify the frequency range of the VHF band.	X	X	X	X	X	X	X	3		
(04)		State the band normally used for aeronautical mobile service (AMS) voice communication.	X	X	X	X	X	X	X	3		
(05)		State the frequency separation allocated between consecutive VHF frequencies.	X	X	X	X	X	X	X	3		
(06)		List the factors which reduce the effective range and quality of VHF radio transmissions.	X	X	X	X	X	X	X	3		

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Syllabus reference	BK	Syllabus details and associated Learning Objectives	Aeroplane		Helicopter			IR	CBIR(A)	BIR Exam	BIR BK	Remarks
			ATPL	CPL	ATPL/IR	ATPL	CPL					
<b>090 07 00 00</b>		<b>Other communications</b>										
<b>090 07 01 00</b>		<b>Weather observations, Morse code</b>										
<b>090 07 01 01</b>		<b><i>Meteorological observations</i></b>										
(01)		Explain when aircraft routine meteorological observations should be made.	X	X	X	X	X	X	X	3		
(02)		Explain when aircraft special meteorological observations should be made.	X	X	X	X	X	X	X	3		
<b>090 07 01 02</b>		<b><i>Use of Morse code</i></b>										
(01)	X	Describe and list Morse code.	X	X	X	X	X	X	X			
(02)		Find the Morse code identifiers of radio navigation aids (VHF omnidirectional radio range (VOR), distance-measuring equipment (DME), non-directional radio beacon (NDB), instrument landing system (ILS)) using aeronautical charts.	X	X	X	X	X	X	X	3		

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**SUBJECT AREA 100 – KNOWLEDGE, SKILLS AND ATTITUDES (KSA)**

Syllabus reference	Syllabus details and associated Learning Objectives	Aeroplane		Helicopter		
		ATPL	CPL	ATPL/IR	ATPL	CPL
<b>100 00 00 00</b>	<b>KNOWLEDGE, SKILLS AND ATTITUDES (KSA)</b>					
<b>100 01 00 00</b>	<b>ICAO CORE COMPETENCIES</b>					
(01)	Recognise the ICAO Core Competencies listed below and the associated competency descriptions (ICAO Doc 9995 'Manual of Evidence-based Training'): – Application of Procedures; – Communication; – Aircraft Flight Path Management, automation; – Aircraft Flight Path Management, manual control; – Leadership and Teamwork; – Problem Solving and Decision Making; – Situation Awareness; – Workload Management.	X	X	X	X	X
<b>100 02 00 00</b>	<b>CORE COMPETENCIES LEARNING OBJECTIVES</b>					
<b>100 02 01 00</b>	<b>Communication</b>					
(01)	Show the ability to identify whether the recipient is ready and able to receive the information.	X	X	X	X	X
(02)	Show the ability to appropriately select what, when, how and with whom to communicate.	X	X	X	X	X
(03)	Show the ability to communicate clearly, accurately and concisely.	X	X	X	X	X
(04)	Show the ability to confirm whether the recipient correctly understands important information.	X	X	X	X	X
(05)	Show the ability to listen actively and show you understand the information you receive.	X	X	X	X	X
(06)	Show the ability to ask relevant and effective questions.	X	X	X	X	X
(07)	Show the ability to adhere to standard radio-telephony phraseology.	X	X	X	X	X
(08)	Show the ability to accurately read, interpret, construct and respond to given documentation in English.	X	X	X	X	X

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Syllabus reference	Syllabus details and associated Learning Objectives	Aeroplane		Helicopter		
		ATPL	CPL	ATPL/IR	ATPL	CPL
(09)	Show the ability to correctly interpret non-verbal communication.	X	X	X	X	X
(10)	Show the ability to use appropriate eye contact, body movement and gestures that are consistent with and support verbal messages.	X	X	X	X	X
<b>100 02 02 00</b>	<b>Leadership and teamwork</b>					
(01)	Show the ability to create an atmosphere of open communication that encourages participation.	X	X	X	X	X
(02)	Show the initiative and the ability to give directions when required.	X	X	X	X	X
(03)	Show the ability to admit mistakes and take responsibility.	X	X	X	X	X
(04)	Show the ability to anticipate and respond appropriately to others' needs.	X	X	X	X	X
(05)	Show the ability to carry out instructions when directed.	X	X	X	X	X
(06)	Show the ability to communicate relevant concerns and intentions.	X	X	X	X	X
(07)	Show the ability to give and receive feedback constructively.	X	X	X	X	X
(08)	Show empathy, respect and tolerance for others.	X	X	X	X	X
(09)	Show the ability to engage others in planning and to allocate activities fairly and appropriately according to others' abilities.	X	X	X	X	X
(10)	Show the ability to address and resolve conflicts and disagreement in a constructive manner.	X	X	X	X	X
(11)	Show the ability to project self-control.	X	X	X	X	X
<b>100 02 03 00</b>	<b>Problem-solving and decision-making</b>					
(01)	Show the ability to seek accurate and adequate information from appropriate sources.	X	X	X	X	X
(02)	Show the ability to identify and verify what and why things have gone wrong.	X	X	X	X	X
(03)	Show the ability to employ proper problem-solving strategies.	X	X	X	X	X
(04)	Show the ability to persevere in working through problems.	X	X	X	X	X
(05)	Show the ability to use appropriate and timely decision-making processes.	X	X	X	X	X
(06)	Show the ability to set priorities appropriately.	X	X	X	X	X
(07)	Show the ability to identify and consider options effectively.	X	X	X	X	X
(08)	Show the ability to monitor, review and adapt decisions as required.	X	X	X	X	X
(09)	Show the ability to identify and manage risks.	X	X	X	X	X
<b>100 02 04 00</b>	<b>Situation awareness</b>					

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Syllabus reference	Syllabus details and associated Learning Objectives	Aeroplane		Helicopter		
		ATPL	CPL	ATPL/IR	ATPL	CPL
(01)	Demonstrate the ability to identify and assess accurately the general environment as it may affect the operation.	X	X	X	X	X
(02)	Demonstrate the ability to identify threats, errors and undesirable aircraft states.	X	X	X	X	X
(03)	Demonstrate the ability to manage threats, errors and undesirable aircraft states.	X	X	X	X	X
<b>100 02 05 00</b>	<b>Workload management</b>					
(01)	Show the ability to maintain self-control.	X	X	X	X	X
(02)	Show the ability to plan, prioritise and schedule tasks effectively.	X	X	X	X	X
(03)	Show the ability to manage time effectively when carrying out tasks.	X	X	X	X	X
(04)	Show the ability to offer and accept assistance, delegate when necessary and ask for help early.	X	X	X	X	X
(05)	Show the ability to manage interruptions, distractions, variations and failures effectively.	X	X	X	X	X
<b>100 03 00 00</b>	<b>ADDITIONAL THREAT AND ERROR MANAGEMENT (TEM) RELATED LEARNING OBJECTIVES</b>					
<b>100 03 01 00</b>	<b>Application of knowledge</b>					
(01)	Demonstrate the ability to complete pre-flight planning in practical exercises.	X	X	X	X	X
(02)	Demonstrate the KSA and TEM relating to phases of flight in the ground training environment.	X	X	X	X	X
<b>100 03 02 00</b>	<b>Upset prevention and recovery training (UPRT) and resilience</b>					
	<i>Note: Resilience is defined as ‘the ability to recognise, absorb and adapt to disruptions’.</i> <i>It is supported by the pilot’s core competencies and improved by experience, which can be gained by training for unexpected events or situations.</i>					
(01)	Recognise potential upset ‘threats’ and suggest effective ‘threat management’ in scenario situations.	X	X			
(02)	Recognise potential upset ‘errors’ and suggest effective ‘error management’ in scenario situations.	X	X			
(03)	Explain the causes of and contributing factors to upsets.	X	X			
(04)	Demonstrate resilience during scenario and/or other exercises.	X	X	X	X	X



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Syllabus reference	Syllabus details and associated Learning Objectives	Aeroplane		Helicopter		
		ATPL	CPL	ATPL/IR	ATPL	CPL
(05)	Show the ability to identify the signs and discuss the effects of stress, fatigue and aviation lifestyle on situation awareness, and how to cope with them in order to maintain situation awareness.	X	X	X	X	X
<b>100 04 00 00</b>	<b>MENTAL MATHS</b>					
	<i>Note: Demonstrate, in non-calculator test scenarios or scenario exercises, the ability in a time-efficient manner to make correct mental calculation approximations for the following.</i>					
(01)	Convert between volumes and masses of fuel using range of units.	X	X	X	X	X
(02)	Estimate time, distance and speed.	X	X	X	X	X
(03)	Estimate the rate of climb or rate of descent, distance and time.	X	X			
(04)	Add or subtract time, distance, and fuel mass.	X	X	X	X	X
(05)	Calculate fuel burn given time and fuel flow.	X	X	X	X	X
(06)	Calculate the time available (for decision-making) given relevant fuel information.	X	X	X	X	X
(07)	Determine the top of descent using a simple method that is described by the approved training organisation (ATO).	X	X			
(08)	Determine the values that vary by a percentage, e.g. dry-to-wet landing distance and fuel burn.	X	X	X	X	X
(09)	Estimate heights at distances on a 3-degree glideslope.	X	X	X	X	X
(10)	Estimate headings using the 1-in-60 rule.	X	X	X	X	X
(11)	Estimate headwind and crosswind components given wind speed and direction and runway in use.	X	X	X	X	X

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(b) Airships

**SYLLABUS OF THEORETICAL KNOWLEDGE FOR CPL AND IR**

The applicable items for each licence or rating are marked with 'x'. An 'x' on the main title of a subject means that all the subdivisions are applicable.

		CPL	IR
<b>1.</b>	<b>AIR LAW AND ATC PROCEDURES</b>	x	
	INTERNATIONAL LAW: CONVENTIONS, AGREEMENTS AND ORGANISATIONS		
	AIRWORTHINESS OF AIRCRAFT		
	AIRCRAFT NATIONALITY AND REGISTRATION MARKS		
	PERSONNEL LICENSING		x
	RULES OF THE AIR		x
	PROCEDURES FOR AIR NAVIGATION SERVICES: AIRCRAFT OPERATIONS		x
	AIR TRAFFIC SERVICES AND AIR TRAFFIC MANAGEMENT		x
	AERONAUTICAL INFORMATION SERVICE		x
	AERODROMES		x
	FACILITATION		
	SEARCH AND RESCUE		
	SECURITY		
	AIRCRAFT ACCIDENT AND INCIDENT INVESTIGATION		
<b>2.</b>	<b>AIRSHIP GENERAL KNOWLEDGE: ENVELOPE, AIRFRAME AND SYSTEMS, ELECTRICS, POWERPLANT AND EMERGENCY EQUIPMENT</b>	x	
	DESIGN, MATERIALS, LOADS AND STRESSES		
	ENVELOPE AND AIRBAGS		
	FRAMEWORK		
	GONDOLA		
	FLIGHT CONTROLS		
	LANDING GEAR		
	HYDRAULICS AND PNEUMATICS		
	HEATING AND AIR CONDITIONING		
	FUEL SYSTEM		
	PISTON ENGINES		
	TURBINE ENGINES (BASICS)		
	ELECTRICS		
	FIRE PROTECTION AND DETECTION SYSTEMS		
	MAINTENANCE		
<b>3.</b>	<b>AIRSHIP GENERAL KNOWLEDGE: INSTRUMENTATION</b>	x	
	SENSORS AND INSTRUMENTS		
	MEASUREMENT OF AIR DATA AND GAS PARAMETERS		

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		CPL	IR
	MAGNETISM: DIRECT READING COMPASS AND FLUX VALVE		
	GYROSCOPIC INSTRUMENTS		
	COMMUNICATION SYSTEMS		
	ALERTING SYSTEMS		
	INTEGRATED INSTRUMENTS: ELECTRONIC DISPLAYS		
	FLIGHT MANAGEMENT SYSTEM (GENERAL BASICS)		
	DIGITAL CIRCUITS AND COMPUTERS		
<b>4.</b>	<b>FLIGHT PERFORMANCE AND PLANNING</b>	x	
<b>4.1.</b>	<b>MASS AND BALANCE: AIRSHIPS</b>	x	
	PURPOSE OF MASS AND BALANCE CONSIDERATIONS		
	LOADING		
	FUNDAMENTALS OF CG CALCULATIONS		
	MASS AND BALANCE DETAILS OF AIRCRAFT		
	DETERMINATION OF CG POSITION		
	PASSENGER, CARGO AND BALLAST HANDLING		
<b>4.2.</b>	<b>FLIGHT PLANNING AND FLIGHT MONITORING</b>		
	FLIGHT PLANNING FOR VFR FLIGHTS	x	
	FLIGHT PLANNING FOR IFR FLIGHTS		x
	FUEL PLANNING	x	x
	PRE-FLIGHT PREPARATION	x	x
	ATS FLIGHT PLAN	x	x
	FLIGHT MONITORING AND IN-FLIGHT RE-PLANNING	x	x
<b>4.3.</b>	<b>PERFORMANCE: AIRSHIPS</b>	x	
	AIRWORTHINESS REQUIREMENTS		
	BASICS OF AIRSHIP PERFORMANCE		
	DEFINITIONS AND TERMS		
	STAGES OF FLIGHT		
	USE OF FLIGHT MANUAL		
<b>5.</b>	<b>HUMAN PERFORMANCE</b>	x	
	HUMAN FACTORS: BASIC CONCEPTS		
	BASIC AVIATION PHYSIOLOGY AND HEALTH MAINTENANCE		
	BASIC AVIATION PSYCHOLOGY		
<b>6.</b>	<b>METEOROLOGY</b>	x	
	THE ATMOSPHERE		
	WIND		
	THERMODYNAMICS		
	CLOUDS AND FOG		
	PRECIPITATION		
	AIR MASSES AND FRONTS		
	PRESSURE SYSTEMS		
	CLIMATOLOGY		

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		CPL	IR
	FLIGHT HAZARDS		
	METEOROLOGICAL INFORMATION		
<b>7.</b>	<b>NAVIGATION</b>		
<b>7.1.</b>	<b>GENERAL NAVIGATION</b>	x	
	BASICS OF NAVIGATION		
	MAGNETISM AND COMPASSES		
	CHARTS		
	DR NAVIGATION		
	IN-FLIGHT NAVIGATION		
<b>7.2.</b>	<b>RADIO NAVIGATION</b>		
	BASIC RADIO PROPAGATION THEORY	x	x
	RADIO AIDS	x	x
	RADAR	x	x
	<i>INTENTIONALLY LEFT BLANK</i>		
	AREA NAVIGATION SYSTEMS AND RNAV/FMS		x
	GNSS	x	x
<b>8.</b>	<b>OPERATIONAL PROCEDURES AIRSHIP</b>	x	
	GENERAL REQUIREMENTS		
	SPECIAL OPERATIONAL PROCEDURES AND HAZARDS (GENERAL ASPECTS)		
	EMERGENCY PROCEDURES		
<b>9.</b>	<b>PRINCIPLES OF FLIGHT</b>	x	
<b>9.1.</b>	<b>PRINCIPLES OF FLIGHT: AIRSHIPS</b>	x	
	BASICS OF AEROSTATICS		
	BASICS OF SUBSONIC AERODYNAMICS		
	AERODYNAMICS OF AIRSHIPS		
	STABILITY		
	CONTROLLABILITY		
	LIMITATIONS		
	PROPELLERS		
	BASICS OF AIRSHIP FLIGHT MECHANICS		
<b>10.</b>	<b>COMMUNICATIONS</b>		
<b>10.1.</b>	<b>VFR COMMUNICATIONS</b>	x	
	DEFINITIONS	x	
	GENERAL OPERATING PROCEDURES	x	
	RELEVANT WEATHER INFORMATION TERMS (VFR)	x	
	ACTION REQUIRED TO BE TAKEN IN CASE OF COMMUNICATION FAILURE	x	
	DISTRESS AND URGENCY PROCEDURES	x	
	GENERAL PRINCIPLES OF VHF PROPAGATION AND ALLOCATION OF FREQUENCIES	x	
<b>10.2.</b>	<b>IFR COMMUNICATIONS</b>		
	DEFINITIONS		x

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	CPL	IR
GENERAL OPERATING PROCEDURES		x
ACTION REQUIRED TO BE TAKEN IN CASE OF COMMUNICATION FAILURE		x
DISTRESS AND URGENCY PROCEDURES		x
RELEVANT WEATHER INFORMATION TERMS (IFR)		x
GENERAL PRINCIPLES OF VHF PROPAGATION AND ALLOCATION OF FREQUENCIES		x
MORSE CODE		x

**GM1 FCL.310; FCL.515(b); FCL.615(b); FCL.835(d) Theoretical knowledge examinations**

**EXPLANATION OF THE VERBS USED IN THE BENJAMIN BLOOM TAXONOMY**

- (a) The depth or level of learning to be achieved during the training and the corresponding level of attainment to be examined or assessed is based on the following taxonomy. In each case, the level of knowledge or skill is signified by the learning objective (LO) verb.
- (b) The majority of the LOs relate to the cognitive domain. The taxonomy described by B. Bloom (1956) and Anderson & Krathwohl (2001) has been used as the standard.
- (c) The six sequential increasing levels of required cognitive learning are identified by the LO verb. Hence the lowest level 'remember' is signified by verbs such as 'state', 'list', 'define' and 'recall' whilst the next higher level of 'understand' is signified by verbs such as 'describe' and 'explain'. The third level of 'apply' is signified by the verbs 'calculate', 'interpret', 'relate' and 'solve'. However, the higher levels of 'analyse', which would be signified by the verbs 'plan' or 'discuss' and 'evaluate' and 'create' are less common due at least partially to questions presently possible in the ECQB examination.
- (d) The LOs used in Area 100 KSA differ in that they require a combination of knowledge and skills. However, the 'skill' level does not relate to Bloom's psychomotor taxonomy but is more closely aligned to the higher taxonomy levels required in medicine, because knowledge and skills must be combined by the student pilot in a strategy.
- (e) The verbs 'demonstrate' and 'show', with their meanings defined below, have therefore been used to supplement the cognitive LO verbs for the Area 100 KSA LOs.

- (1) 'Demonstrate' means the selection and use of the appropriate knowledge, skills and attitudes within a strategy to achieve an effective outcome. It signifies a high taxonomy level and would normally be assessed using multiple indicators from more than one core competency.
- (2) 'Show' means the attainment of knowledge, skill or attitude. It signifies a lower taxonomy level than 'demonstrate' and would normally be assessed by a single indicator.'

### **FCL.315 CPL – Training course**

An applicant for a CPL shall have completed theoretical knowledge instruction and flight instruction at an ATO, in accordance with Appendix 3 to this MCAR.

### **FCL.320 CPL – Skill test**

An applicant for a CPL shall pass a skill test in accordance with Appendix 4 to this MCAR to demonstrate the ability to perform, as PIC of the appropriate aircraft category, the relevant procedures and manoeuvres with the competency appropriate to the privileges granted.

## **SECTION 2 – SPECIFIC REQUIREMENTS FOR THE AEROPLANE CATEGORY – CPL(A)**

### **FCL.315.A CPL – Training course**

Theoretical knowledge and flight instruction for the issue of a CPL(A) shall include upset prevention and recovery training.

### **FCL.325.A CPL(A) – Specific requirements for applicants who hold an MPL**

- (a) Applicants for a CPL(A) who hold an MPL shall have completed in aeroplanes:
  - (1) 70 hours of flight time in one of the following ways:
    - (i) as PIC;
    - (ii) made up of at least 10 hours as PIC and the additional flight time as PIC under supervision (PICUS).

Of those 70 hours, 20 hours shall be of VFR cross-country flight time as PIC, or cross-country flight time made up of at least 10 hours as PIC and 10 hours as PICUS. That shall include a VFR cross-country flight of at least 540 km (300 NM) in the course of which full-stop landings at two different aerodromes shall be flown as PIC;
  - (2) the elements of the CPL(A) modular course as specified in Chapter E, point 10(a) and point 11, of Appendix 3;
  - (3) the CPL(A) skill test, in accordance with point FCL.320.
- (b) When being issued with a CPL in accordance with point (a), applicants shall be subject to the following conditions:
  - (1) comply with the requirements of point FCL.405.A(c) in order to have the privileges of their IR(A) extended to single-pilot operations in aeroplanes;
  - (2) have the privileges of their type ratings restricted to exercise the privileges of a co-pilot only. That restriction shall be removed when applicants complete a proficiency check for the relevant type in accordance with Appendix 9 in the role of the PIC.

## **SUBPART E – MULTI-CREW PILOT LICENCE – MPL**

### **FCL.400.A MPL – Minimum age**

An applicant for an MPL shall be at least 18 years of age.

### **FCL.405.A MPL – Privileges**

- (a) The privileges of the holder of an MPL are to act as co-pilot in an aeroplane required to be operated with a co-pilot.
- (b) Holders of an MPL shall, upon application:
  - (1) be issued with additional privileges of the holder of a PPL(A), provided that they comply with the requirements for the PPL(A) specified in Subpart C;
  - (2) have their MPL replaced by a CPL(A), provided that they comply with the requirements specified in point FCL.325.A.
- (c) The holder of an MPL shall have the privileges of his/her IR(A) limited to aeroplanes required to be operated with a co-pilot. The privileges of the IR(A) may be extended to single-pilot operations in aeroplanes, provided that the licence holder has completed the training necessary to act as PIC in single-pilot operations exercised solely by reference to instruments and passed the skill test of the IR(A) as a single-pilot.

### **FCL.410.A MPL – Training course and theoretical knowledge examinations**

- (a) Course.

Applicants for the issue of an MPL shall have completed a training course of theoretical knowledge and flight instruction at an ATO in accordance with Appendix 5 to this MCAR-Part-FCL.
- (b) Examination.

Applicants for the issue of an MPL shall demonstrate a level of theoretical knowledge appropriate to the holders of an ATPL(A), in accordance with FCL.515, and to a multi-pilot type rating.



**FCL.415.A MPL – Practical skill**

- (a) An applicant for an MPL shall have demonstrated through continuous assessment the skills required for fulfilling all the competency units specified in Appendix 5 to this MCAR, as pilot flying and pilot not flying, in a multi-engine turbine-powered multi-pilot aeroplane, under VFR and IFR.
- (b) On completion of the training course, the applicant shall pass a skill test in accordance with Appendix 9 to this MCAR, to demonstrate the ability to perform the relevant procedures and manoeuvres with the competency appropriate to the privileges granted. The skill test shall be taken in the type of aeroplane used on the advanced phase of the MPL integrated training course or in an FFS representing the same type.

## **SUBPART F – AIRLINE TRANSPORT PILOT LICENCE – ATPL**

### **SECTION 1 – COMMON REQUIREMENTS**

#### **FCL.500 ATPL – Minimum age**

Applicants for an ATPL shall be at least 21 years of age.

#### **FCL.505 ATPL – Privileges**

- (a) The privileges of the holder of an ATPL are, within the appropriate aircraft category, to:
  - (1) exercise all the privileges of the holder of an LAPL, a PPL and a CPL;
  - (2) act as PIC of aircraft engaged in commercial air transport.
- (b) Applicants for the issue of an ATPL shall have fulfilled the requirements for the type rating of the aircraft used in the skill test.

#### **FCL.515 ATPL – Training course and theoretical knowledge examinations**

- (a) Course.

Applicants for an ATPL shall have completed a training course at an ATO. The course shall be either an integrated training course or a modular course, in accordance with Appendix 3 to this MCAR-Part-FCL.

- (b) Examination.

Applicants for the issue of an ATPL shall demonstrate a level of knowledge appropriate to the privileges granted in the following subjects:

- (1) air law;
- (2) aircraft general knowledge — airframe/systems/power plant;
- (3) aircraft general knowledge — instrumentation;
- (4) mass and balance;
- (5) performance;

- (6) flight planning and monitoring;
- (7) human performance;
- (8) meteorology;
- (9) general navigation;
- (10) radio navigation;
- (11) operational procedures;
- (12) principles of flight; and
- (13) communications.;

**AMC1 FCL.310; FCL.515(b); FCL.615(b); FCL.835(d) Theoretical knowledge examinations**

**LEARNING OBJECTIVES FOR ATPL, CPL, IR, CB-IR(A) and BIR**

- (a) Aeroplanes and helicopters

**GENERAL**

In the tables of this AMC, the applicable LOs for each ATPL, CPL, IR, CB-IR(A) are marked with an 'X', and for the BIR exam and BIR BK with the number 1, 2 or 3 (corresponding to the modules as mentioned in FCL.835 'Basic instrument rating (BIR)').

The LOs define the subject knowledge and applied knowledge, skills and attitudes that a student pilot should have assimilated during the theoretical knowledge course.

The LOs are intended to be used by an approved training organisation (ATO) when developing the MCAR-Part-FCL theoretical knowledge elements of the appropriate course. It should be noted, however, that the LOs do not provide a ready-made ground training syllabus for individual ATOs, and should not be seen by organisations as a substitute for a thorough course design. Adherence to the LOs should become part of the ATO's compliance monitoring scheme as required by ORA.GEN.200(a)(6) of MCAR-Part-ORA.

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ATOs are required to produce a training plan for each of their courses based on the instructional systems design (ISD) methodology as specified in AMC2 ORA.ATO.230 of MCAR-Part-ORA.

Additional guidance on the meaning and taxonomy of the verbs used in the LOs can be found in GM1 FCL.310; FCL.515(b); FCL.615(b); FCL.835(d).

### **TRAINING AIMS**

After completion of the training, a student pilot should:

- be able to understand and apply the subject knowledge in order to be able to identify and manage threats and errors effectively;
- meet at least the Area 100 KSA minimum standard.

### **INTERPRETATION**

The abbreviations used are ICAO abbreviations listed in ICAO Doc 8400 'ICAO Abbreviations and Codes', or those listed in GM1 FCL.010.

Where a LO refers to a definition, e.g. 'Define the following terms' or 'Define and understand' or 'Explain the definitions in ...', candidates are also expected to be able to recognise a given definition.

Below is a table showing the short references to applicable legislation and standards:

Reference	Legislation/Standard
The Basic Regulation	Civil Aviation Regulations.
The Aircrew Regulation	MCAR-Part-FCL
Part-FCL	MCAR-Part-FCL(as amended)
Part-MED	MCAR-Part-MED (as amended)
CS-23, AMC & GM to CS-23, CS-25, CS-27, CS-29, CS-E and CS-Definitions	Refer to the respective EASA Certification Specifications / AMC & GM
Single European Sky Regulations	Regulation (EC) No 549/2004 of the European Parliament and of the Council of 10 March 2004 laying down the framework for the creation of the single European sky (the framework Regulation) MCAR-Part-ROA

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Reference	Legislation/Standard
	MCAR-Part-ATS MCAR-Part-CNS
Passenger Rights Regulation	Consumer Protection Act establishing common rules on compensation and assistance to passengers in the event of denied boarding and of cancellation or long delay of flights,
RTCA/EUROCAE	Refers to correspondingly numbered documents issued by the Radio Technical Commission for Aeronautics/ European Organisation for Civil Aviation Equipment
ITU Radio Regulation	International Telecommunication Union Radio Regulation
NASA TM-85652	National Aeronautics and Space Administration — Technical Memorandum 85652

‘Applicable operational requirements’ refers to, for the ATPL(A), CPL(A), ATPL(H)/IR, ATPL(H)/VFR, CPL(H), IR and CBIR, MCAR-Part-Definition, MCAR-Part-ARO, MCAR-Part-ORO, MCAR-Part-CAT, MCAR-Part-SPA and MCAR-Part-SPO as amended. For the BIR, it refers to MCAR-Part-definition, MCAR-Part-ARO, MCAR-Part-SPA and MCAR-Part-NCO.

The General Student Pilot Route Manual (GSPRM) contains planning data plus aerodrome and approach charts that may be used in theoretical knowledge training courses. The guidelines on its content can be found in this AMC, before the LO table for Subject 033 ‘Flight planning and monitoring’.

Excerpts from any aircraft manuals including but not limited to CAP 696, 697 and 698 for aeroplanes, and CAP 758 for helicopters may be used in training. Where questions refer to excerpts from aircraft manuals, the associated aircraft data will be provided in the examinations.

Some numerical data (e.g. speeds, altitudes/levels and masses) used in questions for theoretical knowledge examinations may not be representative for helicopter operations, but the data is satisfactory for the calculations required.

Note: In all subject areas, the term ‘mass’ is used to describe a quantity of matter, and ‘weight’ when describing the force. However, the term ‘weight’ is normally used in aviation to colloquially describe mass. The pilot should always note the units to determine whether the term ‘weight’ is being used to describe a force (e.g. unit newton) or quantity of matter (e.g. unit kilogram).

**DETAILED THEORETICAL KNOWLEDGE SYLLABUS AND LOs FOR ATPL, CPL, IR, CB-IR(A) and BIR**

**GENERAL**

The detailed theoretical knowledge syllabus outlines the topics that should be taught and examined in order to meet the theoretical knowledge requirements appropriate to ATPL, MPL, CPL, IR, CB-IR(A) and BIR.

For each topic in the detailed theoretical knowledge syllabus, one or more LOs are set out in the appendices as shown below:

- Appendix 010 AIR LAW
- Appendix 021 AIRCRAFT GENERAL KNOWLEDGE – AIRFRAME, SYSTEMS AND POWER PLANT
- Appendix 022 AIRCRAFT GENERAL KNOWLEDGE – INSTRUMENTATION
- Appendix 031 FLIGHT PERFORMANCE AND PLANNING – MASS AND BALANCE
- Appendix 032 FLIGHT PERFORMANCE AND PLANNING – PERFORMANCE – AEROPLANES
- Appendix 033 FLIGHT PERFORMANCE AND PLANNING – FLIGHT PLANNING AND MONITORING
- Appendix 034 FLIGHT PERFORMANCE AND PLANNING – PERFORMANCE – HELICOPTERS
- Appendix 040 HUMAN PERFORMANCE AND LIMITATIONS
- Appendix 050 METEOROLOGY
- Appendix 061 NAVIGATION – GENERAL NAVIGATION
- Appendix 062 NAVIGATION – RADIO NAVIGATION
- Appendix 070 OPERATIONAL PROCEDURES
- Appendix 081 PRINCIPLES OF FLIGHT – AEROPLANES
- Appendix 082 PRINCIPLES OF FLIGHT – HELICOPTERS

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- Appendix 090 RADIO COMMUNICATIONS
- Appendix AREA 100 KNOWLEDGE, SKILLS AND ATTITUDES (KSA)

(b) Airships

**SYLLABUS OF THEORETICAL KNOWLEDGE FOR CPL AND IR**

The applicable items for each licence or rating are marked with 'x'. An 'x' on the main title of a subject means that all the subdivisions are applicable.'

		CPL	IR
1.	<b>AIR LAW AND ATC PROCEDURES</b>	x	
	INTERNATIONAL LAW: CONVENTIONS, AGREEMENTS AND ORGANISATIONS		
	AIRWORTHINESS OF AIRCRAFT		
	AIRCRAFT NATIONALITY AND REGISTRATION MARKS		
	PERSONNEL LICENSING		x
	RULES OF THE AIR		x
	PROCEDURES FOR AIR NAVIGATION SERVICES: AIRCRAFT OPERATIONS		x
	AIR TRAFFIC SERVICES AND AIR TRAFFIC MANAGEMENT		x
	AERONAUTICAL INFORMATION SERVICE		x
	AERODROMES		x
	FACILITATION		
	SEARCH AND RESCUE		
	SECURITY		
	AIRCRAFT ACCIDENT AND INCIDENT INVESTIGATION		

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		CPL	IR
2.	<b>AIRSHIP GENERAL KNOWLEDGE: ENVELOPE, AIRFRAME AND SYSTEMS, ELECTRICS, POWERPLANT AND EMERGENCY EQUIPMENT</b>	x	
	DESIGN, MATERIALS, LOADS AND STRESSES		
	ENVELOPE AND AIR-BAGS		
	FRAMEWORK		
	GONDOLA		
	FLIGHT CONTROLS		
	LANDING GEAR		
	HYDRAULICS AND PNEUMATICS		
	HEATING AND AIR CONDITIONING		
	FUEL SYSTEM		
	PISTON ENGINES		
	TURBINE ENGINES (BASICS)		
	ELECTRICS		
	FIRE PROTECTION AND DETECTION SYSTEMS		
	MAINTENANCE		
3.	<b>AIRSHIP GENERAL KNOWLEDGE: INSTRUMENTATION</b>	x	
	SENSORS AND INSTRUMENTS		
	MEASUREMENT OF AIR DATA AND GAS PARAMETERS		
	MAGNETISM: DIRECT READING COMPASS AND FLUX VALVE		



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		<b>CPL</b>	<b>IR</b>
	GYROSCOPIC INSTRUMENTS		
	COMMUNICATION SYSTEMS		
	ALERTING SYSTEMS		
	INTEGRATED INSTRUMENTS: ELECTRONIC DISPLAYS		
	FLIGHT MANAGEMENT SYSTEM (GENERAL BASICS)		
	DIGITAL CIRCUITS AND COMPUTERS		
<b>4.</b>	<b>FLIGHT PERFORMANCE AND PLANNING</b>	x	
<b>4.1.</b>	<b>MASS AND BALANCE: AIRSHIPS</b>	x	
	PURPOSE OF MASS AND BALANCE CONSIDERATIONS		
	LOADING		
	FUNDAMENTALS OF CG CALCULATIONS		
	MASS AND BALANCE DETAILS OF AIRCRAFT		
	DETERMINATION OF CG POSITION		
	PASSENGER, CARGO AND BALLAST HANDLING		
<b>4.2.</b>	<b>FLIGHT PLANNING AND FLIGHT MONITORING</b>		
	FLIGHT PLANNING FOR VFR FLIGHTS	x	
	FLIGHT PLANNING FOR IFR FLIGHTS		x
	FUEL PLANNING	x	x

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		<b>CPL</b>	<b>IR</b>
	PRE-FLIGHT PREPARATION	x	x
	ATS FLIGHT PLAN	x	x
	FLIGHT MONITORING AND IN-FLIGHT RE-PLANNING	x	x
<b>4.3.</b>	<b>PERFORMANCE: AIR-SHIPS</b>	x	
	AIRWORTHINESS REQUIREMENTS		
	BASICS OF AIRSHIP PERFORMANCE		
	DEFINITIONS AND TERMS		
	STAGES OF FLIGHT		
	USE OF FLIGHT MANUAL		
<b>5.</b>	<b>HUMAN PERFORMANCE</b>	x	
	HUMAN FACTORS: BASIC CONCEPTS		
	BASIC AVIATION PHYSIOLOGY AND HEALTH MAINTENANCE		
	BASIC AVIATION PSYCHOLOGY		
<b>6.</b>	<b>METEOROLOGY</b>	x	
	THE ATMOSPHERE		
	WIND		
	THERMODYNAMICS		
	CLOUDS AND FOG		
	PRECIPITATION		
	AIR MASSES AND FRONTS		
	PRESSURE SYSTEMS		
	CLIMATOLOGY		
	FLIGHT HAZARDS		
	METEOROLOGICAL INFORMATION		

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		CPL	IR
<b>7.</b>	<b>NAVIGATION</b>		
<b>7.1.</b>	<b>GENERAL NAVIGATION</b>	x	
	BASICS OF NAVIGATION		
	MAGNETISM AND COMPASSES		
	CHARTS		
	DR NAVIGATION		
	IN-FLIGHT NAVIGATION		
<b>7.2.</b>	<b>RADIO NAVIGATION</b>		
	BASIC RADIO PROPAGATION THEORY	x	x
	RADIO AIDS	x	x
	RADAR	x	x
	INTENTIONALLY LEFT BLANK		
	AREA NAVIGATION SYSTEMS AND RNAV/FMS		x
	GNSS	x	x
<b>8.</b>	<b>OPERATIONAL PROCEDURES AIRSHIP</b>	x	
	GENERAL REQUIREMENTS		
	SPECIAL OPERATIONAL PROCEDURES AND HAZARDS (GENERAL ASPECTS)		
	EMERGENCY PROCEDURES		
<b>9.</b>	<b>PRINCIPLES OF FLIGHT</b>	x	
<b>9.1.</b>	<b>PRINCIPLES OF FLIGHT: AIRSHIPS</b>	x	
	BASICS OF AEROSTATICS		
	BASICS OF SUBSONIC AERODYNAMICS		
	AERODYNAMICS OF AIRSHIPS		
	STABILITY		

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		<b>CPL</b>	<b>IR</b>
	CONTROLLABILITY		
	LIMITATIONS		
	PROPELLERS		
	BASICS OF AIRSHIP FLIGHT MECHANICS		
<b>10.</b>	<b>COMMUNICATIONS</b>		
<b>10.1.</b>	<b>VFR COMMUNICATIONS</b>	x	
	DEFINITIONS	x	
	GENERAL OPERATING PROCEDURES	x	
	RELEVANT WEATHER INFORMATION TERMS (VFR)	x	
	ACTION REQUIRED TO BE TAKEN IN CASE OF COMMUNICATION FAIL- URE	x	
	DISTRESS AND UR- GENCY PROCEDURES	x	
	GENERAL PRINCIPLES OF VHF PROPAGATION AND ALLOCATION OF FREQUENCIES	x	
<b>10.2.</b>	<b>IFR COMMUNICATIONS</b>		
	DEFINITIONS		x
	GENERAL OPERATING PROCEDURES		x
	ACTION REQUIRED TO BE TAKEN IN CASE OF COMMUNICATION FAIL- URE		x
	DISTRESS AND UR- GENCY PROCEDURES		x
	RELEVANT WEATHER INFORMATION TERMS (IFR)		x
	GENERAL PRINCIPLES OF VHF PROPAGATION		x

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		CPL	IR
	AND ALLOCATION OF FREQUENCIES		
	MORSE CODE		x

**GM1 FCL.310; FCL.515(b); FCL.615(b); FCL.835(d) Theoretical knowledge examinations**

**EXPLANATION OF THE VERBS USED IN THE BENJAMIN BLOOM TAXONOMY**

- (a) The depth or level of learning to be achieved during the training and the corresponding level of attainment to be examined or assessed is based on the following taxonomy. In each case, the level of knowledge or skill is signified by the learning objective (LO) verb.
- (b) The majority of the LOs relate to the cognitive domain. The taxonomy described by B. Bloom (1956) and Anderson & Krathwohl (2001) has been used as the standard.
- (c) The six sequential increasing levels of required cognitive learning are identified by the LO verb. Hence the lowest level 'remember' is signified by verbs such as 'state', 'list', 'define' and 'recall' whilst the next higher level of 'understand' is signified by verbs such as 'describe' and 'explain'. The third level of 'apply' is signified by the verbs 'calculate', 'interpret', 'relate' and 'solve'. However, the higher levels of 'analyse', which would be signified by the verbs 'plan' or 'discuss' and 'evaluate' and 'create' are less common due at least partially to questions presently possible in the ECQB examination.
- (d) The LOs used in Area 100 KSA differ in that they require a combination of knowledge and skills. However, the 'skill' level does not relate to Bloom's psychomotor taxonomy but is more closely aligned to the higher taxonomy levels required in medicine, because knowledge and skills must be combined by the student pilot in a strategy.
- (e) The verbs 'demonstrate' and 'show', with their meanings defined below, have therefore been used to supplement the cognitive LO verbs for the Area 100 KSA LOs.
  - (1) 'Demonstrate' means the selection and use of the appropriate knowledge, skills and attitudes within a strategy to achieve an effective outcome. It signifies a high taxonomy level and would normally be assessed using multiple indicators from more than one core competency.

- (2) 'Show' means the attainment of knowledge, skill or attitude. It signifies a lower taxonomy level than 'demonstrate' and would normally be assessed by a single indicator.'

## **SECTION 2 – SPECIFIC REQUIREMENTS FOR THE AEROPLANE CATEGORY – ATPL(A)**

### **FCL.505.A ATPL(A) – Restriction of privileges for pilots previously holding an MPL**

When the holder of an ATPL(A) has previously held only an MPL, the privileges of the licence shall be restricted to multi-pilot operations, unless the holder has complied with FCL.405.A(b)(2) and (c) for single-pilot operations.

### **FCL.510.A ATPL(A) – Prerequisites, experience and crediting**

- (a) Prerequisites. Applicants for an ATPL(A) shall hold:
  - (1) an MPL; or
  - (2) a CPL(A) and a multi-engine IR for aeroplanes. In this case, the applicant shall also have received instruction in MCC.
- (b) Experience. Applicants for an ATPL(A) shall have completed a minimum of 1 500 hours of flight time in aeroplanes, including at least:
  - (1) 500 hours in multi-pilot operations on aeroplanes;
  - (2)
    - (i) 500 hours as PIC under supervision; or
    - (ii) 250 hours as PIC; or
    - (iii) 250 hours, including at least 70 hours as PIC, and the remaining as PIC under supervision;
  - (3) 200 hours of cross-country flight time of which at least 100 hours shall be as PIC or as PIC under supervision;
  - (4) 75 hours of instrument time of which not more than 30 hours may be instrument ground time; and
  - (5) 100 hours of night flight as PIC or co-pilot.

Of the 1500 hours of flight time, up to 100 hours of flight time may have been completed in an FFS and FNPT. Of these 100 hours, only a maximum of 25 hours may be completed in an FNPT.

(c) Crediting.

- (1) Holders of a pilot licence for other categories of aircraft shall be credited with flight time up to a maximum of:
  - (i) for TMG or sailplanes, 30 hours flown as PIC;
  - (ii) for helicopters, 50 % of all the flight time requirements of paragraph (b).
- (2) Holders of a flight engineer licence issued in accordance with applicable national rules shall be credited with 50 % of the flight engineer time up to a maximum credit of 250 hours. These 250 hours may be credited against the 1 500 hours requirement of paragraph (b), and the 500 hours requirement of paragraph (b)(1), provided that the total credit given against any of these paragraphs does not exceed 250 hours.
- (3) Holders of a restricted type rating issued in accordance with point FCL.720.A(c) shall receive credits for their flight time completed while exercising the privileges of that type rating up to a maximum of 250 hours.

- (d) The experience required in (b) shall be completed before the skill test for the ATPL(A) is taken.

### **FCL.520.A ATPL(A) – Skill test**

Applicants for an ATPL(A) shall pass a skill test in accordance with Appendix 9 to this MCAR to demonstrate the ability to perform, as PIC of a multi-pilot aeroplane under IFR, the relevant procedures and manoeuvres with the competency appropriate to the privileges granted.

The skill test shall be taken in the aeroplane or an adequately qualified FFS representing the same type.

### **AMC1 FCL.520.A; FCL.520.H**

#### **ATPL SKILL TEST**

The ATPL skill test may serve at the same time as a skill test for the issue of the licence and a proficiency check for the revalidation of the type rating for the aircraft used in the test and may be combined with the skill test for the issue of a MP type rating.



## **GM1 FCL.520.A ATPL(A) — Skill test**

### **ATPL SKILL TEST IN AN EBT MODULE**

The skill test in accordance with Appendix 9 may be combined with an EBT module. It may follow the same process already described in mixed EBT for the LPC (e.g. EVAL + manoeuvres validation phase for the pilot performing the ATPL skill test). The same rationale can be applied to the regular skill test. Guidance can be found in the EASA EBT manual. The Authority may provide additional and further guidance.

## **SECTION 3 – SPECIFIC REQUIREMENTS FOR THE HELICOPTER CATEGORY – ATPL(H)**

### **FCL.510.H ATPL(H) – Prerequisites, experience and crediting**

Applicants for an ATPL(H) shall:

- (a) hold a CPL(H);
- (b) have received instruction in MCC in accordance with point FCL.735.H;
- (c) have completed as a pilot of helicopters a minimum of 1 000 hours of flight time including at least:
  - (1) 350 hours in multi-pilot operations in helicopters;
  - (2)
    - (i) 250 hours as PIC; or
    - (ii) 100 hours as PIC and 150 hours as PIC under supervision; or
    - (iii) 250 hours as PIC under supervision in multi-pilot helicopters. In this case, the ATPL(H) privileges shall be limited to multi-pilot operations only, until 100 hours as PIC have been completed;
  - (3) 200 hours of cross-country flight time of which at least 100 hours shall be as PIC or as PIC under supervision;
  - (4) 30 hours of instrument time of which not more than 10 hours may be instrument ground time; and
  - (5) 100 hours of night flight as PIC or as co-pilot.

Of the 1 000 hours, a maximum of 100 hours may have been completed in an FSTD, of which not more than 25 hours may be completed in an FNPT;
- (d) flight time in aeroplanes shall be credited up to 50 % against the flight time requirements of point (c);
- (e) the experience required in point (c) shall be completed before the skill test for the ATPL(H) is taken;
- (f) applicants for an ATPL(H) shall receive a full credit for the requirement in point (b) when they comply with point FCL.720.H(a)(2)(ii) and, additionally, have received

training at an ATO to meet the necessary standard for the successful completion of the course as per point FCL.735.H.

### **AMC1 FCL.510.H(f) ATPL(H) — Prerequisites, experience and crediting**

#### **MCC TRAINING WITH CREDITS FOR ATPL(H) — PILOTS THAT ARE EXPERIENCED IN MULTI-PILOT OPERATIONS**

(a) General

MCC training in accordance with point FCL.510.H(f) is intended to be completed by applicants who are undergoing integrated ATPL(H) training.

(b) Training course

The training course should include theoretical training instruction and exercises, as well as practical MCC training using one of the following helicopter simulators:

- (1) FNPT II or III qualified for MCC;
- (2) an FTD 2/3;
- (3) an FFS.

(c) Objectives

The training course should meet the objectives of AMC1 FCL.735.A; FCL.735.H; FCL.735.As. The head of training of the ATO should adapt the duration of training to the individual needs of the applicant, in order to achieve these objectives.

(d) Certificate of completion

On completion of the course, once the applicant has met the objectives defined in (c), the applicant should receive a certificate of completion of the training from the ATO. The form should be based on that defined in AMC1 FCL.735.A; FCL.735.H; FCL.735.As. The title of the form should read 'Training in accordance with FCL.510(f) — helicopters'.

### **FCL.520.H ATPL(H) – Skill test**

Applicants for an ATPL(H) shall pass a skill test in accordance with Appendix 9 to this MCAR to demonstrate the ability to perform as PIC of a multi-pilot helicopter the relevant procedures and manoeuvres with the competency appropriate to the privileges granted.

The skill test shall be taken in the helicopter or an adequately qualified FFS representing the same type.

**AMC1 FCL.520.A; FCL.520.H**

**ATPL SKILL TEST**

The ATPL skill test may serve at the same time as a skill test for the issue of the licence and a proficiency check for the revalidation of the type rating for the aircraft used in the test and may be combined with the skill test for the issue of a MP type rating.

## **SUBPART G – INSTRUMENT RATING – IR**

### **SECTION 1 – COMMON REQUIREMENTS**

#### **FCL.600 IR – General**

Except as provided in point FCL.835, operations under IFR on an aeroplane, helicopter, airship or powered-lift aircraft shall be conducted only by holders of a PPL, CPL, MPL and ATPL with an IR appropriate to the category of aircraft or, if an IR appropriate to the category of aircraft is not available, only while undergoing skill testing or dual instruction.

#### **FCL.605 IR – Privileges and conditions**

(a) Privileges

The privileges of holders of an IR are to fly aircraft under IFR, including PBN operations, with a minimum decision height of:

- (1) no less than 200 ft (60 m);
- (2) less than 200 ft (60 m), provided that they are authorised to do so in accordance with MCAR-Part-SPA.

(b) Conditions

- (1) Holders of an IR shall exercise their privileges in accordance with the conditions established in Appendix 8 to this MCAR.
- (2) To exercise privileges as PIC under IFR in multi-pilot operation in helicopters, holders of an IR(H) shall have at least 70 hours of instrument time, of which up to 30 hours may be instrument ground time.

#### **FCL.610 IR – Prerequisites and crediting**

Applicants for an IR shall:

(a) hold:

- (1) at least a PPL in the appropriate aircraft category, and:
  - (i) the privileges to fly at night in accordance with FCL.810, if the IR privileges will be used at night; or

- (ii) an ATPL in another category of aircraft; or
- (2) a CPL, in the appropriate aircraft category;
- (b) have completed at least 50 hours of cross-country flight time as PIC in aeroplanes, TMGs, helicopters or airships, of which at least 10 or, in the case of airships, 20 hours shall be in the relevant aircraft category.
- (c) Helicopters only. Applicants who have completed an ATP(H)/IR, ATP(H), CPL(H)/IR or CPL(H) integrated training course shall be exempted from the requirement in (b).

### **FCL.615 IR – Theoretical knowledge and flight instruction**

(a) Course

Applicants for an IR shall have completed a course of theoretical knowledge and flight instruction at an ATO. The course shall be:

- (1) an integrated training course which includes training for the IR, in accordance with Appendix 3 to this MCAR-Part-FCL; or
- (2) a modular course in accordance with Appendix 6 to this MCAR-Part-FCL.

(b) Examination

Applicants shall demonstrate a level of theoretical knowledge appropriate to the privileges granted in the following subjects:

- (1) air law;
- (2) aircraft general knowledge — instrumentation;
- (3) flight planning and monitoring;
- (4) human performance;
- (5) meteorology;
- (6) radio navigation; and
- (7) communications.;

**AMC1 FCL.310; FCL.515(b); FCL.615(b); FCL.835(d) Theoretical knowledge examinations**

**LEARNING OBJECTIVES FOR ATPL, CPL, IR, CB-IR(A) and BIR**

- (a) Aeroplanes and helicopters

**GENERAL**

In the tables of this AMC, the applicable LOs for each ATPL, CPL, IR, CB-IR(A) are marked with an 'X', and for the BIR exam and BIR BK with the number 1, 2 or 3 (corresponding to the modules as mentioned in FCL.835 'Basic instrument rating (BIR)').

The LOs define the subject knowledge and applied knowledge, skills and attitudes that a student pilot should have assimilated during the theoretical knowledge course.

The LOs are intended to be used by an approved training organisation (ATO) when developing the MCAR-Part-FCL theoretical knowledge elements of the appropriate course. It should be noted, however, that the LOs do not provide a ready-made ground training syllabus for individual ATOs, and should not be seen by organisations as a substitute for a thorough course design. Adherence to the LOs should become part of the ATO's compliance monitoring scheme as required by ORA.GEN.200(a)(6) of MCAR-Part-ORA.

ATOs are required to produce a training plan for each of their courses based on the instructional systems design (ISD) methodology as specified in AMC2 ORA.ATO.230 of MCAR-Part-ORA.

Additional guidance on the meaning and taxonomy of the verbs used in the LOs can be found in GM1 FCL.310; FCL.515(b); FCL.615(b); FCL.835(d).

**TRAINING AIMS**

After completion of the training, a student pilot should:

- be able to understand and apply the subject knowledge in order to be able to identify and manage threats and errors effectively;
- meet at least the Area 100 KSA minimum standard.

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## **INTERPRETATION**

The abbreviations used are ICAO abbreviations listed in ICAO Doc 8400 'ICAO Abbreviations and Codes', or those listed in GM1 FCL.010.

Where a LO refers to a definition, e.g. 'Define the following terms' or 'Define and understand' or 'Explain the definitions in ...', candidates are also expected to be able to recognise a given definition.

Below is a table showing the short references to applicable legislation and standards:

<b>Reference</b>	<b>Legislation/Standard</b>
The Basic Regulation	Civil Aviation Regulations 2007
The Aircrew Regulation	Civil Aviation Regulations 2007
Part-FCL	MCAR-Part-FCL
Part-MED	MCAR-Part-med
CS-23, AMC & GM to CS-23, CS-25, CS-27, CS-29, CS-E and CS-Definitions	Refer to the respective EASA Certification Specifications / AMC & GM
Single European Sky Regulations	Regulation (EC) No 549/2004 of the European Parliament and of the Council of 10 March 2004 laying down the framework for the creation of the single European sky (the framework Regulation) MCAR-Part-ROA MCAR-Part-ATS MCAR-Part-CNS
Passenger Rights Regulation	Under UK and EU regulations and Mauritius Code de Commerce.
RTCA/EUROCAE	Refers to correspondingly numbered documents issued by the Radio Technical Commission for Aeronautics/ European Organisation for Civil Aviation Equipment
ITU Radio Regulation	International Telecommunication Union Radio Regulation
NASA TM-85652	National Aeronautics and Space Administration — Technical Memorandum 85652



‘Applicable operational requirements’ refers to, for the ATPL(A), CPL(A), ATPL(H)/IR, ATPL(H)/VFR, CPL(H), IR and CBIR, For the BIR, it refers to MCAR-BCL.

The General Student Pilot Route Manual (GSPRM) contains planning data plus aerodrome and approach charts that may be used in theoretical knowledge training courses. The guidelines on its content can be found in this AMC, before the LO table for Subject 033 ‘Flight planning and monitoring’.

Excerpts from any aircraft manuals including but not limited to CAP 696, 697 and 698 for aeroplanes, and CAP 758 for helicopters may be used in training. Where questions refer to excerpts from aircraft manuals, the associated aircraft data will be provided in the examinations.

Some numerical data (e.g. speeds, altitudes/levels and masses) used in questions for theoretical knowledge examinations may not be representative for helicopter operations, but the data is satisfactory for the calculations required.

Note: In all subject areas, the term ‘mass’ is used to describe a quantity of matter, and ‘weight’ when describing the force. However, the term ‘weight’ is normally used in aviation to colloquially describe mass. The pilot should always note the units to determine whether the term ‘weight’ is being used to describe a force (e.g. unit newton) or quantity of matter (e.g. unit kilogram).

## **DETAILED THEORETICAL KNOWLEDGE SYLLABUS AND LOs FOR ATPL, CPL, IR, CB-IR(A) and BIR**

### **GENERAL**

The detailed theoretical knowledge syllabus outlines the topics that should be taught and examined in order to meet the theoretical knowledge requirements appropriate to ATPL, MPL, CPL, IR, CB-IR(A) and BIR.

For each topic in the detailed theoretical knowledge syllabus, one or more LOs are set out in the appendices as shown below:

- Appendix 010 AIR LAW
- Appendix 021 AIRCRAFT GENERAL KNOWLEDGE – AIRFRAME, SYSTEMS AND POWER PLANT
- Appendix 022 AIRCRAFT GENERAL KNOWLEDGE – INSTRUMENTATION

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- Appendix 031 FLIGHT PERFORMANCE AND PLANNING – MASS AND BALANCE
- Appendix 032 FLIGHT PERFORMANCE AND PLANNING – PERFORMANCE – AEROPLANES
- Appendix 033 FLIGHT PERFORMANCE AND PLANNING – FLIGHT PLANNING AND MONITORING
- Appendix 034 FLIGHT PERFORMANCE AND PLANNING – PERFORMANCE – HELICOPTERS
- Appendix 040 HUMAN PERFORMANCE AND LIMITATIONS
- Appendix 050 METEOROLOGY
- Appendix 061 NAVIGATION – GENERAL NAVIGATION
- Appendix 062 NAVIGATION – RADIO NAVIGATION
- Appendix 070 OPERATIONAL PROCEDURES
- Appendix 081 PRINCIPLES OF FLIGHT – AEROPLANES
- Appendix 082 PRINCIPLES OF FLIGHT – HELICOPTERS
- Appendix 090 RADIO COMMUNICATIONS
- Appendix AREA 100 KNOWLEDGE, SKILLS AND ATTITUDES (KSA)

(b) Airships

**SYLLABUS OF THEORETICAL KNOWLEDGE FOR CPL AND IR**

The applicable items for each licence or rating are marked with 'x'. An 'x' on the main title of a subject means that all the subdivisions are applicable.'

		CPL	IR
1.	<b>AIR LAW AND ATC PROCEDURES</b>	x	
	INTERNATIONAL LAW: CONVENTIONS, AGREEMENTS AND ORGANISATIONS		

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		CPL	IR
	AIRWORTHINESS OF AIRCRAFT		
	AIRCRAFT NATIONALITY AND REGISTRATION MARKS		
	PERSONNEL LICENSING		x
	RULES OF THE AIR		x
	PROCEDURES FOR AIR NAVIGATION SERVICES: AIRCRAFT OPERATIONS		x
	AIR TRAFFIC SERVICES AND AIR TRAFFIC MANAGEMENT		x
	AERONAUTICAL INFORMATION SERVICE		x
	AERODROMES		x
	FACILITATION		
	SEARCH AND RESCUE		
	SECURITY		
	AIRCRAFT ACCIDENT AND INCIDENT INVESTIGATION		
2.	<b>AIRSHIP GENERAL KNOWLEDGE: ENVELOPE, AIRFRAME AND SYSTEMS, ELECTRICS, POWERPLANT AND EMERGENCY EQUIPMENT</b>	x	
	DESIGN, MATERIALS, LOADS AND STRESSES		
	ENVELOPE AND AIR-BAGS		
	FRAMEWORK		
	GONDOLA		
	FLIGHT CONTROLS		
	LANDING GEAR		

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		<b>CPL</b>	<b>IR</b>
	HYDRAULICS AND PNEUMATICS		
	HEATING AND AIR CONDITIONING		
	FUEL SYSTEM		
	PISTON ENGINES		
	TURBINE ENGINES (BASICS)		
	ELECTRICS		
	FIRE PROTECTION AND DETECTION SYSTEMS		
	MAINTENANCE		
<b>3.</b>	<b>AIRSHIP GENERAL KNOWLEDGE: INSTRUMENTATION</b>	x	
	SENSORS AND INSTRUMENTS		
	MEASUREMENT OF AIR DATA AND GAS PARAMETERS		
	MAGNETISM: DIRECT READING COMPASS AND FLUX VALVE		
	GYROSCOPIC INSTRUMENTS		
	COMMUNICATION SYSTEMS		
	ALERTING SYSTEMS		
	INTEGRATED INSTRUMENTS: ELECTRONIC DISPLAYS		
	FLIGHT MANAGEMENT SYSTEM (GENERAL BASICS)		
	DIGITAL CIRCUITS AND COMPUTERS		
<b>4.</b>	<b>FLIGHT PERFORMANCE AND PLANNING</b>	x	

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		CPL	IR
<b>4.1.</b>	<b>MASS AND BALANCE: AIRSHIPS</b>	x	
	PURPOSE OF MASS AND BALANCE CONSIDERATIONS		
	LOADING		
	FUNDAMENTALS OF CG CALCULATIONS		
	MASS AND BALANCE DETAILS OF AIRCRAFT		
	DETERMINATION OF CG POSITION		
	PASSENGER, CARGO AND BALLAST HANDLING		
<b>4.2.</b>	<b>FLIGHT PLANNING AND FLIGHT MONITORING</b>		
	FLIGHT PLANNING FOR VFR FLIGHTS	x	
	FLIGHT PLANNING FOR IFR FLIGHTS		x
	FUEL PLANNING	x	x
	PRE-FLIGHT PREPARATION	x	x
	ATS FLIGHT PLAN	x	x
	FLIGHT MONITORING AND IN-FLIGHT RE-PLANNING	x	x
<b>4.3.</b>	<b>PERFORMANCE: AIRSHIPS</b>	x	
	AIRWORTHINESS REQUIREMENTS		
	BASICS OF AIRSHIP PERFORMANCE		
	DEFINITIONS AND TERMS		
	STAGES OF FLIGHT		
	USE OF FLIGHT MANUAL		

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		CPL	IR
<b>5.</b>	<b>HUMAN PERFORMANCE</b>	x	
	HUMAN FACTORS: BASIC CONCEPTS		
	BASIC AVIATION PHYSI- OLOGY AND HEALTH MAINTENANCE		
	BASIC AVIATION PSY- CHOLOGY		
<b>6.</b>	<b>METEOROLOGY</b>	x	
	THE ATMOSPHERE		
	WIND		
	THERMODYNAMICS		
	CLOUDS AND FOG		
	PRECIPITATION		
	AIR MASSES AND FRONTS		
	PRESSURE SYSTEMS		
	CLIMATOLOGY		
	FLIGHT HAZARDS		
	METEOROLOGICAL IN- FORMATION		
<b>7.</b>	<b>NAVIGATION</b>		
<b>7.1.</b>	<b>GENERAL NAVIGATION</b>	x	
	BASICS OF NAVIGATION		
	MAGNETISM AND COM- PASSES		
	CHARTS		
	DR NAVIGATION		
	IN-FLIGHT NAVIGATION		
<b>7.2.</b>	<b>RADIO NAVIGATION</b>		
	BASIC RADIO PROPAGA- TION THEORY	x	x
	RADIO AIDS	x	x
	RADAR	x	x
	INTENTIONALLY LEFT BLANK		

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		CPL	IR
	AREA NAVIGATION SYSTEMS AND RNAV/FMS		x
	GNSS	x	x
<b>8.</b>	<b>OPERATIONAL PROCEDURES AIRSHIP</b>	x	
	GENERAL REQUIREMENTS		
	SPECIAL OPERATIONAL PROCEDURES AND HAZARDS (GENERAL ASPECTS)		
	EMERGENCY PROCEDURES		
<b>9.</b>	<b>PRINCIPLES OF FLIGHT</b>	x	
<b>9.1.</b>	<b>PRINCIPLES OF FLIGHT: AIRSHIPS</b>	x	
	BASICS OF AEROSTATICS		
	BASICS OF SUBSONIC AERODYNAMICS		
	AERODYNAMICS OF AIRSHIPS		
	STABILITY		
	CONTROLLABILITY		
	LIMITATIONS		
	PROPELLERS		
	BASICS OF AIRSHIP FLIGHT MECHANICS		
<b>10.</b>	<b>COMMUNICATIONS</b>		
<b>10.1.</b>	<b>VFR COMMUNICATIONS</b>	x	
	DEFINITIONS	x	
	GENERAL OPERATING PROCEDURES	x	
	RELEVANT WEATHER INFORMATION TERMS (VFR)	x	
	ACTION REQUIRED TO BE TAKEN IN CASE OF	x	

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		CPL	IR
	COMMUNICATION FAILURE		
	DISTRESS AND URGENCY PROCEDURES	x	
	GENERAL PRINCIPLES OF VHF PROPAGATION AND ALLOCATION OF FREQUENCIES	x	
<b>10.2.</b>	<b>IFR COMMUNICATIONS</b>		
	DEFINITIONS		x
	GENERAL OPERATING PROCEDURES		x
	ACTION REQUIRED TO BE TAKEN IN CASE OF COMMUNICATION FAILURE		x
	DISTRESS AND URGENCY PROCEDURES		x
	RELEVANT WEATHER INFORMATION TERMS (IFR)		x
	GENERAL PRINCIPLES OF VHF PROPAGATION AND ALLOCATION OF FREQUENCIES		x
	MORSE CODE		x

**GM1 FCL.310; FCL.515(b); FCL.615(b); FCL.835(d) Theoretical knowledge examinations**

**EXPLANATION OF THE VERBS USED IN THE BENJAMIN BLOOM TAXONOMY**

- (a) The depth or level of learning to be achieved during the training and the corresponding level of attainment to be examined or assessed is based on the following taxonomy. In each case, the level of knowledge or skill is signified by the learning objective (LO) verb.



- (b) The majority of the LOs relate to the cognitive domain. The taxonomy described by B. Bloom (1956) and Anderson & Krathwohl (2001) has been used as the standard.
- (c) The six sequential increasing levels of required cognitive learning are identified by the LO verb. Hence the lowest level 'remember' is signified by verbs such as 'state', 'list', 'define' and 'recall' whilst the next higher level of 'understand' is signified by verbs such as 'describe' and 'explain'. The third level of 'apply' is signified by the verbs 'calculate', 'interpret', 'relate' and 'solve'. However, the higher levels of 'analyse', which would be signified by the verbs 'plan' or 'discuss' and 'evaluate' and 'create' are less common due at least partially to questions presently possible in the ECQB examination.
- (d) The LOs used in Area 100 KSA differ in that they require a combination of knowledge and skills. However, the 'skill' level does not relate to Bloom's psychomotor taxonomy but is more closely aligned to the higher taxonomy levels required in medicine, because knowledge and skills must be combined by the student pilot in a strategy.
- (e) The verbs 'demonstrate' and 'show', with their meanings defined below, have therefore been used to supplement the cognitive LO verbs for the Area 100 KSA LOs.
  - (1) 'Demonstrate' means the selection and use of the appropriate knowledge, skills and attitudes within a strategy to achieve an effective outcome. It signifies a high taxonomy level and would normally be assessed using multiple indicators from more than one core competency.
  - (2) 'Show' means the attainment of knowledge, skill or attitude. It signifies a lower taxonomy level than 'demonstrate' and would normally be assessed by a single indicator.'

### **AMC1 FCL.615(b) IR – Theoretical knowledge and flight instruction**

#### **SYLLABUS OF THEORETICAL KNOWLEDGE FOR THE IR FOLLOWING THE COMPETENCY-BASED MODULAR COURSE AND BIR**

- (a) The syllabus for the theoretical knowledge instruction and examination for the ATPL, MPL, CPL and IR in AMC1 FCL.310; FCL.515(b); FCL.615(b), FCL.835(d) should be used for the CB-IR(A) and the BIR respectively.
- (b) Aspects related to threat and error management (TEM) should be included in an integrated manner, taking into account the particular risks associated to the licence and the activity.

- (c) An applicant who has completed a modular IR(A) course according to Appendix 6 Section A and passed the IR(A) theoretical knowledge examination should be fully credited towards the requirements of theoretical knowledge instruction and examination for a competency-based IR(A) or EIR within the validity period of the examination. An applicant wishing to transfer to a competency-based IR(A) or BIR course during a modular IR(A) course should be credited towards the requirements of theoretical knowledge instruction and examination for a competency-based IR(A) or BIR for those subjects or theory items already completed.

### **FCL.620 IR – Skill test**

Applicants for an IR shall pass a skill test in accordance with Appendix 7 to this MCAR to demonstrate their ability to perform the relevant procedures and manoeuvres with a degree of competency appropriate to the privileges granted.

### **FCL.625 IR – Validity, revalidation and renewal**

- (a) Validity

An IR shall be valid for 1 year.

- (b) Revalidation

- (1) An IR shall be revalidated within the 3 months immediately preceding its expiry date by complying with the revalidation criteria for the relevant aircraft category.
- (2) If applicants choose to fulfil the revalidation requirements earlier than prescribed in point (1), the new validity period shall commence from the date of the proficiency check.
- (3) Applicants who fail to pass the relevant section of an IR proficiency check before the expiry date of the IR shall exercise the IR privileges only if they have passed the IR proficiency check.
- (4) Applicants for the revalidation of an IR shall receive full credits for the proficiency check as required in this Subpart when they complete EBT practical assessment in accordance with Appendix 10 related to the IR at an EBT operator.

- (c) Renewal

If an IR has expired, in order to renew their privileges, applicants shall comply with all of the following:

- (1) in order to determine whether refresher training is necessary for the applicant to reach the level of proficiency needed to pass the instrument element of the skill test in accordance with Appendix 9, they shall undergo an assessment at either of the following organisations:
    - (i) at an ATO;
    - (ii) at an EBT operator that is specifically approved for such refresher training;
  - (2) if deemed necessary by the organisation providing the assessment in accordance with point (1), they shall complete refresher training at that organisation;
  - (3) after complying with point (1) and, as applicable, point (2), they shall pass a proficiency check in accordance with Appendix 9 or complete EBT practical assessment in accordance with Appendix 10 in the relevant aircraft category. That EBT practical assessment may be combined with the refresher training specified in point (2);
  - (4) they shall hold the relevant class or type rating unless specified otherwise in this MCAR.
- (d) If the IR has not been revalidated or renewed in the preceding 7 years, applicants for the IR shall pass again the IR theoretical knowledge examination and skill test.
- (e) Holders of a valid IR on a pilot licence issued by a third country in accordance with Annex 1 to the Chicago Convention shall be exempted from complying with the requirements in points (c)(1), (c)(2) and (d) when renewing the IR privileges contained in licences issued in accordance with this MCAR.
- (f) The proficiency check specified in point (c)(3) may be combined with a proficiency check performed for the renewal of the relevant class or type rating.

#### **AMC1 FCL.625(c) IR – Validity, revalidation and renewal**

##### **RENEWAL OF INSTRUMENT RATING AT AN APPROVED TRAINING ORGANISATION (ATO): REFRESHER TRAINING**

- (a) The objective of the refresher training at an ATO is to reach the level of proficiency needed to pass the instrument rating proficiency check, as described in Appendix 9, or the instrument rating skill test as described in Appendix 7 to MCAR-Part-FCL, as applicable. The amount of refresher training needed should be determined by the ATO on a case-by-case basis, taking into account the following factors:

- (1) the experience of the applicant;
- (2) the amount of time elapsed since the privileges of the rating were last used;
- (3) the complexity of the aircraft;
- (4) whether the applicant has a current rating on another aircraft type or class;  
and
- (5) where considered necessary, the performance of the applicant during a simulated proficiency check for the rating in a flight simulation training device (FSTD) or an aircraft of a relevant type or class.

The amount of training needed to reach the desired level of competency should increase with the time elapsed since the privileges of the rating were last used.

- (b) Once the ATO has determined the needs of the applicant, it should develop an individual training programme based on the ATO's approved course for the rating and focusing on those aspects where the applicant has shown the greatest needs. Theoretical-knowledge instruction should be included, as necessary. The performance of the applicant should be reviewed during the training, and additional instruction should be provided where necessary to reach the standard required for the proficiency check.
- (c) After successful completion of the training, the ATO should provide a training completion certificate to the applicant, which describes the evaluation of the factors listed under (a) above and the training received, and includes a statement that the training has been successfully completed. The training completion certificate should be presented to the examiner prior to the proficiency check. Following the successful renewal of the rating, the training completion certificate and examiner report form should be submitted to the Authority.
- (d) Taking into account the factors listed in (a) above, an ATO may also decide that the applicant already possesses the required level of proficiency and that no refresher training is necessary. In such a case, the certificate or other documental evidence referred to in point (c) above should contain a respective statement including sufficient reasoning.

## **SECTION 2 – SPECIFIC REQUIREMENTS FOR THE AEROPLANE CATEGORY**

### **FCL.620.A IR(A) – Skill test**

- (a) For a multi-engine IR(A), the skill test shall be taken in a multi-engine aeroplane. For a single engine IR(A), the test shall be taken in a single-engine aeroplane. A multi-engine centreline thrust aeroplane shall be considered a single-engine aeroplane for the purposes of this point.
- (b) Applicants who have completed a skill test for a multi-engine IR(A) in a single-pilot multi-engine aeroplane for which a class rating is required shall also be issued with a single-engine IR(A) for the single-engine aeroplane class or type ratings that they hold.

### **FCL.625.A IR(A) – Revalidation**

- (a) Revalidation.

To revalidate an IR(A), applicants shall:

- (1) hold the relevant class or type rating, unless the IR revalidation is combined with the renewal of the relevant class or type rating;
- (2) pass a proficiency check in accordance with Appendix 9, or complete EBT practical assessment in accordance with Appendix 10, if the IR revalidation is combined with the revalidation of a class or type rating;
- (3) if the IR revalidation is not combined with the revalidation of a class or type rating:
  - (i) for single-pilot aeroplanes, complete section 3b and those parts of section 1 which are relevant to the intended flight of the proficiency check in accordance with Appendix 9 to this MCAR;
  - (ii) for multi-engine aeroplanes, complete section 6 of the proficiency check for single pilot aeroplanes in accordance with Appendix 9 to this MCAR by sole reference to instruments.
- (4) An FNPT II or an FFS representing the relevant class or type of aeroplane may be used for the revalidation pursuant to point (3), provided that at least

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each alternate proficiency check for the revalidation of an IR(A) is performed in an aeroplane.

- (b) Cross-credit shall be given in accordance with Appendix 8 to this MCAR.

## **SECTION 3 – SPECIFIC REQUIREMENTS FOR THE HELICOPTER CATEGORY**

### **FCL.625.H IR(H) – Revalidation**

- (a) To revalidate an IR(H), applicants shall:
  - (1) hold the relevant type rating, unless the IR revalidation is combined with the renewal of the relevant type rating;
  - (2) pass a proficiency check in accordance with Appendix 9 to this MCAR for the relevant type of helicopter if the IR revalidation is combined with the revalidation of a type rating;
  - (3) if the IR revalidation is not combined with the revalidation of a type rating, complete Section 5 and the relevant parts of Section 1 of the proficiency check in accordance with Appendix 9 to this MCAR for the relevant type of helicopter.
- (b) An FTD 2/3 or an FFS representing the relevant type of helicopter may be used for the proficiency check pursuant to point (a)(3), provided that at least each alternate proficiency check for the revalidation of an IR(H) is performed in a helicopter.
- (c) Cross-credit shall be given in accordance with Appendix 8 to this MCAR.

### **FCL.630.H IR(H) – Extension of the privileges of an IR(H) to further helicopter types**

Unless specified otherwise in the operational suitability data established in accordance with MCAR-Part-21, holders of an IR(H) who wish to extend their IR(H) privileges to further helicopter types shall, in addition to the relevant type rating training course, complete at an ATO 2 hours of flight training on the relevant type by sole reference to instruments according to IFR which may be conducted in an FFS or an FTD which appropriately represents the relevant type for IFR operation.

### **AMC1 FCL.630.H IR(H) — Extension of the privileges of an IR(H) to further helicopter types**

#### **APPROPRIATE FFS OR FTD**

The appropriate FSTD should be a FFS C/D or a FTD 2/3.

## **SECTION 4 – SPECIFIC REQUIREMENTS FOR THE AIRSHIP CATEGORY**

### **FCL.620.As IR(As) – Skill test**

For a multi-engine IR(As), the skill test shall be taken in a multi-engine airship. For a single-engine IR(As), the test shall be taken in a single-engine airship.

### **FCL.625.As IR(As) – Revalidation**

Applicants for the revalidation of an IR(As):

- (a) when combined with the revalidation of a type rating, shall complete a proficiency check in accordance with Appendix 9 to this MCAR, for the relevant type of airship;
- (b) when not combined with the revalidation of a type rating, shall complete section 5 and those parts of section 1 relevant to the intended flight of the proficiency check for airships in accordance with Appendix 9 of this MCAR. In this case, an FTD 2/3 or FFS representing the relevant type may be used, but at least each alternate proficiency check for the revalidation of an IR(As) in these circumstances shall be performed in an airship.



## **SUBPART H – CLASS AND TYPE RATINGS**

### **SECTION 1 – COMMON REQUIREMENTS**

#### **FCL.700 Circumstances in which class or type ratings are required**

- (a) Holders of a pilot licence shall act as pilots of an aircraft only if they have a valid and appropriate class or type rating, unless any of the following applies:
  - (1) if exercising the privileges of an LAPL;
  - (2) if they take skill tests or proficiency checks for renewal of class or type ratings;
  - (3) if they receive flight instruction;
  - (4) if they hold a flight test rating issued in accordance with point FCL.820.
- (b) Notwithstanding (a), in the case of flights related to the introduction or modification of aircraft types, pilots may hold a special certificate given by the Authority, authorising them to perform the flights. This authorisation shall have its validity limited to the specific flights.

#### **AMC1 FCL.700 Circumstances in which class or type ratings are required**

- (a) A class or type rating and license endorsement should comply with the class and type ratings that are listed in one of the following EASA publications, as applicable:
  - (1) 'List of Aeroplanes — Class and Type Ratings and Endorsement List'; and
  - (2) 'List of Helicopters — Type Ratings List'.
- (b) Holders of MCAR-Part-FCL licences should complete differences training or familiarisation training in accordance with the lists of point (a).

#### **GM1 FCL.700 Circumstances in which class or type ratings are required**

##### **LIST OF CLASS OR TYPE RATINGS**

The following tables contain lists of aeroplanes or TMG that are included in class ratings.

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(a) Class ratings (aeroplane): SP and SEP or MEP aeroplane (land or sea):

Manufacturer	Aeroplanes		Licence Endorsement
<b>All manufacturers</b>	SEP (land)	<b>(D)</b>	<b>SEP (land)</b>
	SEP (land) with variable pitch propellers		
	SEP (land) with retractable undercarriage		
	SEP (land) with turbo or super charged engines		
	SEP (land) with cabin pressurisation		
	SEP (land) with tail wheels		
	SEP (land) with EFIS		
	SEP (land) with SLPC		
	SEP (sea)	<b>(D)</b>	<b>SEP (sea)</b>
	SEP (sea) with variable pitch propellers		
<b>All manufacturers</b>	SEP (sea) with turbo or super charged engines		
	SEP (sea) with cabin pressurisation		
	SEP (sea) with EFIS		
	SEP (sea) with SLPC		
<b>All manufacturers</b>	MEP (land)	<b>(D)</b>	<b>MEP (land)</b>
	MEP (sea)	<b>(D)</b>	<b>MEP (sea)</b>

(b) Class ratings (aeroplane): SP and SEP TMG (land):

Manufacturer	Aeroplanes		Licence Endorsement
<b>All manufacturers</b>	All TMGs having an integrally mounted, non-retractable engine and a non-retractable propeller		<b>TMG</b>

(c) Additional class and type rating lists and endorsement lists are published by the Agency.

(d) Whenever (D) is indicated in one of the lists mentioned in paragraphs (a) to (c), it indicates that differences training in accordance with FCL.710 is required.

## **FCL.705 Privileges of the holder of a class or type rating**

The privileges of the holder of a class or type rating are to act as pilot on the class or type of aircraft specified in the rating.

## **FCL.710 Class and type ratings – variants**

- (a) Pilots shall complete differences training or familiarisation in order to extend their privileges to another variant of aircraft within a class or type rating, or, in the case of point FCL.710(d)(1) of this MCAR, in order to maintain those privileges. In the case of variants within a class or type rating, the differences training or familiarisation shall include the relevant elements defined in the operational suitability data established in accordance with MCAR-Part-21, where applicable. When extending the privileges of an SEP aeroplane class rating to a variant with another type of engine referred to in Article 2, point (8c), of this Regulation, the differences training shall consist of dual flight instruction and theoretical knowledge instruction which shall include, with regard to that other type of engine and related aircraft systems, at least all of the following subjects:
  - (1) Aircraft general knowledge;
  - (2) Operational procedures;
  - (3) Flight performance and planning.
- (b) The differences training shall be conducted at any of the following:
  - (1) an ATO;
  - (2) a DTO in the case of aircraft referred to in points (a)(1)(c) and (a)(2)(c) of point DTO.GEN.110 of MCAR-Part-DTO;
  - (3) an AOC holder having an approved differences training programme for the relevant class or type.
- (c) Notwithstanding the requirement in point (b), differences training for the following aircraft may be conducted by an appropriately qualified instructor unless otherwise provided in the operational suitability data established in accordance with MCAR-Part-21:
  - (1) aeroplanes requiring a class rating:
    - (i) TMGs;

- (ii) SEP aeroplanes;
  - (iii) MEP aeroplanes;
  - (iv) SET aeroplanes, except for complex or high-performance SET aeroplanes;
- (2) single-engine helicopters with a maximum take-off mass not exceeding 3 175 kg.
- (d) Pilots who, after having extended their privileges to another variant within a class or type rating in accordance with this point, have not flown that variant within the preceding 2 years shall, before exercising their privileges in that variant, complete any of the following in that variant:
  - (1) further differences training in accordance with points (a) and (b) or, if applicable, (c);
  - (2) a proficiency check;
  - (3) in the case of a variant within the SEP class rating with a particular engine type referred to in Article 2, point (8c), refresher training in accordance with point FCL.740.A(b)(1)(ii)(C).
- (da) Point FCL.710(d) shall not apply in the case of variants within the TMG class rating and variants within the SEP class rating that have the same type of engine a licence may be converted into an MCAR-Part-FCL licence;
- (e) The differences training or the proficiency check in that variant shall be entered in the pilots' logbook or equivalent record and signed by the instructor or examiner as appropriate.

## **GM1 FCL.710 Class and type ratings – variants**

### **DIFFERENCES AND FAMILIARISATION TRAINING**

- (a) Differences training requires the acquisition of additional knowledge and training on an appropriate training device or the aircraft.
- (b) Familiarisation training requires the acquisition of additional knowledge.

**FCL.725 Requirements for the issue of class and type ratings**

- (a) Training course. An applicant for a class or type rating shall complete a training course at an ATO. An applicant for a non-high-performance SEP aeroplane class rating, a TMG class rating or a single-engine type rating for helicopters referred to in point DTO.GEN.110(a)(2)(c) of MCAR-Part-DTO may complete the training course at a DTO. The type rating training course shall include the mandatory training elements for the relevant type as defined in the operational suitability data established in accordance with MCAR-Part-21.
- (b) Theoretical knowledge examination. The applicant for a class or type rating shall pass a theoretical knowledge examination organised by the ATO to demonstrate the level of theoretical knowledge required for the safe operation of the applicable aircraft class or type.
  - (1) For multi-pilot aircraft, the theoretical knowledge examination shall be written and comprise at least 100 multiple-choice questions distributed appropriately across the main subjects of the syllabus.
  - (2) For single-pilot multi-engine aircraft, the theoretical knowledge examination shall be written and the number of multiple-choice questions shall depend on the complexity of the aircraft.
  - (3) For single-engine aircraft, the theoretical knowledge examination shall be conducted verbally by the examiner during the skill test to determine whether or not a satisfactory level of knowledge has been achieved.
  - (4) For single-pilot aeroplanes that are classified as high performance aeroplanes, the examination shall be written and comprise at least 100 multiple-choice questions distributed appropriately across the subjects of the syllabus.
  - (5) For single-pilot single-engine and single-pilot multi-engine aeroplanes (sea), the examination shall be in a written form and shall comprise at least 30 multiple-choice questions.
- (c) Skill test. An applicant for a class or type rating shall pass a skill test in accordance with Appendix 9 to this MCAR to demonstrate the skill required for the safe operation of the applicable class or type of aircraft.

The applicant shall pass the skill test within a period of 6 months after commencement of the class or type rating training course and within a period of 6 months preceding the application for the issue of the class or type rating.

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- (d) Single- and multi-pilot operations in single-pilot aircraft – type ratings
- (1) The privileges of holders of a type rating for a single-pilot aircraft include the privileges to fly the aircraft in single-pilot operations and multi-pilot operations. However, such holders shall exercise those privileges for a particular form of operation only if they comply with all of the following:
- (i) they have successfully completed flight training for the relevant form of operation in the relevant aircraft type in accordance with Appendix 9 to this MCAR, unless specified otherwise in the operational suitability data established in accordance with MCAR-Part-21. That flight training for a particular form of operation shall either be included in the initial type rating training course at an ATO or, following the initial issuance of the type rating, be completed in the form of additional training at either of the following:
- (A) an ATO;
- (B) an organisation that is subject to MCAR-Part-ORO and that is entitled to provide such training on the basis of either an approval or a declaration;
- (ii) they have completed a skill test or a proficiency check:
- (A) for single-pilot operations in one of the following ways:
- (1) in single-pilot operations;
- (2) in multi-pilot operations with additional elements for single-pilot operations as specified in Appendix 9;
- (B) for multi-pilot operations, in multi-pilot operations.
- (iii) additionally, in the case of multi-pilot operations in single-pilot aircraft:
- (A) they meet the requirements that are specified in:
- (1) point FCL.720.A(b)(4) or point FCL.720.H(a)(2), as applicable;
- (2) point FCL.720.A(b)(5), for single-pilot aeroplanes, before starting flight training for multi-pilot operations in accordance with point FCL.725(d)(1)(i);

(B) they exercise their privileges only at an organisation that is subject to MCAR-Part-ORO.

- (2) When applicants for the initial issue of a type rating for a single-pilot aircraft complete the flight training and the skill test in multi-pilot operations only, the type rating shall be issued with a restriction to multi-pilot operations. That restriction shall be removed when applicants complete, in accordance with Appendix 9, additional training and a proficiency check that include the necessary elements for single-pilot operations.

In all other cases, the form of operation shall not be entered onto the licence.

(da) Single- and multi-pilot operations – aeroplane class ratings

The privileges of holders of a class rating for a single-pilot aeroplane include the privileges to fly the aeroplane in multi-pilot operations, provided that such holders:

- (1) comply with the requirements set out in:
- (i) point FCL.720.A(b)(4);
  - (ii) point FCL.720.A(b)(5), before starting flight training for multi-pilot operations in accordance with point FCL.725(da)(2);
- (2) have completed flight training and passed a proficiency check for multi-pilot operations in the relevant aeroplane class in accordance with Section B, point 5(g), of Appendix 9 at an organisation that is specified in point FCL.725(d)(1)(i); and
- (3) exercise their privileges only at an organisation that is subject to MCAR-Part-ORO.

Additional privileges for multi-pilot operations in a single-pilot aeroplane class shall not be entered onto the licence.

- (db) If a skill test or proficiency check for a single-pilot aircraft class or type rating is conducted in either of the following, the form or forms of operation in which that skill test or a proficiency check is conducted shall be entered in the logbook of the applicants and signed by the examiner:
- (1) multi-pilot operations;
  - (2) single-pilot and multi-pilot operations.

- (e) Notwithstanding the paragraphs above, pilots holding a flight test rating issued in accordance with FCL.820 who were involved in development, certification or production flight tests for an aircraft type, and have completed either 50 hours of total flight time or 10 hours of flight time as PIC on test flights in that type, shall be entitled to apply for the issue of the relevant type rating, provided that they comply with the experience requirements and the prerequisites for the issue of that type rating, as established in this Subpart for the relevant aircraft category.
- (f) Applicants for a class rating for TMGs who also hold an SPL in accordance with MCAR-Part-SFCL, including the privileges to fly on TMGs, shall receive full credits towards the requirements in paragraphs (a), (b) and (c).

### **AMC1 FCL.725(a) Requirements for the issue of class and type ratings**

#### **SYLLABUS OF THEORETICAL KNOWLEDGE FOR CLASS OR TYPE RATINGS**

##### **I. SE AND ME AEROPLANES**

- (a) Detailed listing for aeroplane structure and equipment, normal operation of systems and malfunctions:
  - (1) dimensions: minimum required runway width for 180 ° turn.
  - (2) engine including auxiliary power unit:
    - (i) type of engine or engines;
    - (ii) in general, function of the following systems or components:
      - (A) engine;
      - (B) auxiliary power unit;
      - (C) oil system;
      - (D) fuel system;
      - (E) ignition system;
      - (F) starting system;
      - (G) fire warning and extinguishing system;
      - (H) generators and generator drives;



- (I) power indication;
    - (J) reverse thrust;
    - (K) water injection.
  - (iii) on piston or turbine-propeller engines additionally:
    - (A) propeller system;
    - (B) feathering system.
  - (iv) engine controls (including starter), engine instruments and indications in the cockpit, their function, interrelation and interpretation;
  - (v) engine operation, including APU, during engine start, start and engine malfunctions, procedures for normal operation in the correct sequence.
- (3) fuel system:
- (i) location of the fuel tanks, fuel pumps, fuel lines to the engines, tank capacities, valves and measuring;
  - (ii) location of the following systems:
    - (A) filtering;
    - (B) heating;
    - (C) fuelling and defueling;
    - (D) dumping;
    - (E) venting.
  - (iii) in the cockpit:
    - (A) the monitors and indicators of the fuel system;
    - (B) quantity and flow indication, interpretation.
  - (iv) procedures:
    - (A) fuel procedures distribution into the various tanks;

- (B) fuel supply, temperature control and fuel dumping.
- (4) pressurisation and air conditioning:
  - (i) components of the system and protection devices;
  - (ii) cockpit monitors and indicators;
  - (iii) interpretation about the operational condition;
  - (iv) normal operation of the system during start, cruise, approach and landing, air conditioning airflow and temperature control.
- (5) ice and rain protection, windshield wipers and rain repellent:
  - (i) ice protected components of the aeroplane including engines, heat sources, controls and indications;
  - (ii) operation of the anti-icing or de-icing system during take-off, climb, cruise and descent, conditions requiring the use of the protection systems;
  - (iii) controls and indications of the windshield wipers and rain repellent systems operation.
- (6) hydraulic system:
  - (i) components of the hydraulic system(s), quantities and system pressure, hydraulically actuated components associated to the respective hydraulic system;
  - (ii) controls, monitors and indicators in the cockpit, function and interrelation and interpretation of indications.
- (7) landing gear:
  - (i) main components of the:
    - (A) main landing gear;
    - (B) nose gear;
    - (C) gear steering;
    - (D) wheel brake system, including anti-skid.

- (ii) gear retraction and extension (including changes in trim and drag caused by gear operation);
  - (iii) required tyre pressure, or location of the relevant placard;
  - (iv) controls and indicators including warning indicators in the cockpit in relation to the retraction or extension condition of the landing gear and brakes;
  - (v) components of the emergency extension system.
- (8) flight controls and high lift devices:
- (i)
    - (A) aileron system;
    - (B) elevator system;
    - (C) rudder system;
    - (D) trim system;
    - (E) spoiler system;
    - (F) lift devices;
    - (G) stall warning system;
    - (H) take-off configuration warning system.
  - (ii) flight control system from the cockpit controls to the flight control or surfaces;
  - (iii) controls, monitors and indicators including warning indicators of the systems mentioned under (8)(i), interrelation and dependencies.
- (9) electrical power supply:
- (i) number, power, voltage, frequency and location of the main power system (AC or DC), auxiliary power system location and external power system;
  - (ii) location of the controls, monitors and indicators in the cockpit;
  - (iii) flight instruments, communication and navigation systems, main and back-up power sources;

- (iv) location of vital circuit breakers;
  - (v) generator operation and monitoring procedures of the electrical power supply.
- (10) flight instruments, communication, radar and navigation equipment, autoflight and flight data recorders:
  - (i) visible antennae;
  - (ii) controls and instruments of the following equipment in the cockpit during normal operation:
    - (A) flight instruments;
    - (B) flight management systems;
    - (C) radar equipment, including radio altimeter;
    - (D) communication and navigation systems;
    - (E) autopilot;
    - (F) flight data recorder, cockpit voice recorder and data-link communication recording function;
    - (G) TAWS;
    - (H) collision avoidance system;
    - (I) warning systems; and
    - (J) weather radar system, best practices for optimum use, interpretation of displayed information.
- (11) cockpit, cabin and cargo compartment:
  - (i) operation of the exterior, cockpit, cabin and cargo compartment lighting and the emergency lighting;
  - (ii) operation of the cabin and cargo doors, stairs, windows and emergency exits;
  - (iii) main components of the oxygen system and their location, oxygen masks and operation of the oxygen systems for the crew and

passengers, required amount of oxygen by means of a table or diagram.

(12) emergency equipment operation and correct application of the following emergency equipment in the aeroplane:

- (i) portable fire extinguisher;
- (ii) first-aid kits;
- (iii) portable oxygen equipment;
- (iv) emergency ropes;
- (v) life-jacket;
- (vi) life rafts;
- (vii) emergency transmitters;
- (viii) crash axes;
- (ix) megaphones;
- (x) emergency signals.

(13) pneumatic system:

- (i) components of the pneumatic system, pressure source and actuated components;
- (ii) controls, monitors and indicators in the cockpit and function of the system;
- (iii) vacuum system.

(b) Limitations:

(1) general limitations:

- (i) certification of the aeroplane, category of operation, noise certification and maximum and minimum performance data for all flight profiles, conditions and aircraft systems:
  - (A) maximum tail and crosswind-components at take-off and landing;

- (B) maximum speeds for flap extension  $v_{fo}$ ;
- (C) at various flap settings  $v_{fe}$ ;
- (D) for landing gear operation  $v_{lo}$ ,  $M_{lo}$ ;
- (E) for extended landing gear  $v_{le}$ ,  $M_{le}$ ;
- (F) for maximum rudder deflection  $v_a$ ,  $M_a$ ;
- (G) for tyres;
- (H) one propeller feathered.
- (ii) (A) minimum control speed air  $v_{mca}$ ;
- (B) minimum control speed ground  $v_{mcg}$ ;
- (C) stall speed under various conditions  $v_{so}$ ,  $v_{s1}$ ;
- (D) maximum speed  $v_{ne}$ ,  $M_{ne}$ ;
- (E) maximum speed for normal operation  $v_{mo}$ ,  $M_{mo}$ ;
- (F) altitude and temperature limitations;
- (G) stick shaker activation.
- (iii) (A) maximum airport pressure altitude, runway slope;
- (B) maximum taxi mass;
- (C) maximum take-off mass;
- (D) maximum lift off mass;
- (E) maximum landing mass;
- (F) zero fuel mass;
- (G) maximum dumping speed  $v_{dco}$ ,  $M_{dco}$ ,  $v_{dce}$ ,  $M_{dce}$ ;
- (H) maximum load factor during operation;
- (I) certificated range of centre of gravity.

- (2) engine limitations:
  - (i) operating data of the engines:
    - (A) time limits and maximum temperatures;
    - (B) minimum RPMs and temperatures;
    - (C) torque;
    - (D) maximum power for take-off and go-around on pressure altitude or flight altitude and temperature;
    - (E) piston engines: certified range of mixture;
    - (F) minimum and maximum oil temperature and pressure;
    - (G) maximum starter time and required cooling;
    - (H) time between two start attempts for engines and auxiliary power unit;
    - (I) for propeller: maximum RPM of propeller triggering of automatic feathering device.
  - (ii) certified oil grades.
- (3) systems limitations:
  - (i) operating data of the following systems:
    - (A) pressurisation, air conditioning maximum pressures;
    - (B) electrical power supply, maximum load of main power system (AC or DC);
    - (C) maximum time of power supply by battery in case of emergency;
    - (D) mach trim system and yaw damper speed limits;
    - (E) autopilot limitations of various modes;
    - (F) ice protection;
    - (G) speed and temperature limits of window heat;

- (H) temperature limits of engine and wing anti-ice.
  - (ii) fuel system: certified fuel specifications, minimum and maximum pressures and temperature of the fuel.
- (4) minimum equipment list.
- (c) Performance, flight planning and monitoring:
  - (1) performance calculation about speeds, gradients, masses in all conditions for take-off, en-route, approach and landing according to the documentation available (for example for take-off  $v_1$ ,  $vmbe$ ,  $vr$ ,  $vlof$ ,  $v_2$ , take-off distance, maximum take-off mass and the required stop distance) on the following factors:
    - (i) accelerate or stop distance;
    - (ii) take-off run and distance available (TORA, TODA);
    - (iii) ground temperature, pressure altitude, slope, wind;
    - (iv) maximum load and maximum mass (for example ZFM);
    - (v) minimum climb gradient after engine failure;
    - (vi) influence of snow, slush, moisture and standing water on the runway;
    - (vii) possible single or dual engine failure during cruise flight;
    - (viii) use of anti-icing systems;
    - (ix) failure of water injection system or antiskid system;
    - (x) speeds at reduced thrust,  $v_1$ ,  $v_{1red}$ ,  $vmbe$ ,  $vmu$ ,  $vr$ ,  $vlof$ ,  $v_2$ ;
    - (xi) safe approach speed  $v_{ref}$ , on  $vmca$  and turbulent conditions;
    - (xii) effects of excessive approach speed and abnormal glideslope on the landing distance;
    - (xiii) minimum climb gradient during approach and landing;
    - (xiv) limiting values for a go-around with minimum fuel;
    - (xv) maximum allowable landing mass and the landing distance for the destination and alternate aerodrome on the following factors:



- (A) available landing distance;
  - (B) ground temperature, pressure altitude, runway slope and wind;
  - (C) fuel consumption to destination or alternate aerodrome;
  - (D) influence of moisture on the runway, snow, slush and standing water;
  - (E) failure of the water injection system or the anti skid system;
  - (F) influence of thrust reverser and spoilers.
- (2) flight planning for normal and abnormal conditions:
  - (i) optimum or maximum flight level;
  - (ii) minimum required flight altitude;
  - (iii) drift down procedure after an engine failure during cruise flight;
  - (iv) power setting of the engines during climb, cruise and holding under various circumstances, as well as the most economic cruising flight level;
  - (v) calculation of a short range or long range flight plan;
  - (vi) optimum and maximum flight level and power setting of the engines after engine failure.
- (3) flight monitoring.
- (d) Load and balance and servicing:
  - (1) load and balance:
    - (i) load and trim sheet on the maximum masses for take-off and landing;
    - (ii) centre of gravity limits;
    - (iii) influence of fuel consumption on the centre of gravity;
    - (iv) lashing points, load clamping, maximum ground load.
  - (2) servicing on ground, servicing connections for:

- (i) fuel;
- (ii) oil;
- (iii) water;
- (iv) hydraulic;
- (v) oxygen;
- (vi) nitrogen;
- (vii) conditioned air;
- (viii) electric power;
- (ix) start air;
- (x) toilet and safety regulations.

(e) Emergency procedures:

- (1) recognition of the situation as well as immediate memory actions in correct sequence and for those conditions recognised as emergencies by the manufacturer and Authority for certification:
  - (i) engine failure during take-off before and after v<sub>1</sub>, as well as in flight;
  - (ii) malfunctions of the propeller system;
  - (iii) engine overheat, engine fire on ground and in-flight;
  - (iv) wheel well fire;
  - (v) electrical smoke or fire;
  - (vi) rapid decompression and emergency descent;
  - (vii) air-conditioning overheat, anti-ice system overheat;
  - (viii) fuel pump failure;
  - (ix) fuel freezing overheat;
  - (x) electric power failure;

- (xi) equipment cooling failure;
    - (xii) flight instrument failure;
    - (xiii) partial or total hydraulic failure;
    - (xiv) failures at the lift devices and flight controls including boosters
    - (xv) cargo compartment smoke or fire.
  - (2) actions according to the approved abnormal and emergency checklist:
    - (i) engine restart in-flight;
    - (ii) landing gear emergency extension;
    - (iii) application of the emergency brake system;
    - (iv) emergency extension of lift devices;
    - (v) fuel dumping;
    - (vi) emergency descent.
  - (f) Special requirements for 'glass cockpit' aeroplanes with EFIS additional learning objectives:
    - (1) general rules of aeroplanes computer hardware and software design;
    - (2) logic of all crew information and alerting systems and their limitations;
    - (3) interaction of the different aeroplane computer systems, their limitations, the possibilities of computer fault recognition and the actions to be performed on computer failures;
    - (4) normal procedures including all crew coordination duties;
    - (5) aeroplane operation with different computer degradations (basic flying).
  - (g) Flight management systems.
- II. SE AND ME HELICOPTERS
- (a) Detailed listing for helicopters structure, transmissions, rotors and equipment, normal and abnormal operation of systems:

- (1) dimensions.
- (2) engine including aux. power unit, rotor and transmissions; if an initial type rating for a turbine engine helicopter is applied for, the applicant should have received turbine engine instruction:
  - (i) type of engine or engines;
  - (ii) in general, the function of the following systems or components:
    - (A) engine;
    - (B) auxiliary power unit;
    - (C) oil system;
    - (D) fuel system;
    - (E) ignition system;
    - (F) starting system;
    - (G) fire warning and extinguishing system;
    - (H) generators and generator drive;
    - (I) power indication;
    - (J) water or methanol injection.
  - (iii) engine controls (including starter), engine instruments and indications in the cockpit, their function and interrelation and interpretation;
  - (iv) engine operation, including APU, during engine start and engine malfunctions, procedures for normal operation in the correct sequence;
  - (v) transmission system:
    - (A) lubrication;
    - (B) generators and generator drives;
    - (C) freewheeling units;

- (D) hydraulic drives;
  - (E) indication and warning systems.
- (vi) type of rotor systems: indication and warning systems.
- (3) fuel system:
  - (i) location of the fuel tanks, fuel pumps, fuel lines to the engines tank capacities, valves and measuring;
  - (ii) the following systems:
    - (A) filtering;
    - (B) fuelling and defuelling heatings;
    - (C) dumping;
    - (D) transferring;
    - (E) venting.
  - (iii) in the cockpit: the monitors and indicators of the fuel system, quantity and flow indication, interpretation;
  - (iv) fuel procedures distribution into the various tanks fuel supply and fuel dumping.
- (4) air conditioning:
  - (i) components of the system and protection devices;
  - (ii) cockpit monitors and indicators;

Note: interpretation about the operational condition: normal operation of the system during start, cruise approach and landing, air conditioning airflow and temperature control.
- (5) ice and rain protection, windshield wipers and rain repellent:
  - (i) ice protected components of the helicopter, including engines and rotor systems, heat sources, controls and indications;

- (ii) operation of the anti-icing or de-icing system during take-off, climb, cruise and descent, conditions requiring the use of the protection systems;
  - (iii) controls and indications of the windshield wipers and rain repellent system operation.
- (6) hydraulic system:
  - (i) components of the hydraulic system(s), quantities and system pressure, hydraulically actuated components associated to the respective hydraulic system;
  - (ii) controls, monitors and indicators in the cockpit, function and interrelation and interpretation of indications.
- (7) landing gear, skids fixed and floats:
  - (i) main components of the:
    - (A) main landing gear;
    - (B) nose gear;
    - (C) tail gear;
    - (D) gear steering;
    - (E) wheel brake system.
  - (ii) gear retraction and extension;
  - (iii) required tyre pressure, or location of the relevant placard;
  - (iv) controls and indicators including warning indicators in the cockpit in relation to the retraction or extension condition of the landing gear;
  - (v) components of the emergency extension system.
- (8) flight controls, stab- and autopilot systems: controls, monitors and indicators including warning indicators of the systems, interrelation and dependencies.
- (9) electrical power supply:

- (i) number, power, voltage, frequency and if applicable phase and location of the main power system (AC or DC) auxiliary power system location and external power system;
  - (ii) location of the controls, monitors and indicators in the cockpit;
  - (iii) main and back-up power sources flight instruments, communication and navigation systems, main and back-up power sources;
  - (iv) location of vital circuit breakers;
  - (v) generator operation and monitoring procedures of the electrical power supply.
- (10) flight instruments, communication, radar and navigation equipment, autoflight and flight data recorders:
- (i) antennas;
  - (ii) controls and instruments of the following equipment in the cockpit:
    - (A) flight instruments (for example air speed indicator, pitot static system, compass system, flight director);
    - (B) flight management systems;
    - (C) radar equipment, including radio;
    - (D) communication and navigation system (for example HF, VHF, ADF, VOR/DME, ILS, marker beacon) and area navigation systems;
    - (E) stabilisation and autopilot system;
    - (F) flight data recorder, cockpit voice recorder, data-link communication recording function and radio altimeter;
    - (G) collision avoidance system;
    - (H) TAWS;
    - (I) HUMSS;
    - (J) weather radar system, best practices for optimum use, interpretation of displayed information.

- (11) cockpit, cabin and cargo compartment:
  - (i) operation of the exterior, cockpit, cabin and cargo compartment lighting and the emergency lighting;
  - (ii) operation of the cabin doors and emergency exits.
- (12) emergency equipment:
  - (i) operation and correct application of the following mobile emergency equipment in the helicopter:
    - (A) portable fire extinguisher;
    - (B) first-aid kits;
    - (C) portable oxygen equipment;
    - (D) emergency ropes;
    - (E) life-jacket;
    - (F) life rafts;
    - (G) emergency transmitters;
    - (H) crash axes;
    - (I) megaphones;
    - (J) emergency signals;
    - (K) torches.
  - (ii) operation and correct application of the fixed emergency equipment in the helicopter: emergency floats.
- (b) Limitations:
  - (1) general limitations, according to the helicopter flight manual;
  - (2) minimum equipment list.



- (c) Performance, flight planning and monitoring:
- (1) performance calculation about speeds, gradients, masses in all conditions for take-off, en-route, approach and landing:
    - (i) take-off:
      - (A) hover performance in and out of ground effect;
      - (B) all approved profiles, cat A and B;
      - (C) HV diagram;
      - (D) take-off and rejected take-off distance;
      - (E) take-off decision point (TDP) or (DPATO);
      - (F) calculation of first and second segment distances;
      - (G) climb performance.
    - (ii) en-route:
      - (A) air speed indicator correction;
      - (B) service ceiling;
      - (C) optimum or economic cruising altitude;
      - (D) max endurance;
      - (E) max range;
      - (F) cruise climb performance.
    - (iii) landing:
      - (A) hovering in and out of ground effect;
      - (B) landing distance;
      - (C) landing decision point (LDP) or (DPBL).
    - (iv) knowledge or calculation of:  $v_{lo}$ ,  $v_{le}$ ,  $v_{mo}$ ,  $v_x$ ,  $v_y$ ,  $v_{toss}$ ,  $v_{ne}$ ,  $v_{max}$  range,  $v_{mini}$ .

- (2) flight planning for normal and abnormal conditions:
  - (i) optimum or maximum flight level;
  - (ii) minimum required flight altitude;
  - (iii) drift down procedure after an engine failure during cruise flight;
  - (iv) power setting of the engines during climb, cruise and holding under various circumstances as well as at the most economic cruising flight level;
  - (v) optimum and maximum flight level and power setting after an engine failure.
- (3) effect of optional equipment on performance.
- (d) Load, balance and servicing:
  - (1) load and balance:
    - (i) load and trim sheet on the maximum masses for take-off and landing;
    - (ii) centre of gravity limits;
    - (iii) influence of the fuel consumption on the centre of gravity;
    - (iv) lashing points, load clamping, max ground load.
  - (2) servicing on the ground, servicing connections for:
    - (i) fuel;
    - (ii) oil, etc.;
    - (iii) and safety regulations for servicing.
- (e) Emergency procedures.
- (f) Special requirements for helicopters with EFIS.
- (g) Optional equipment.

**III. AIRSHIPS**

- (a) Detailed listing for airship structure and equipment, normal operation of systems and malfunctions:
- (1) dimensions;
  - (2) structure and envelope:
    - (i) internal structure;
    - (ii) envelope;
    - (iii) pressure system;
    - (iv) gondola;
    - (v) empennage.
  - (3) flight controls;
  - (4) systems:
    - (i) hydraulic;
    - (ii) pneumatic.
  - (5) landing gear;
  - (6) fuel system;
  - (7) fire warning and extinguishing system;
  - (8) emergency equipment;
  - (9) electrical systems;
  - (10) avionics, radio navigation and communication equipment;
  - (11) instrumentation;
  - (12) engines and propellers;
  - (13) heating, ventilation and air-condition;
  - (14) operational procedures during start, cruise, approach and landing:

- (i) normal operations;
  - (ii) abnormal operations.
- (b) Limitations:
  - (1) general limitations:
    - (i) certification of the airship, category of operation, noise certification and maximum and minimum performance data for all flight profiles, conditions and aircraft systems;
    - (ii) speeds;
    - (iii) altitudes.
  - (2) engine limitations;
  - (3) systems limitations;
  - (4) minimum equipment list.
- (c) Performance and flight planning:
  - (1) performance calculation;
  - (2) flight planning.
- (d) Load and balance and servicing:
  - (1) load and balance;
  - (2) servicing.
- (e) Emergency procedures:
  - (1) recognition of emergency situations;
  - (2) actions accordingly.

**AMC2 FCL.725(a) Requirements for the issue of class and type ratings**

**TRAINING COURSE**

**FLIGHT INSTRUCTION FOR TYPE RATINGS: HELICOPTERS**

- (a) The amount of flight instruction depends on:
- (i) complexity of the helicopter type, handling characteristics, level of technology;
  - (ii) category of helicopter (SEP or SE turbine helicopter, ME turbine and MP helicopter);
  - (iii) previous experience of the applicant;
  - (iv) the availability of FSTDs.

(b) FSTDs

In accordance with Appendix 9 to MCAR-Part-FCL Section A paragraph 1 third subparagraph, the level of qualification and the complexity of the type will determine the amount of practical training that may be accomplished in FSTDs, including completion of the skill test. Before undertaking the skill test, a student should demonstrate competency in the skill test items during the practical training.

(c) Initial issue

The flight instruction (excluding skill test) should comprise training time as specified in column 2 in the table below unless otherwise foreseen in the operational suitability data established in accordance with MCAR-Part-21. If, in accordance with Appendix 9 to MCAR-Part-FCL Section A paragraph 1 third subparagraph, training is conducted in a combination of FSTDs (other than FFS) and the helicopter, the in-aircraft training time will depend on the specificities of the FSTD used. In such a case, in-aircraft training time should comprise, as a minimum, the training time given in column 3 of the table below unless otherwise foreseen in the OSD.

(1)	(2)	(3)
Helicopter types	Minimum training time	Minimum training time in the helicopter, when also using FSTDs other than FFS
SEP (H)	5 hrs	4 hrs

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(1)	(2)	(3)
SET(H) under 3175 kg MTOM	5 hrs	4 hrs
SET(H) at or over 3175 kg MTOM	8 hrs	4 hrs
SPH MET (H) CS and FAR 27 and 29	8 hrs	4 hrs
MPH, when the applicant has already completed: - MCC course; - 50 hours of flight time in multi-pilot operations in SPH	5 hrs	Using FTD2/3: At least 2 hrs in the helicopter
MPH	10 hrs	4 hrs

(d) Additional types

The flight instruction (excluding the skill test) should comprise training time as specified in column 2 in the table below unless otherwise foreseen in the OSD. If, in accordance with Appendix 9 to MCAR-Part-FCL Section A paragraph 1 third subparagraph, training is conducted in a combination of FSTDs (other than FFS) and the helicopter, the in-aircraft training time will depend on the specificities of the FSTD used. In such a case, in-aircraft training time should comprise, as a minimum, the time given in column 3 of the table below unless otherwise foreseen in the OSD.

(1)	(2)	(3)
<b>Helicopter types</b>	<b>Minimum training time</b>	<b>Minimum training time in the helicopter, when also using FSTDs other than FFS</b>
SEP(H) to SEP(H) within <a href="#">AMC1 FCL.740.H(a)(3)</a>	2 hrs	1 hr
SEP(H) to SEP(H) not included in <a href="#">AMC1 FCL.740.H(a)(3)</a>	5 hrs	2 hrs

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(1)	(2)	(3)
SET(H) to SET(H)	2 hrs	1 hr
SE difference training	1 hr	N/A
MET(H) to MET(H)	3 hrs	2 hrs
ME difference training	1 hr	N/A
MPH to MPH	5 hrs	2 hrs
Extend privileges on the same type rating from SPH to MPH (except for initial MP issue), or from MPH to SPH	2 hrs	N/A
Extend privileges on the same type rating from SPH to MPH (except for initial MP issue), when applicants have completed 50 hours of flight time in multi-pilot operations on that type	1 hr	Training in helicopter or FFS C/D

**GM1 FCL.725(d)(4)(ii)(B)(2) Requirements for the issue of class and type ratings**

**MULTI-PILOT OPERATION IN SINGLE-PILOT HELICOPTERS IN ACCORDANCE WITH MCAR-Part-ORO**

Point FCL.725(d)(4)(ii)(B)(2) requires pilots to exercise their type rating privileges for multi-pilot operation in single-pilot helicopters only in accordance with the requirements of MCAR-Part-ORO. Multi-pilot operations in single-pilot helicopters cannot be carried out under MCAR-Part-NCO. The regulatory framework of MCAR-Part-ORO applies in any case of commercial operations or operation of complex single-pilot helicopters under the Civil Aviation Regulations. This means that an ATO that provides training for multi-pilot operation in single-pilot helicopters will need to base that training on the operational procedures of the operator for which the pilot is flying. That ATO will either be an operator itself or will have an arrangement with an operator on behalf of which the training will be carried out.

**GM1 FCL.725(e) Requirements for the issue of class and type ratings**

The hours gained during the instruction flights for category 1 or 2 flight tests are not considered as flight tests related to development, certification or production.

## **FCL.740 Validity and renewal of class and type ratings**

**(a) Validity**

- (1) The validity period of class and type ratings shall be 1 year, except for single-pilot single-engine class ratings for which the validity period shall be 2 years, unless otherwise determined in the OSD. If pilots choose to fulfil the revalidation requirements earlier than prescribed in points FCL.740.A, FCL.740.H, FCL.740.PL and FCL.740.As, the new validity period shall commence from the date of the proficiency check.
- (2) Applicants for the revalidation of a class or type rating shall receive full credits for the proficiency check as required in this Subpart when they complete EBT practical assessment in accordance with Appendix 10 at an operator that has implemented EBT for the relevant class or type rating.

**(b) Renewal**

For the renewal of a class or type rating, applicants shall comply with all of the following:

- (1) in order to determine whether refresher training is necessary for the applicant to reach the level of proficiency to safely operate the aircraft, they shall undergo an assessment at one of the following:
  - (i) at an ATO;
  - (ii) at a DTO or at an ATO, if the expired rating concerned a non-high-performance SEP aeroplane class rating, a TMG class rating or a single-engine type rating for helicopters referred to in point DTO.GEN.110(a)(2)(c) of MCAR-Part-DTO;
  - (iii) at a DTO, at an ATO or with an instructor, if the rating expired no more than 3 years ago and the rating concerned a non-high-performance SEP aeroplane class rating or a TMG class rating;
  - (iv) at an EBT operator that is specifically approved for such refresher training;
- (2) if deemed necessary by the organisation or the instructor providing the assessment as per point (1), they shall complete refresher training at that organisation or with that instructor;
- (3) after complying with point (1) and, as applicable, point (2), they shall pass a proficiency check in accordance with Appendix 9 or complete EBT



practical assessment in accordance with Appendix 10. That EBT practical assessment may be combined with the refresher training specified in point (2).

By way of derogation from points (b)(1), (b)(2) and (b)(3), pilots holding a flight test rating issued in accordance with point FCL.820 who were involved in the development, certification or production flight tests for an aircraft type and have completed either 50 hours of total flight time or 10 hours of flight time as PIC in test flights in that type during the year prior to the date of their application, shall be entitled to apply for the revalidation or renewal of the relevant type rating.

Applicants shall be exempted from the requirement in points (b)(1) and (b)(2) if they hold a valid rating for the same class or type of aircraft on a pilot licence issued by a third country in accordance with Annex 1 to the Chicago Convention and if they are entitled to exercise the privileges of that rating.

- (c) Pilots who leave an operator's EBT programme after having failed to demonstrate an acceptable level of competence in accordance with that EBT programme shall not exercise the privileges of that type rating until they have complied with one of the following:
  - (1) they have completed EBT practical assessment in accordance with Appendix 10;
  - (2) they have passed a proficiency check in accordance with point FCL.625(c)(3) or point FCL.740(b)(3), as applicable. In such a case, point FCL.625(b)(4) and point FCL.740(a)(2) shall not apply.

### **AMC1 FCL.740(b) Validity and renewal of class and type ratings**

#### **RENEWAL OF CLASS AND TYPE RATINGS: REFRESHER TRAINING AT AN ATO, A DTO OR WITH AN INSTRUCTOR**

- (a) The objective of the refresher training is for the applicant to reach the level of proficiency necessary to safely operate the relevant type or class of aircraft. The amount of refresher training needed should be determined on a case-by-case basis by the ATO, the DTO or the instructor, as applicable, taking into account the following factors:
  - (1) the experience of the applicant;
  - (2) the amount of time elapsed since the privileges of the rating were last used;
  - (3) the complexity of the aircraft;

- (4) whether the applicant has a current rating on another aircraft type or class; and
- (5) where considered necessary, the performance of the applicant during a simulated proficiency check for the rating in an FSTD or an aircraft of the relevant type or class.

It should be expected that the amount of training needed to reach the desired level of proficiency will increase analogously to the time elapsed since the privileges of the rating were last used.

- (b) After having determined the needs of the applicant, the ATO, the DTO or the instructor, as applicable, should develop an individual training programme based on the initial training for the rating, focusing on the aspects where the applicant has shown the greatest needs.
- (c) With the exception of refresher training for ratings for aircraft referred to in point FCL.740(b)(2)(i), refresher training should include theoretical knowledge instruction, as necessary, such as for type-specific system failures in complex aircraft. The performance of the applicant should be reviewed during the training and additional instruction should be provided to the applicant, where necessary, to reach the standard required for the proficiency check.
- (d) After successful completion of the training, the ATO, the DTO or the instructor, as applicable, should issue the applicant with a training completion certificate or another document specified by the Authority, describing the evaluation of the factors listed in (a), the training received, and a statement that the training has been successfully completed. The training completion certificate should be presented to the examiner prior to the proficiency check. Following the successful renewal of the rating, the training completion certificate or the other document specified by the Authority and the examiner report form should be submitted to the Authority.
- (e) Taking into account the factors listed in (a) above, the ATO, the DTO or the instructor, as applicable, may also decide that the applicant already possesses the required level of proficiency and that no refresher training is necessary. In such a case, the certificate or other documental evidence referred to in (c) above should contain a respective statement including sufficient reasoning.

## **GM1 FCL.740(b) Validity and renewal of class and type ratings**

### **RENEWAL OF CLASS AND TYPE RATINGS: REFRESHER TRAINING AT AN AOC HOLDER**

It is recommended that an AOC holder approved for renewal of type ratings under MCAR-Part-ORO may provide refresher training if the applicant is enrolled in the EBT programme; and if the rating has lapsed by no more than 1 year.

If the rating has lapsed by more than 1 year, it is recommended that the applicant consider to follow the training at an ATO and AMC1 FCL.740(b) applies.

## **SECTION 2 – SPECIFIC REQUIREMENTS FOR THE AEROPLANE CATEGORY**

### **FCL.720.A Experience requirements and prerequisites for the issue of class or type ratings – aeroplanes**

Unless otherwise determined in the operational suitability data established in accordance with MCAR-Part-21, applicants for the issue of a class or type rating shall comply with the following experience requirements and prerequisites for the issue of the relevant rating:

**(a) Single-pilot aeroplanes**

**(1) Single-pilot multi-engine aeroplanes**

Applicants for the issue of a first class or type rating on a single-pilot multi-engine aeroplane shall have completed at least 70 hours as PIC in aeroplanes.

**(2) Single-pilot high-performance non-complex aeroplanes**

Before starting flight training, applicants for the issue of a class or type rating for a single-pilot aeroplane classified as a high-performance aeroplane shall:

- (i)** have at least 200 hours of total flying experience, of which 70 hours as PIC in aeroplanes; and
- (ii)** comply with one of the following requirements:
  - (A)** hold a certificate of satisfactory completion of a course for additional theoretical knowledge undertaken at an ATO; or
  - (B)** have passed the ATPL(A) theoretical knowledge examinations in accordance with this MCAR-Part-FCL; or
  - (C)** hold, in addition to a licence issued in accordance with this MCAR-Part-FCL, an ATPL(A) or CPL(A)/IR with theoretical knowledge credit for ATPL(A), issued in accordance with Annex 1 to the Chicago Convention.

**(3) Single-pilot high-performance complex aeroplanes**

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Applicants for the issue of a type rating for a complex single-pilot aeroplane classified as a high-performance aeroplane shall, in addition to meeting the requirements in point (2), comply with all of the following:

- (i) they shall hold or have held a single- or multi-engine IR(A), as appropriate and as established in Subpart G;
  - (ii) for the issue of the first type rating, they shall, before starting the type rating training course, meet the requirements in point (b)(5).
- (b) Applicants for the issue of the first type rating for a multi-pilot aeroplane shall be student pilots currently undergoing training on an MPL training course or shall, before starting the type rating training course, comply with the following requirements:
- (1) have at least 70 hours of flight experience as PIC in aeroplanes;
  - (2) hold or have held a multi-engine IR(A);
  - (3) have passed the ATPL(A) theoretical knowledge examinations in accordance with this MCAR-Part-FCL;
  - (4) except when the type rating course is combined with an MCC course:
    - (i) hold a certificate of satisfactory completion of an MCC course in aeroplanes; or
    - (ii) hold a certificate of satisfactory completion of MCC in helicopters and have more than 100 hours of flight experience as pilots of multi-pilot helicopters; or
    - (iii) have at least 500 hours as pilots of multi-pilot helicopters; or
    - (iv) have at least 500 hours as pilots in multi-pilot operations on single-pilot multi-engine aeroplanes, in commercial air transport in accordance with the applicable air operations requirements; and
  - (5) have completed the training course specified in point FCL.745.A, unless they comply with any of the following:
    - (i) they completed, within the preceding 3 years, the training and checking in accordance with points ORO.FC.220 or ORO.FC.230 of MCAR-Part-ORO;
    - (ii) they have completed the training specified in point FCL.915(e)(1)(ii).

- (c) Notwithstanding point FCL.720.A(b), applicants who comply with Section B, point 6(i), of Appendix 9 shall be issued with a type rating with restricted privileges for a multi-pilot aeroplane that allows holders of such a rating to act as cruise relief co-pilots above Flight Level 200, provided that two other members of the crew have a type rating in accordance with point FCL.720.A(b).

To remove the restriction, applicants shall comply with all of the following:

- (1) undergo an assessment at an ATO which shall determine their training needs to have the restriction removed;
  - (2) based on the assessment specified in point (1), complete, at that ATO, training which shall allow them to reach the level of proficiency to safely operate the aircraft;
  - (3) after the completion of the training specified in point (2), complete a skill test in accordance with Appendix 9;
  - (4) after the completion of the skill test specified in point (3), meet one of the following conditions:
    - (i) comply with point ORO.FC.220(e) of MCAR-Part-ORO, provided that they meet the experience requirements specified in point FCL.730.A of this MCAR;
    - (ii) complete flight training in the aircraft which includes manoeuvres on take-off, landing and go-around.
- (d) When so determined in the OSD, the exercise of the privileges of a type rating may be initially limited to flight under the supervision of an instructor. The flight hours under supervision shall be entered in the pilots' logbook or equivalent record and signed by the instructor. The limitation shall be removed when pilots demonstrate that the hours of flight under supervision required in the OSD have been completed.

### **AMC1 FCL.720.A(b)(2)(i) Experience requirements and prerequisites for the issue of class or type ratings – aeroplanes**

#### **ADDITIONAL THEORETICAL KNOWLEDGE FOR A CLASS OR TYPE RATING FOR HIGH-PERFORMANCE SINGLE-PILOT (SP) AEROPLANES**

- (a) A number of aeroplanes certificated for SP operation have similar performances, systems and navigation capabilities to those more usually associated with MP types of aeroplanes, and regularly operate within the same airspace. The level of

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knowledge required to operate safely in this environment is not part of, or not included to the necessary depth of knowledge in the training syllabi for the PPL, CPL or IR(A) but these licence holders may fly as PIC of such aeroplanes. The additional theoretical knowledge required to operate such aeroplanes safely is obtained by completion of a course at an ATO.

- (b) The aim of the theoretical knowledge course is to provide the applicant with sufficient knowledge of those aspects of the operation of aeroplanes capable of operating at high speeds and altitudes, and the aircraft systems necessary for such operation.

### **COURSE SYLLABUS**

- (c) The course will be divided in a VFR and an IFR part, and should cover at least the following items of the aeroplane syllabus to the ATPL(A) level:

#### **FOR VFR OPERATIONS:**

<b>Subject ref.:</b>	<b>Syllabus content:</b>
<b>021 00 00 00</b>	<b>AIRCRAFT GENERAL KNOWLEGDE: AIRFRAME, SYSTEMS, AND POWER PLANT</b>
021 09 01 03	Alternating current
021 09 03 00	Generation
021 09 03 02	AC generation
021 09 03 03	Constant speed drive (CSD) and integrated drive generator (IDG)
021 09 04 00	systems Distribution
021 09 04 01	General
021 09 04 03	AC distribution
021 09 04 04	Electrical load management and monitoring systems: automatic generators and bus switching during normal and failure operation, indications and warnings
021 06 01 01	Piston-engine air supply
021 06 01 02	Gas turbine engine: bleed-air supply
021 10 10 01	Performance
021 11 03 01	Engine fuel system
021 10 04 01	Carburettor: design, operation, degraded modes of operation, indications and warnings
021 03 01 09	Mixture
021 11 00 00 to 021 11 01 04	Turbine engines
021 13 00 00	Oxygen systems
<b>032 03 00 00</b>	<b>Performance class B: ME aeroplanes</b>

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<b>Subject ref.:</b>	<b>Syllabus content:</b>
032 03 03 01	Take-off
032 03 03 02	Climb
032 03 03 04	Landing
032 01 03 00	Level flight, range and endurance
032 01 04 00	Climbing
032 01 05 00	Descending
032 02 04 00	Climb, cruise and descent
<b>040 00 00 00</b>	<b>HUMAN PERFORMANCE</b>
040 02 01 00 to 040 02 01 03	Basic human physiology and High-altitude environment
<b>050 00 00 00</b>	<b>METEOROLOGY</b>
050 02 07 00	Jet streams
050 02 05 00	Standing waves
050 09 01 00 to 050 09 04 05	Flight hazards Icing and turbulence Thunderstorms
<b>062 03 00 00</b>	<b>Basic radar principles</b>
062 03 00 01 to 062 03 04 00	Basic radar principles Airborne radar SSR
<b>081 00 00 00</b>	<b>PRINCIPLES OF FLIGHT: AEROPLANES</b>
081 02 01 00	Speeds
081 02 02 00	Shock waves
081 02 03 00	Effects of exceeding $M_{CRIT}$

**FOR IFR OPERATIONS**

<b>Subject ref.:</b>	<b>Syllabus content:</b>
<b>010 00 00 00</b>	<b>AIR LAW</b>
010 06 07 00	Simultaneous operation on parallel or near-parallel instrument run-ways
010 06 08 00	Secondary surveillance radar (transponder) operating procedures
<b>022 00 00 00</b>	<b>AIRCRAFT GENERAL KNOWLEDGE - INSTRUMENTATION</b>
022 01 02 00	Temperature sensing
022 03 04 00	Flux valve
<b>022 12 00 00</b>	<b>ALERTING SYSTEMS, PROXIMITY SYSTEMS</b>
022 12 07 00	Altitude alert system
022 12 08 00	Radio-altimeter



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<b>Subject ref.:</b>	<b>Syllabus content:</b>
022 12 10 00	ACAS/TCAS principles and operation
022 13 03 01	Electronic flight instrument system (EFIS) — Design, operation
<b>050 00 00 00</b>	<b>METEOROLOGY</b>
050 02 06 03	Clear-air turbulence (CAT) - Description, cause and location
050 10 02 03	Upper-air charts
<b>062 00 00 00</b>	<b>RADIO NAVIGATION</b>
062 02 05 04	ILS — Errors and accuracy

- (d) Demonstration of acquisition of this knowledge is undertaken by passing an examination set by an ATO. A successful pass of this examination results in the issue of a certificate indicating that the course and examination have been completed.
- (e) The certificate represents a 'once only' qualification and satisfies the requirement for the addition of all future high performance aeroplanes to the holder's licence. The certificate is valid indefinitely and is to be submitted with the application for the first HPA type or class rating.
- (f) A pass in any theoretical knowledge subjects as part of the HPA course will not be credited against meeting future theoretical examination requirements for issue of a CPL(A), IR(A) or ATPL(A).
- (g) The applicant who has completed a competency-based modular IR(A) course according to Appendix 6 Aa needs to complete both VFR and IFR parts of this course.
- (h) The applicant who has completed a modular IR(A) course according to Appendix 6 A only needs to complete the VFR part of this course.

**AMC2 FCL.720.A(b)(2)(i) Experience requirements and prerequisites for the issue of class or type ratings – aeroplanes**

**ADDITIONAL THEORETICAL KNOWLEDGE FOR A CLASS OR TYPE RATING FOR HIGH-PERFORMANCE SINGLE-PILOT (SP) AEROPLANES**

An applicant for an additional class or type rating for a single-pilot aeroplane classified as a high performance aeroplane (HPA), who:

- (a) has held a single-pilot HPA class or type rating prior to the application of MCAR-Part-FCL; and

- (b) has completed a competency-based modular IR(A) course according to Appendix 6 Aa; and
- (c) does not fulfil the requirements of FCL.720.A (b)(2)(ii) or (iii); should pass the theoretical knowledge instruction and examination for the VFR and IFR parts of the course required in accordance with FCL.720.A.(b)(2)(i).

### **FCL.725.A Theoretical knowledge and flight instruction for the issue of class and type ratings – aeroplanes**

Unless otherwise determined in in the operational suitability data established in accordance with MCAR-Part-21:

- (a) for single-pilot multi-engine aeroplanes:
  - (1) the theoretical knowledge course for a single-pilot multi-engine class rating shall include at least 7 hours of instruction in multi-engine aeroplane operations; and
  - (2) the flight training course for a single-pilot multi-engine class or type rating shall include at least 2 hours and 30 minutes of dual flight instruction under normal conditions of multi-engine aeroplane operations, and not less than 3 hours 30 minutes of dual flight instruction in engine failure procedures and asymmetric flight techniques.
- (b) for single-pilot aeroplanes (sea):
  - (1) the training course for single-pilot aeroplane (sea) ratings shall include theoretical knowledge and flight instruction; and
  - (2) the flight training for a class or type rating (sea) for single-pilot aeroplanes (sea) shall include at least 8 hours of dual flight instruction if applicants hold the land version of the relevant class or type rating, or 10 hours if applicants do not hold such a rating; and
- (c) for single-pilot non-high-performance complex aeroplanes, single-pilot high-performance complex aeroplanes and multi-pilot aeroplanes, the training courses shall include UPRT theoretical knowledge and flight instruction related to the specificities of the relevant class or type. For the flight instruction, FSTDs may be used in accordance with Section A, point 18 of Appendix 9.

**AMC1 FCL.725.A(b) Theoretical knowledge and flight instruction for the issue of class and type ratings – aeroplanes**

**CLASS RATING SEA**

- (a) The theoretical knowledge instruction should be conducted by an instructor having appropriate experience of class rating sea.
- (b) Depending on the equipment and systems installed, the instruction should include, but not be limited to, the following content:
  - (1) theoretical knowledge:
    - (i) the aim of the training is to teach:
      - (A) the importance of preparation for flight and the safe planning taking into consideration all the factors for manoeuvring the aircraft on the wind, tidal currents, high and low water times and water movements at sea, river estuaries and lakes. In addition, icing conditions, ice covered water and broken ice flows;
      - (B) the techniques about the most critical moments at take-off, landing, taxiing and mooring the aircraft;
      - (C) the construction methods and characteristics of floats and water rudders and the importance of checking for leaks in the floats;
      - (D) the necessary requirements for the compliance of the rules for the avoidance of collisions at sea, in regard to sea charts, buoys and lights and horns.
    - (ii) after completing the training, the student should be able to:
      - (A) describe the factors that have significance for planning and decision about initiation of seaplane flying and alternative measures for completion of flight;
      - (B) describe how the water level is affected by air pressure, wind, tide, regularisations and the flight safety depending on changes in the water level;
      - (C) describe the origin of different ice conditions in water areas;

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- (D) interpret nautical charts and maps about depths and shoals and risk for water currents, shifts of the wind, turbulence;
- (E) decide what required equipment to bring during seaplane flying according to the operational requirements;
- (F) describe the origin and extension of water waves, swells and water currents and their effect on the aeroplane;
- (G) describe how water and air forces effect the aeroplane on water;
- (H) describe the effect of water resistance on the aeroplanes' performance on glassy water and during different wave conditions;
- (I) describe the consequences of taxiing with too high engine RPM;
- (J) describe the effect of pressure and temperature on performance at take-off and climb from lakes located at higher altitude;
- (K) describe the effect of wind, turbulence, and other meteorological conditions of special importance for flight over lakes, islands in mountain areas and other broken ground;
- (L) describe the function of the water rudder and its handling, including the effect of lowered water rudder at take-off and landing;
- (M) describe the parts of the float installation and their function;
- (N) describe the effect of the floats on the aeroplanes' aerodynamics and performance in water and in air;
- (O) describe the consequences of water in the floats and fouling of float bottoms;
- (P) describe aviation requirements that apply specifically for the conduct of aircraft activity on water;
- (Q) describe requirements about animal, nature and environment protection of significance for flight by seaplane, including flight in national parks;

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- (R) describe the meaning of navigation buoys;
  - (S) describe the organisation and working methods of the Sea Rescue Service;
  - (T) describe the requirements in ICAO Annex 2 as set out in paragraph 3.2.6 'Water operation', including relevant parts of the Convention on the International Regulations for Preventing Collisions at Sea.
- (2) practical training:
- (i) the aim of the practical training is to learn:
    - (A) the skills in manoeuvring aeroplanes on water and in mooring the aeroplane;
    - (B) the skills required for the reconnaissance of landing and mooring areas from the air, including the take-off area;
    - (C) the skills for assessing the effects of different water depths, shoals, wind, height of waves and swell;
    - (D) the skills for flying with floats about their effect on performance and flight characteristics;
    - (E) the skills for flying in broken ground during different wind and turbulence conditions;
    - (F) the skills for take-off and landing on glassy water, different ° of swell and water current conditions.
  - (ii) after the training, the student should be able to:
    - (A) handle the equipment that shall be brought during seaplane flying;
    - (B) perform pre-flight daily inspection on aeroplane, float installation and special seaplane equipment, including emptying of floats;
    - (C) sail, taxi and turn the aeroplane at swell with correct handling of the water rudder;
    - (D) taxi on the step and perform turns;

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- (E) establish the wind direction with the aeroplane;
- (F) take necessary actions if loss of steering ability and person falling overboard;
- (G) make land and moor aeroplane at bridge, buoy and beach with the use of appropriate knots to secure the aircraft;
- (H) maintain given rate of descent by means of variometer only;
- (I) perform take-off and landing on glassy water with and without outer references;
- (J) perform take-off and landing under swell;
- (K) perform power-off landing;
- (L) from the air, reconnaissance of landing, mooring and takeoff areas, observing;
- (M) wind direction and strength during landing and take-off;
- (N) surrounding terrain;
- (O) overhead wires and other obstacles above and under water;
- (P) congested areas;
- (Q) determine wind direction and assess wind strength from water level and when airborne;
- (R) state, for the aeroplane type in question;
  - (a) maximum wave height allowed;
  - (b) maximum number of ERPM allowed during taxi;
- (S) describe how flying with floats affects the performance and flight characteristics of the aeroplane;
- (T) take corrective action at critical moments due to wind shear and turbulence;
- (U) navigate on the water with reference to buoys markers, obstacles and other traffic on the water.

- (c) For the initial issue of class rating sea for SP, SE and ME aeroplanes, the number of multi-choice questions in the written or computer-based examination should at least comprise thirty questions, and may be conducted by the training organisation. The pass mark should be 75 %.

### **FCL.730.A Specific requirements for pilots undertaking a zero flight time type rating (ZFTT) course – aeroplanes**

- (a) A pilot undertaking instruction at a ZFTT course shall have completed, on a multi-pilot turbo-jet aeroplane certificated to the standards of CS-25 or equivalent airworthiness code or on a multi-pilot turbo-prop aeroplane having a maximum certificated take-off mass of not less than 10 tonnes or a certificated passenger seating configuration of more than 19 passengers, at least:
- (1) if an FFS qualified to level CG, C or interim C is used during the course:
    - (i) in the case of cruise relief co-pilots, 1 500 hours of flight time;
    - (ii) in all other cases, 1 500 hours of flight time or 250 route sectors;
  - (2) if an FFS qualified to level DG or D is used during the course:
    - (i) in the case of cruise relief co-pilots, 750 hours of flight time;
    - (ii) in all other cases, 500 hours of flight time or 100 route sectors.
- (b) When a pilot is changing from a turbo-prop to a turbo-jet aeroplane or from a turbo-jet to a turbo-prop aeroplane, additional simulator training shall be required.

### **FCL.735.A Multi-crew cooperation training course – aeroplanes**

- (a) The MCC training course shall comprise at least:
- (1) 25 hours of theoretical knowledge instruction and exercises; and
  - (2) 20 hours of practical MCC training, or 15 hours in the case of student pilots attending an ATP integrated course.

An FNPT II MCC or an FFS shall be used. When the MCC training is combined with initial type rating training, the practical MCC training may be reduced to no less than 10 hours if the same FFS is used for both the MCC and type rating training.

- (b) The MCC training course shall be completed within 6 months at an ATO.

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- (c) Unless the MCC course has been combined with a type rating course, on completion of the MCC training course the applicant shall be given a certificate of completion.
- (d) An applicant having completed MCC training for any other category of aircraft shall be exempted from the requirement in (a)(1).

**AMC1 FCL.735.A; FCL.735.H; FCL.735.As Multi-crew cooperation (MCC) training course**

- (a) Competency is a combination of knowledge, skills and attitudes required to perform a task to the prescribed standard.
- (b) The objectives of MCC training are to develop the technical and non-technical components of the knowledge, skills and attitudes required to operate a multicrew aircraft.
- (c) Training should comprise both theoretical and practical elements and be designed to achieve the competencies/training objectives (see Table 1 below).

Table 1 — Competencies/training objectives			
Competency/ objective	Performance indicators	Knowledge	Practical exercises
Communication	<ul style="list-style-type: none"><li>(a) Know what, how much and who to communicate to;</li><li>(b) Ensure the recipient is ready and able to receive the information;</li><li>(c) Pass messages and information clearly, accurately, timely and adequately;</li><li>(d) Check if the other person has the correct understanding when passing important information;</li><li>(e) Listen actively, patiently and demonstrate understanding when receiving information;</li></ul>	<ul style="list-style-type: none"><li>(a) Human Factors, TEM and CRM;</li><li>(b) Application of TEM and CRM principles to training.</li></ul>	<p>In a commercial air transport environment, apply multi-crew procedures, including principles of TEM and CRM to the following:</p> <ul style="list-style-type: none"><li>(a) Pre-flight preparation:<ul style="list-style-type: none"><li>(1) FMS initialisation;</li><li>(2) radio and navigation equipment preparation;</li><li>(3) flight documentation;</li><li>(4) computation of take-off performance data.</li></ul></li><li>(b) Take-off and climb:</li></ul>



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**Table 1 — Competencies/training objectives**

Competency/ objective	Performance indicators	Knowledge	Practical exercises
	(f) Ask relevant and effective questions, and offer suggestions; (g) Use appropriate body language, eye contact and tone; (h) Open and receptive to other people's view.		(1) before take-off checks; (2) normal take-offs; (3) rejected take-offs; (4) take-offs with abnormal and emergency situations included. (c) Cruise: emergency descent. (d) Descent and approach:
Leadership and team working	(a) Friendly, enthusiastic, motivating and considerate of others; (b) Use initiative, give direction and take responsibility when required; (c) Open and honest about thoughts, concerns and intentions; (d) Give and receive criticism and praise well, and admit mistakes; (e) Confidently do and say what is important to him or her; (f) Demonstrate respect and tolerance towards other people; (g) Involve others in planning and share activities fairly.		(1) instrument flight procedures; (2) holding; (3) 3D Operations using raw data; (4) 3D Operations using flight director; (5) 3D Operations using autopilot; (6) one-engine-inoperative approach; (7) 2D Operations and circling; (8) computation of approach and landing data; (9) all engines go-around; (10) go-around with one engine inoperative; (11) wind shear during approach.
Situational awareness	(a) Be aware of what the aircraft and its systems are doing; (b) Be aware of where the aircraft is and its environment; (c) Keep track of time and fuel;		(e) landing: transition from instrument to visual flight on reaching decision altitude or height or

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**Table 1 — Competencies/training objectives**

Competency/ objective	Performance indicators	Knowledge	Practical exercises
	(d) Be aware of the condition of people involved in the operation including passengers; (e) Recognise what is likely to happen, plan and stay ahead of the game; (f) Develop what-if scenarios and make pre-decisions; (g) Identify threats to the safety of the aircraft and of the people.		minimum descent altitude or height; (f) after landing and post flight procedures; (g) selected emergency and abnormal procedures.
Workload management	(a) Be calm, relaxed, careful and not impulsive; (b) Prepare, prioritise and schedule tasks effectively; (c) Use time efficiently when carrying out tasks; (d) Offer and accept assistance, delegate when necessary and ask for help early; (e) Review and monitor and cross-check actions conscientiously; (f) Follow procedures appropriately and consistently; (g) Concentrate on one thing at a time, ensure tasks are completed and does not become distracted; (h) Carry out instructions as directed.		
Problem-solving and decision-making	(a) Identify and verify why things have gone wrong and do not jump		

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**Table 1 — Competencies/training objectives**

Competency/ objective	Performance indicators	Knowledge	Practical exercises
	to conclusions or make assumptions; (b) Seek accurate and adequate information from appropriate resources; (c) Persevere in working through a problem; (d) Use and agree an appropriate decision making process; (e) Agree essential and desirable criteria and prioritises; (f) Consider as many options as practicable; (g) Make decisions when they need to, reviews and changes if required; (h) Consider risks but do not take unnecessary risks.		
Monitoring and cross-checking	(a) Monitor and cross-checks all actions; (b) Monitor aircraft trajectory in critical flight phases; (c) Take appropriate actions in response to deviations from the flight path.	(a) SOPs; (b) Aircraft systems; (c) Undesired aircraft states.	
Task sharing	(a) Apply SOPs in both PF and pilot monitoring (PM) roles; (b) Makes and responds to standard call-outs.	(a) PF and PM roles; (b) SOPs.	

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**Table 1 — Competencies/training objectives**

Competency/ objective	Performance indicators	Knowledge	Practical exercises
Use of check-lists	Utilise checklists appropriately according to SOPs.	(a) SOPs; (b) Checklist philosophy.	
Briefings	Prepare and deliver appropriate briefings.	(a) SOPs; (b) Interpretation of FMS data and in-flight documentation.	
Flight management	(a) Maintain a constant awareness of the aircraft automation state; (b) Manage automation to achieve optimum trajectory and minimum workload; (c) Take effective recovery actions from automation anomalies; (d) Manage aircraft navigation, terrain clearance; (e) Manage aircraft fuel state and take appropriate actions.	(a) Understanding of aircraft performance and configuration; (b) Systems; (c) SOPs; (d) Interpretation of FMS data and in-flight documentation; (e) Minimum terrain clearance; (f) Fuel management IFR and VFR regulation.	
FMS use	Programme, manage and monitor FMS in accordance with SOPs.	(a) Systems (FMS); (b) SOPs; (c) Automation.	
Systems normal operations	Perform and monitor normal systems operation in accordance with SOPs.	(a) Systems; (b) SOPs.	
Systems abnormal and emergency operations	(a) Perform and monitor abnormal systems operation in accordance with SOPs; (b) Utilise electronic and paper abnormal checklists in accordance with SOPs.	(a) Systems; (b) SOPs; (c) Emergency and abnormal procedures and checklists; (d) Recall items.	

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**Table 1 — Competencies/training objectives**

Competency/ objective	Performance indicators	Knowledge	Practical exercises
Environment, weather and ATC	(a) Communicate effectively with ATC; (b) Avoid misunderstandings by requesting clarification; (c) Adhere to ATC instructions; (d) Construct a mental model of the local ATC and weather environment.	(a) Systems; (b) SOPs; (c) ATC environment and phraseology; (d) Procedures for hazardous weather conditions.	

**CERTIFICATE OF COMPLETION FORM**

<b>CERTIFICATE OF COMPLETION OF MCC</b>			
Applicant's last name(s):		First name(s):	
Type of licence:		Number:	State:
ME/IR training completed		<b>OR</b> ME/IR validity date: ME/IR skill test date:	
Issued on:		passed on:	
	Signature of applicant:		

The satisfactory completion of MCC-Training according to requirements is certified below:

<b>TRAINING</b>			
Multi-crew co-operation training received during period:			
from:	to:	at:	ATO / operator*

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Location and date:	Signature of head of ATO or authorised instructor*:
Type and number of licence and state of issue:	Name(s) in capital letters of authorised instructor:

\* Delete as appropriate

**AMC2 FCL.735.A Multi-crew cooperation (MCC) training course – aeroplanes**

**ENHANCED MCC TRAINING TO AIRLINE PILOT STANDARDS (APS MCC) COURSE**

- (a) The APS MCC training course should comprise both theoretical and practical elements and should be designed to achieve the training objectives, as set out in Table 1 below.

Table 1 — Training objectives			
Training objectives	Performance indicators	Knowledge	Practical exercises
Monitoring and cross-checking	(a) Monitor and cross-check all actions; (b) Monitor aeroplane trajectory in critical flight phases; (c) Take appropriate actions in response to deviations from the flight path.	(a) SOPs; (b) Aeroplane systems; (c) Undesired aeroplane states.	In a commercial air transport environment, apply multi-crew procedures, including principles of TEM and CRM to the following: (a) Pre-flight preparation: (1) FMS initialisation; (2) radio and navigation equipment preparation; (3) flight documentation; (4) computation of take-off performance data.
Task sharing	(a) Apply SOPs in both PF and PM roles; (b) Make and respond to standard call-outs.	(a) PF and PM roles; (b) SOPs.	(b) Take-off and climb: (1) before take-off checks; (2) normal take-offs; (3) rejected take-offs; (4) take-offs with abnormal and emergency situations included.
Use of checklists	Utilise checklists appropriately according to SOPs.	(a) SOPs; (b) Checklist philosophy.	

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**Table 1 — Training objectives**

<b>Training objectives</b>	<b>Performance indicators</b>	<b>Knowledge</b>	<b>Practical exercises</b>
Briefings	Prepare and deliver appropriate briefings.	(a) SOPs; (b) Interpretation of FMS data and in-flight documentation.	(c) Cruise: emergency descent. (d) Descent and approach: (1) instrument flight procedures; (2) holding; (3) 3D Operations using raw data; (4) 3D Operations using flight director; (5) 3D Operations using autopilot; (6) one-engine-inoperative approach; (7) 2D Operations and circling; (8) computation of approach and landing data; (9) all engines go-around; (10) go-around with one engine inoperative; (11) wind shear during approach.
Flight management	(a) Maintain a constant awareness of the aeroplane automation state; (b) Manage automation to achieve optimum trajectory and minimum workload; (c) Take effective recovery actions from automation anomalies; (d) Manage aeroplane navigation, terrain clearance; (e) Manage aeroplane fuel state and take appropriate actions.	(a) Understanding of aeroplane performance and configuration; (b) Systems; (c) SOPs; (d) Interpretation of FMS data and in-flight documentation; (e) Minimum terrain clearance; (f) Fuel management IFR and VFR regulation.	(e) landing: transition from instrument to visual flight on reaching decision altitude or height or minimum descent altitude or height;
FMS use	Programme, manage and monitor FMS in accordance with SOPs.	(a) Systems (FMS); (b) SOPs; (c) Automation.	(f) after landing and post flight procedures; (g) selected emergency and abnormal procedures.
Systems normal operations	Perform and monitor normal systems operation in accordance with SOPs.	(a) Systems; (b) SOPs.	
Systems abnormal and emergency operations	(a) Perform and monitor abnormal systems operation in accordance with SOPs; (b) Utilise electronic and paper	(a) Systems; (b) SOPs; (c) Emergency and abnormal procedures and checklists; (d) Recall items.	

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Table 1 — Training objectives			
Training objectives	Performance indicators	Knowledge	Practical exercises
	abnormal check-lists in accordance with SOPs.		
Environment, weather and air traffic control (ATC)	(a) Communicate effectively with ATC; (b) Avoid misunderstandings by requesting clarification; (c) Adhere to ATC instructions; (d) Construct a mental model of the local ATC and weather environment.	(a) Systems; (b) SOPs; (c) ATC environment and phraseology; (d) Procedures for hazardous weather conditions.	

- (b) The APS MCC training course should include advanced swept-wing jet aeroplane training and airline operations scenario training to equip a pilot with the knowledge, skills, and attitudes required to commence initial type rating training to the standards generally required by a commercial air transport (CAT) operator certified pursuant to the Civil Aviation Regulations and its associated MCAR's.
- (c) The APS MCC course should consist of the following:
- (1) the content of the MCC training course;
  - (2) advanced swept-wing jet aeroplane training;
  - (3) advanced airline operations scenario training; and
  - (4) a final assessment.
- (d) The flight simulation training device (FSTD) time per crew during practical training should be a minimum of 40 hours, or 35 for an integrated airline transport pilot licence (ATPL) holders, as set out in Table 2 below.

Table 2 — Minimum hours	
Training element	Minimum FSTD time per crew
MCC TRAINING	20 hours/15 hours



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Table 2 — Minimum hours	
Training element	Minimum FSTD time per crew
ADVANCED SWEEP-WING JET AEROPLANE TRAINING	12 hours
ADVANCED AIRLINE OPERATIONS SCENARIO TRAINING	6 hours
FINAL ASSESSMENT	2 hours

The training elements may be ordered, split and combined, as determined by the approved training organisation (ATO)'s course design.

- (e) The ATO should provide generic stand-alone or CAT-operator-specific APS MCC training, advanced swept-wing jet aeroplane training and advanced airline operations scenario training. In the case of generic stand-alone training, the ATO should establish appropriate documentation and manuals representative of a CAT operator, such as manuals for aeroplane original-equipment manufacturers (OEMs), standard operating procedures (SOPs), flight documentation, as well as reporting and documentation for management systems.

#### **FSTDs**

- (f) The practical training in the APS MCC training course should be based on a multi-pilot, multi-engine aeroplane type capable of carrying at least 50 passengers or equivalent mass. The FSTD used should be type-specific and equipped with a visual system that provides at least 180° horizontal and 40° vertical field of view. However, an FNPT II MCC that has a similar visual cueing system to the above or is approved for MCC pursuant to FCL.735.A may also be acceptable provided that the device is representative of the same class of multi-pilot, multi-engine aeroplane specified in this paragraph in terms of passenger load, mass and performance, and equipped with equivalent aeroplane systems and avionics functionality.
- (g) In the case of advanced swept-wing jet aeroplane practical training, an FSTD representing a swept-wing multi-engine jet aeroplane should be used.

#### **INSTRUCTOR QUALIFICATION**

- (h) The minimum qualification level of an instructor to deliver the training course should be an MCCI(A). The ATO should ensure that:
- (1) all the instructors, before delivering the training course content, have received training on the application of core competencies as well as competency-based training; and

- (2) before the MCCI(A) delivers the advanced swept-wing jet handling or airline operations scenario training elements, they have satisfactorily completed relevant specific handling, systems and technical instructor training under the supervision of an SFI or TRI with the privilege to instruct for multi-pilot aeroplanes.
- (i) The final assessment should be completed by an instructor nominated by the head of training (HT) for this purpose.

### **COURSE DESIGN AND CORE COMPETENCIES**

- (j) The course should be designed using instructional systems design (ISD) methodology.
- (k) Progress should be monitored throughout the course in accordance with the course design.
- (l) A final progress assessment should be conducted at the end of the practical training.

### **PROGRESS ASSESSMENTS AND COURSE COMPLETION CERTIFICATE**

- (m) Practical training and progress assessments should be conducted to ensure that the student pilot has demonstrated the required level of competency (see Tables 1, 2, 3, 4 and 5 of this AMC).
- (n) During progress assessments, the student's knowledge, skills and attitudes in both pilot flying and pilot monitoring roles should be assessed; those assessments should be integrated into the training sessions.
- (o) All assessments should be graded. An example of a grading system for the APS MCC is provided in GM3 FCL.735.A.
- (p) For the final assessment, the minimum standard for each competency should be at least 'satisfactory'. 'Satisfactory' is defined as demonstrating 75 % or greater of the relevant performance indicators/observable behaviours set out in the table of GM3 FCL.735.A.
- (q) A student pilot who has reached a satisfactory or higher standard at the final assessment of the practical training should be awarded the APS MCC course completion certificate pursuant to AMC2 FCL.735.A.
- (r) Alternatively, a student pilot who completes the APS MCC course but does not achieve the APS MCC standard should be awarded the MCC course completion certificate pursuant to AMC1 FCL.735.A; FCL.735.H; FCL.735.As.

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**APS MCC TRAINING COURSE CONTENT AND PERFORMANCE INDICATORS**

- (s) The elements of AMC1 FCL.735.A(c) should be enhanced as a result of the additional training in an airline context.
- (t) CRM training should be provided to an APS MCC standard.

**Table 3 — APS MCC CRM TRAINING CONTENT AND PERFORMANCE INDICATORS**

Training	Performance indicators	Knowledge	Practical exercises
CRM training	(a) Display competency in the relevant CRM-related behaviours. (b) Successfully complete the final progress check.	Understand the CRM concepts set out in ORO.FC.115 of MCAR-Part-ORO.	Integrate CRM into all practical exercises of the APS MCC.

- (1) The ATO should ensure that the student pilot understands how multi-crew coordination as well as the content and intent of CRM in ORO.FC.115 is applied in an airline context.
- (2) In order to impart maximum learning to the student pilot, the ATO should ensure the following:
  - (i) CRM is integrated into all practical exercises of the APS MCC; and
  - (ii) Threat-and-error management (TEM) is central to the course instruction; the concepts of threat anticipation, threat recognition, recovery to safe flight, error management, and consequent avoidance of undesired aeroplanes states is emphasised at all times.

**Table 4 — ADVANCED APS MCC FLYING TRAINING COURSE CONTENT AND PERFORMANCE INDICATORS**

Training	Performance indicators	Knowledge	Practical exercises
Advanced swept-wing flying training	(a) Understand and apply combinations of thrust and attitude that ensure a stable, safe flight in various aeroplane configurations and altitudes. (b) Manage the (much) wider range of speed and thrust at both low level and high level.	Elements and components of jet orientation: (a) glass cockpit displays; (b) propulsion; (c) aerodynamics; (d) flight controls; (e) performance;	(a) Take-off, approach, landing, go-around. (b) Flight deck management practices. (c) Complex problem-solving techniques. (d) Advanced handling. (e) Manual handling skills (no autopilot, no auto

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**Table 4 — ADVANCED APS MCC FLYING TRAINING COURSE CONTENT AND PERFORMANCE INDICATORS**

Training	Performance indicators	Knowledge	Practical exercises
	<p>(c) Demonstrate good judgement and correct use of lift and drag devices during various phases of the flight.</p> <p>(d) Use displays along with all available aids to stay mentally ahead when piloting all profiles.</p> <p>(e) Understand and recognise the precursors of high-energy approaches.</p> <p>(f) Know angle-of-attack (AoA) versus attitude indications at low level as well as at high level.</p> <p>(g) Practice upset prevention as a priority, and clearly recognise when and how recovery is necessary, by using the required pilot skills to mitigate loss of control in-flight (LOC-I) events.</p>	<p>(f) jet flight planning;</p> <p>(g) weight and balance;</p> <p>(h) basic jet flying;</p> <p>(i) pilot techniques for jet flying, advanced-handling-skills development;</p> <p>(j) flight path management;</p> <p>(k) auto flight;</p> <p>(l) high-altitude operations;</p> <p>(m) introduction into prevention and recovery of upsets.</p>	<p>thrust, and where possible, no flight director).</p> <p>(f) Flight at different speeds, including slow flight and altitudes within the normal flight envelope.</p> <p>(g) Steep turns.</p> <p>(h) Aeroplane stability and stall awareness.</p> <p>(i) Upset prevention techniques and approach-to-stall recovery events (appropriate to FSTD limitations and capabilities).</p> <p>(j) High-energy approach prevention.</p> <p>(k) Go-around management of approach and landing configurations.</p>

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**Table 4 — ADVANCED APS MCC FLYING TRAINING COURSE CONTENT AND PERFORMANCE INDICATORS**

Training	Performance indicators	Knowledge	Practical exercises
Advanced air-line operations scenario training	<p>(a) Execute pre-flight preparation in accordance with airline or OEM SOPs.</p> <p>(b) Conduct an effective crew briefing, including cabin crew managers (CCMs).</p> <p>(c) Display good air-manship and TEM skills in assessing aeroplane serviceability, weather planning, fuel planning, and destination facilities.</p> <p>(d) Conduct cockpit preparation and briefings in an effective and accurate manner.</p> <p>(e) Manage and execute engine start, taxi-out and pre-take-off checks safely and in accordance with airline or OEM SOPs.</p> <p>(f) Manage and execute runway line-up, take-off, climb, cruising, descent, approach, landing and taxi-in safely and in accordance with airline or OEM SOPs.</p> <p>(g) During non-normal operations, display good system knowledge, and apply non-normal procedures, communications, TEM, situational awareness (SA), decision-making and aeroplane handling.</p>	<p>(a) Knowledge of systems as set out in this AMC.</p> <p>(b) SOPs.</p> <p>(c) Normal- and non-normal operations' checklists and procedures.</p>	<p>(a) CHECK-IN PROCEDURES.</p> <p>(b) PRE-FLIGHT PREPARATION:</p> <ol style="list-style-type: none"> <li>(1) weather analysis;</li> <li>(2) flight planning;</li> <li>(3) fuel planning;</li> <li>(4) configuration deviation list (CDL), dispatch deviation procedures guide (DDPG), and minimum equipment list (MEL) analysis; and</li> <li>(5) cabin crew briefing.</li> </ol> <p>(c) NORMAL PROCEDURES:</p> <p>cockpit preparation, pushback, engine starting, taxiing, take-off, climb, cruising, descent, landing, shutdown, and disembarkation procedures.</p> <p>(d) ON TIME PERFORMANCE:</p> <ol style="list-style-type: none"> <li>(1) weather analysis;</li> <li>(2) flight planning; and</li> <li>(3) fuel planning.</li> </ol> <p>(e) NON-NORMAL PROCEDURES:</p> <ol style="list-style-type: none"> <li>(1) as per (c) above, in case of a technical or operational non-normal event;</li> <li>(2) TEM;</li> <li>(3) diversion decision-making;</li> <li>(4) communication;</li> <li>(5) diversion;</li> <li>(6) fuel SA; and</li> <li>(7) passenger and crew care.</li> </ol>

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**Table 5 — ADVANCED APS MCC AIRLINE TRAINING CONTENT AND PERFORMANCE INDICATORS**

Training	Performance Indicators	Knowledge	Practical Exercises
Airline-oriented training	(a) Understand the roles of airline departments. (b) Understand the challenges faced by airline departments. (c) Understand the relationships between airline departments. (d) Understand airline responsibilities. (e) Understand a pilot's responsibilities as a crew member.	Appropriate elements of the applicable Regulation (Regulation (EU) No 1178/2012 (the 'Aircrew Regulation') and the Air OPS Regulation).	The exercise should provide the student pilot with a practical understanding of airline operations. This may be achieved through a visit to an airline or alternative means.

**CERTIFICATE OF COMPLETION FORM**

<b>CERTIFICATE OF COMPLETION OF APS MCC-TRAINING</b>				
Applicant's last name(s):		First name(s):		
Type of licence:		Number:	State:	
ME/IR:		<b>OR</b>	ME/IR skill test:	
Issued on:		passed on:		
	Signature of applicant:			

The satisfactory completion of APS MCC training according to requirements is certified below:

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<b>TRAINING</b>			
Multi-crew cooperation training to airline pilot standards received during period:			
from:	to:	at:	ATO/operator*
Location and date:		Signature of head of ATO or authorised instructor*:	
Type and number of licence and state of issue:		Name(s) in capital letters of authorised instructor:	

\* Delete as appropriate

**GM1 FCL.735.A Multi-crew cooperation (MCC) training course – aeroplanes**

**ENHANCED MCC TRAINING TO AIRLINE PILOT STANDARDS (APS MCC) COURSE**

(a) The ATO should be responsible for the initial course design based on the instructional systems design (ISD) methodology, as well as for the integral evaluation and further development of the course.

(b) Technical-knowledge instruction

To maximise the benefit during the training in a flight simulation training device (FSTD), it is essential that the student pilot understands the aeroplane systems. Consequently, the approved training organisation (ATO) should provide sufficient systems training to ensure that student pilots are capable of effective situational awareness (SA) of the aeroplane systems when following normal and non-normal procedures and completing the related checklists. The standard of technical-knowledge training should be limited to this goal unless the course is part of a combined APS MCC/type rating course. ATOs providing APS MCC training in a combined APS MCC/type rating course may provide systems training up to type rating standard.

Aeroplane systems training may be delivered by any means provided that the training ensures knowledge transfer to a standard within the scope of the ATO's APS MCC training course approval. This training may be delivered either through distance learning or instructor-led classroom instruction or a combination thereof. If distance learning is utilised as an element of the course, it should be supplemented by instructor-led training.

Aeroplane systems knowledge at the required level should be confirmed by an assessment determined by the ATO's course design.

(c) Advanced swept-wing jet flying training (see Table 4 of AMC2 FCL.735.A)

The student pilot should develop a flight path management competency, including energy management, as pilot flying (PF), and associated active monitoring skills as pilot monitoring (PM). Aeroplane and airline procedures used during this training should develop the student pilot's understanding of the aeroplane flight envelope and inertia, as well as of the relationship between thrust and attitude. This phase should include an introduction to prevention and recovery of upsets, which builds confidence, skill, and resilience.

(d) Advanced airline operations scenario training (see Table 4 of AMC2 FCL.735.A)

(1) The student pilot should be trained to apply the core competencies to conduct a safe and efficient operation in realistic airline operations scenarios.

(2) The airline-representative scenarios should include normal and non-normal situations.

(3) Operations should be run in real time according to a typical schedule.

(4) The scenarios should be constructed in an airline context in order to emphasise the following:

(i) threat-and-error management (TEM);

(ii) crew resource management (CRM);

(iii) flight path management, including energy management; and

(iv) interaction with internal and external stakeholders in the resolution of scenarios.

(e) Airline-oriented training (see Table 5 of AMC2 FCL.735.A)

The training should provide an understanding of the regulatory framework that an airline must operate in. The student pilot should understand the context and operational environment that applies to airline employees. Subjects should include but are not limited to the following:

(1) regulation of operations and aircrew;



- (2) safety management systems (SMSs) with emphasis on the pilot's reporting obligations and 'just culture';
- (3) fatigue management and fatigue risk management system (FRMS) with emphasis on the airline's and pilot's obligations;
- (4) flight time limitations (FTLs), including crew scheduling and crew control functions;
- (5) flight operations planning and flight watch reporting systems;
- (6) airline maintenance department and interaction with flight operations;
- (7) ground operations and interaction with flight operations; and
- (8) in-flight department and interaction with flight operations.

## **GM2 FCL.735.A Multi-crew cooperation (MCC) training course – aeroplanes**

### **ENHANCED MCC TRAINING TO AIRLINE PILOT STANDARDS (APS MCC) COURSE**

The approved training organisation (ATO) should ensure that their course design develops the required core competencies through their training and assessment plan based on the competency framework provided in Table 1 below. An ATO may adapt this framework to include additional competencies and/or performance indicators/observable behaviours

Table 1 — COMPETENCIES		
Competency	Description	Performance indicators/observable behaviours
Application of knowledge	Relates and applies relevant knowledge in the operational environment and in scenario settings.	<ul style="list-style-type: none"><li>– Demonstrates the acquisition and retention of required aviation knowledge;</li><li>– Relates knowledge between subject areas;</li><li>– Applies knowledge to the operational environment;</li><li>– Correctly identifies threats and errors in a timely manner;</li><li>– Uses knowledge to create valid options of managing threats, errors, and undesirable aeroplane states;</li><li>– Mentally resolves basic-mathematics problems relating to operational situations, both under normal circumstances and under pressure;</li><li>– Shares knowledge with others openly and constructively, as and when appropriate.</li></ul>

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**Table 1 — COMPETENCIES**

<b>Competency</b>	<b>Description</b>	<b>Performance indicators/observable behaviours</b>
Application of regulations and procedures	Identifies and applies appropriate procedures in accordance with published operating instructions and pursuant to applicable regulations.	<ul style="list-style-type: none"> <li>– Identifies where to find the information;</li> <li>– Follows standard operating procedures (SOPs) unless a higher degree of safety dictates an appropriate deviation therefrom;</li> <li>– Follows all operating instructions in a timely manner;</li> <li>– Correctly operates aeroplane systems and associated equipment;</li> <li>– Monitors the status of aeroplane systems;</li> <li>– Complies with applicable regulations;</li> <li>– Applies relevant procedural knowledge.</li> </ul>
Communication	Communicates through appropriate means in normal and non-normal situations.	<ul style="list-style-type: none"> <li>– Ensures that the recipient is ready and able to receive the information;</li> <li>– Shares appropriate information;</li> <li>– Selects appropriately what, when, how, and with whom to communicate;</li> <li>– Conveys messages clearly, accurately, and concisely;</li> <li>– Confirms that the recipient correctly understands important information;</li> <li>– Listens actively and demonstrates understanding when receiving information;</li> <li>– Asks relevant and effective questions;</li> <li>– Communicates in order to resolve deviations identified through monitoring;</li> <li>– Adheres to standard radiotelephony phraseology and procedures;</li> <li>– Accurately reads, interprets, drafts, and responds to data link messages in English;</li> <li>– Correctly uses and interprets non-verbal communication.</li> </ul>
Aeroplane flight path management — automation	Controls the aeroplane flight path through automation.	<ul style="list-style-type: none"> <li>– Uses appropriate flight management and guidance systems as well as automation, as installed and as appropriate to the conditions;</li> <li>– Monitors and detects deviations from the desired aeroplane trajectory and takes appropriate action;</li> <li>– Manages the flight path to optimise the operational performance;</li> <li>– Maintains the desired flight path during flight using automation, whilst managing other tasks and distractions;</li> <li>– Effectively monitors automation, including engagement and automatic-mode transitions.</li> </ul>

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**Table 1 — COMPETENCIES**

<b>Competency</b>	<b>Description</b>	<b>Performance indicators/observable behaviours</b>
Aeroplane flight path management — manual control	Controls the aeroplane flight path through manual flight.	<ul style="list-style-type: none"> <li>– Uses appropriate flight management and guidance systems and automation, as installed and appropriate to the conditions;</li> <li>– Manually controls the aeroplane using only the relationship between aeroplane attitude, speed and thrust, as well as navigation signals or visual information;</li> <li>– Monitors and detects deviations from the desired aeroplane trajectory and takes appropriate action;</li> <li>– Manages the flight path to optimise the operational performance;</li> <li>– Maintains the desired flight path during manual flight, whilst managing other tasks and distractions;</li> <li>– Effectively monitors flight guidance systems, including engagement and automatic-mode transitions.</li> </ul>
Leadership and teamwork	Influences others so that they contribute to a shared purpose. Collaborates to accomplish the goals of the team.	<ul style="list-style-type: none"> <li>– Creates an atmosphere of open communication and encourages team participation;</li> <li>– Displays initiative and gives directions when required;</li> <li>– Admits mistakes and takes responsibility;</li> <li>– Carries out instructions when directed;</li> <li>– Gives and receives feedback constructively;</li> <li>– Applies effective intervention strategies to resolve deviations identified whilst monitoring;</li> <li>– Takes into account cultural differences;</li> <li>– Engages others in planning;</li> <li>– Addresses and resolves conflicts and disagreements in a constructive manner;</li> <li>– Exercises decisive leadership.</li> </ul>
Problem-solving and decision-making	Identifies problem precursors and resolves actual problems, using decision-making techniques, in a timely manner.	<ul style="list-style-type: none"> <li>– Seeks accurate and appropriate information from appropriate sources;</li> <li>– Identifies and verifies what and why has failed;</li> <li>– Perseveres with resolving problems whilst prioritising safety;</li> <li>– Uses appropriate and timely decision-making techniques;</li> <li>– Sets priorities appropriately;</li> <li>– Identifies and considers options, as appropriate;</li> </ul>

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**Table 1 — COMPETENCIES**

Competency	Description	Performance indicators/observable behaviours
		<ul style="list-style-type: none"> <li>– Monitors, reviews, and adapts decisions, as required;</li> <li>– Identifies, assesses, and manages risks effectively;</li> <li>– Adapts when faced with situations where no guidance or procedure exists.</li> </ul>
Situational awareness (SA) and information management	Perceives, comprehends, and manages information, as well as anticipates its effect on the operation.	<ul style="list-style-type: none"> <li>– Monitors, identifies, and assesses accurately the aeroplane's state and systems;</li> <li>– Monitors, identifies, and assesses accurately the aeroplane's energy state and anticipated flight path;</li> <li>– Monitors, identifies, and assesses accurately the general environment as it may affect the operation;</li> <li>– Validates the accuracy of information and checks for gross errors;</li> <li>– Maintains the awareness of the people involved in or affected by the operation as well as their capacity to perform as expected;</li> <li>– Anticipates what could happen, plans, and stays ahead of the situation;</li> <li>– Develops effective contingency plans based upon potential threats;</li> <li>– Recognises and effectively responds to indications of reduced SA.</li> </ul>
Workload management	Maintains available workload capacity through prioritisation and distribution of tasks, using resources.	<ul style="list-style-type: none"> <li>– Exercises self-control in all situations;</li> <li>– Plans, prioritises, and schedules tasks effectively;</li> <li>– Manages time efficiently when carrying out tasks;</li> <li>– Offers and gives assistance, delegates when necessary;</li> <li>– Seeks and accepts assistance, when necessary;</li> <li>– Monitors, reviews, and cross-checks taken action conscientiously;</li> <li>– Verifies that tasks are completed as expected;</li> <li>– Manages and recovers from interruptions, distractions, variations, and failures effectively, while performing tasks.</li> </ul>

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**GM3 FCL.735.A Multi-crew cooperation (MCC) training course – aeroplanes**

**EXAMPLE OF AN ENHANCED MCC TRAINING TO AIRLINE PILOT STANDARDS (APS MCC) GRADING SYSTEM**

EXAMPLE OF AN APS MCC GRADING SYSTEM					
Competency	Unsatisfactory	Satisfactory	Good	Very Good	Exemplary
General description of each competency level.	The pilot's performance in this competency was unsatisfactory with a negative effect on safety. The pilot did not demonstrate the majority of the relevant performance indicators.	The pilot's performance in this competency was satisfactory with a slightly positive effect on safety. The pilot demonstrated most of the relevant performance indicators in this competency to at least a satisfactory standard.	The pilot's performance in this competency was effective with a significant contribution to safety. The pilot consistently demonstrated most of the relevant performance indicators in this competency to a good standard.	The pilot's performance in this competency was very effective, which significantly enhanced safety. The pilot regularly demonstrated all of the relevant performance indicators in this competency to a very good standard.	The pilot's performance in this competency was exemplary with an outstanding effect on safety. The pilot always demonstrated all of the relevant performance indicators in this competency to an exemplary standard.
Notes			<p>— Most: 75 % or greater.</p> <p>— Relevant performance indicator: a performance indicator/observable behaviour that is expected to be demonstrated during the assessment.</p>		

**GM4 FCL.735.A Multi-crew cooperation (MCC) training course – aeroplanes**

**ENHANCED MCC TRAINING TO AIRLINE PILOT STANDARDS (APS MCC) TRAINING — SPECIFIC ARRANGEMENT**

The specific arrangement, pursuant to ORA.GEN.205, between an approved training organisation (ATO) and an operator for the APS MCC course should cover at least the following points:

- (1) pre-entry requirements (including screening and selection);
- (2) provision of the relevant documentation (operations manuals (OMs) and training manuals);
- (3) design of the training programme;
- (4) content of the course, including criteria to ensure that the operator's documentation, manuals, standard operating procedures (SOPs), reporting structures, and management system are represented throughout the training course;
- (5) training effectiveness;
- (6) performance data feedback from the ATO to the operator;
- (7) course evaluation and improvement;
- (8) alignment of the grading and assessment criteria; and
- (9) use of the operator's crew resource management (CRM) content and utilisation of a flight crew CRM trainer, standardised by the operator.

The ATO and the operator may use their OMs and training manuals to identify additional areas to be covered by the specific arrangement.

#### **FCL.740.A Revalidation of class and type ratings – aeroplanes**

- (a) Revalidation of multi-engine class ratings and type ratings. For revalidation of multi-engine class ratings and type ratings, the applicant shall:
  - (1) pass a proficiency check in accordance with Appendix 9 or complete EBT practical assessment in accordance with Appendix 10 in the relevant class or type of aeroplane or an FSTD representing that class or type, within the 3 months immediately preceding the expiry date of the rating; and
  - (2) complete during the period of validity of the rating, at least:
    - (i) 10 route sectors as pilot of the relevant class or type of aeroplane; or

- (ii) 1 route sector as pilot of the relevant class or type of aeroplane or FFS, flown with an examiner. This route sector may be flown during the proficiency check.
  - (3) A pilot working for a commercial air transport operator approved in accordance with the applicable air operations requirements who has passed the operators proficiency check combined with the proficiency check for the revalidation of the class or type rating shall be exempted from complying with the requirement in (2).
  - (4) The revalidation of a BIR or an IR(A), if held, may be combined with a proficiency check for the revalidation of a class or type rating.
- (b) Revalidation of single-pilot single-engine class ratings.
- (1) SEP aeroplane class ratings and TMG class ratings. For the revalidation of SEP aeroplane class ratings or TMG class ratings, applicants shall:
    - (i) within the 3 months preceding the expiry date of the rating, pass a proficiency check in the relevant class in accordance with Appendix 9 to this MCAR with an examiner; or
    - (ii) within the 12 months preceding the expiry date of the rating, complete 12 hours of flight time in the relevant class, including the following:
      - (A) 6 hours as PIC;
      - (B) 12 take-offs and 12 landings;
      - (C) refresher training of at least 1 hour of total flight time with and to the satisfaction of a flight instructor (FI) or a class rating instructor (CRI) who shall select those flight exercises that allow the applicant to refresh their competence in safely operating the aircraft and applying normal, abnormal and emergency procedures. Applicants shall be exempted from this refresher training if they have passed any of the following, in any class or type of aeroplane:
        - (1) a class or type rating proficiency check;
        - (2) a skill test;
        - (3) an EBT practical assessment;

- (4) an assessment of competence.
- (2) When applicants hold both an SEP aeroplane-land class rating and a TMG class rating, they may complete the requirements of point (1) in either class or a combination of those classes, and achieve revalidation of both ratings.
- (3) Single-pilot single-engine turbo-prop aeroplanes. For revalidation of single-engine turbo-prop class ratings applicants shall pass a proficiency check on the relevant class in accordance with Appendix 9 to this MCAR with an examiner, within the 3 months preceding the expiry date of the rating.
- (4) When applicants hold both an SEP aeroplane-land class rating and an SEP aeroplane-sea class rating, they may complete the requirements of point (1)(ii) in either class or a combination of those classes, and achieve the fulfilment of those requirements for both ratings. At least 1 hour of the required PIC time and 6 of the required 12 take-offs and 12 landings shall be completed in each class.
- (5) The proficiency check for the revalidation of a single-pilot single-engine aeroplane class rating may be combined with the proficiency check for the revalidation of a BIR, in accordance with point FCL.835(g)(8).
- (c) Applicants who fail to achieve a pass in all sections of a proficiency check before the expiry date of a class or type rating shall not exercise the privileges of that rating until a pass in the proficiency check has been achieved.

### **GM1 FCL.740.A Revalidation of class and type ratings — aeroplanes**

#### **COMPLETE EBT PRACTICAL ASSESSMENT IN ACCORDANCE WITH APPENDIX 10**

- (a) The completion of an EBT practical assessment includes:
  - (1) the assessment of pilot performance either in a simulated or an operational environment; and
  - (2) the administrative action which includes the completion of the Appendix 10 form.
- (b) The assessment as per point (1) usually occurs during the entire validity period of the rating as the EBT programme includes several FSTD sessions, while the administrative action as per point (2) is completed within the 3 months immediately preceding the expiry date of the rating.



## **AMC1 FCL.740.A(b)(1)(ii) Revalidation of class and type ratings**

### **CONTENT OF THE REFRESHER TRAINING**

Training flight items should be based on the exercise items of the proficiency check, as deemed relevant by the instructor, and depending on the experience of the candidate. The briefing should include a discussion on TEM with special emphasis on decision-making when encountering adverse meteorological conditions or unintentional IMC, as well as on navigation flight capabilities.

## **FCL.745.A Advanced UPRT course – aeroplanes**

- (a) The advanced UPRT course shall be completed at an ATO and shall comprise at least:
  - (1) 5 hours of theoretical knowledge instruction;
  - (2) preflight briefings and postflight debriefings; and
  - (3) 3 hours of dual flight instruction with a flight instructor for aeroplanes FI(A) qualified in accordance with point FCL.915(e) and consisting of advanced UPRT in an aeroplane qualified for the training task. Flight time that does not include advanced UPRT but serves to go to or return from the UPRT training area shall not count towards those 3 hours.
- (b) Upon completion of the UPRT course, applicants shall be issued with a certificate of completion by the ATO.

## **AMC1 FCL.745.A Advanced UPRT course – aeroplanes**

### **COURSE OBJECTIVE AND CONTENT**

#### **COURSE OBJECTIVE**

- (a) The objective of the course is for the pilot under training:
  - (1) to understand how to cope with the physiological and psychological aspects of dynamic upsets in aeroplanes; and
  - (2) to develop the necessary competence and resilience to be able to apply appropriate recovery techniques during upsets.
- (b) In order to meet the objective as specified in point (a), the course should:

- (1) emphasise physiological and psychological effects of an upset and develop strategies to mitigate those effects;
- (2) be delivered in a suitable training aircraft in order to expose trainees to conditions that cannot be replicated in an FSTD; and
- (3) employ recovery techniques that are suitable for the aircraft used for training in order to support the training objectives. In order to minimise the risk associated with potential negative transfer of training, the recovery techniques used during the course should be compatible with techniques typically used for transport category aeroplanes.

### **THEORETICAL KNOWLEDGE**

- (c) Theoretical knowledge instruction supports the objectives of the course and should include the following:
- (1) a review of basic aerodynamics typically applicable to aeroplane upsets in transport category aeroplanes, including case studies of incidents involving potential or actual upsets.
  - (2) aerodynamics relevant to the aeroplane and exercises used in the practical training, including differences to aerodynamics as referred to in point (1);
  - (3) possible physiological and psychological effects of an upset, including surprise and startle effect;
  - (4) strategies to develop resilience and mitigate startle effect; and
  - (5) memorising the appropriate procedures and techniques for upset recovery.

### **FLIGHT INSTRUCTION**

- (d) Flight instruction should include:
- (1) exercises to demonstrate:
    - (i) the relationship between speed, attitude and AoA;
    - (ii) the effect of g-load on aeroplane performance, including stall events at different attitudes and airspeeds;
    - (iii) aerodynamic indications of a stall including buffeting, loss of control authority and inability to arrest a descent;

- (iv) the physiological effects of different g-loads between -1 and 2.5G; and
  - (v) surprise and the startle effect;
- (2) training in techniques to recover from:
  - (i) nose high at various bank angles;
  - (ii) nose low at various bank angles;
  - (iii) spiral dives;
  - (iv) stall events; and
  - (v) incipient spin; and
- (3) training to develop resilience and to employ strategies to mitigate the startle effect.

## **COURSE COMPLETION**

- (e) The course is considered to have been satisfactorily completed if the trainee is able to successfully:
  - (1) apply strategies to mitigate psychological and physical effects;
  - (2) recognise upsets;
  - (3) apply correct recovery techniques from upset scenarios as specified in point (d)(2).

## **GM1 FCL.745.A Advanced UPRT course – aeroplanes**

### **UPSET RECOVERY TRAINING EXERCISES**

#### **GENERAL**

- (a) The objective of this GM is to provide instructors with further guidance on the conduct of the various upset recovery exercises, which requires instructor performance beyond that experienced in normal operations.
- (b) Instructors should:
  - (1) ensure that the risk mitigation measures determined by the ATO are strictly adhered to;
  - (2) continuously assess the performance of the student to ensure that the training objectives of the upset recovery exercises are achieved;
  - (3) understand that all-attitude/on-aeroplane upset recovery exercises serve primarily as resilience-builder. In other words, the training serves mainly human-factor training objectives and not only flying skills training;
  - (4) understand the differences between all-attitude UPRT and aerobatics training;
  - (5) have knowledge and understanding of how:
    - (i) on-aeroplane and FSTD UPRT complement each other; and
    - (ii) to ensure that negative transfer of training from small aeroplanes to heavier transport category aeroplanes is avoided. This may be achieved by observing UPRT in an FSTD, especially in a type-specific FFS; and
  - (6) have knowledge and understanding of the upset prevention theoretical knowledge and flight instruction elements taught during the CPL(A) and ATPL(A) training courses to ensure continuity and consistency in delivering UPRT.

Note: Instructors should be aware that the safety and potential human factor implications of poor upset recovery instructional technique or misleading information are more significant than in any other areas of pilot training.
- (c) In order to increase the applicant's resilience related to the handling of aeroplane upsets, the advanced UPRT course needs to include the development of confidence and competence in recognising and recovering safely from upsets under the presence of the real human factors. Such confidence building is specifically addressed by:
  - (i) successfully overcoming natural stress response (startle and surprise); and

- (ii) performing critically important counter-intuitive actions.

Advanced UPRT therefore considers pitch attitudes, bank angles, AOA/airspeeds, sideslip and g-loads, none of which are normally experienced during routine operations.

- (d) Aeroplanes used in this course should be:
  - (1) appropriately certified and operated by the ATO in a manner that takes into account the effects of repeated training manoeuvres on airframe fatigue life; and
  - (2) provide sufficient safety margins to cater for student and instructor errors.
- (e) This course complements UPRT in FSTDs by providing exposure to psycho-physiological conditions, which cannot be delivered by the motion systems of today's qualified FSTDs. At completion of the course, the student should pilot to be able to:
  - (1) recognise and confirm the upset-situation;
  - (2) manage stress response;
  - (3) apply the correct recovery strategy timely and effectively;
  - (4) stay within the defined training envelope;
  - (5) stabilise the flight path after recovery; and
  - (6) become competent and confident in recovering from upsets.

## **SPECIFIC EXERCISES**

- (f) Exercise 1 — Nose HIGH recovery

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**Exercise 1**

Recovery from **Nose HIGH** upsets at various bank angles

(1) Training objectives	The student pilot should: (i) recognise and confirm the Nose HIGH situation (AOA, attitude, energy, trends); (ii) announce 'Nose High'; and (iii) apply the correct recovery strategy.
(2) Training tasks	The student pilot should: (i) regain situation awareness; (ii) recognise and analyse AOA, pitch, bank, energy state and trends; (iii) note natural and synthetic indications for AOA, attitude, and energy; (iv) manage human factors, stress response (startle and surprise, counter-intuitive actions); (v) take manual control; (vi) identify and apply the Nose HIGH recovery strategy; (vii) correct any out-of-trim condition; (viii) manage nose-down movement; (ix) manage g-load; (x) use the effects of power to assist nose-down movement; (xi) use bank to orient the lift vector as necessary; (xii) stabilise the flight path after recovery using basic pitch/power settings;
(3) Enabling objectives	The student pilot should: (i) decide if Stall Recovery or Nose HIGH recovery is applicable; (ii) perform control inputs deliberately; (iii) use up to full control deflections; (iv) avoid unnecessary low or high loads; (v) use secondary flight controls (trim/power) as necessary to support primary flight control inputs (i.e. nose-down movement); (vi) apply control inputs in the correct sequence (see Table 1, Nose-HIGH Recovery Strategy); (vii) apply counter-intuitive actions as necessary: (A) unloading; (B) power-reduction in Nose-HIGH attitude (depending on engine mounting); and (C) using bank to orient the lift vector downwards.

Note: Refer to GM1 to Appendix 9, Table 2: Recommended nose-high recovery strategy template.

(g) Exercise 2 — Nose LOW Recovery

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<b>Exercise 2</b> Recovery from <b>Nose LOW</b> upsets at various bank angles	
(1) Training objectives	The student pilot should: (i) recognise and confirm the situation (AOA, attitude, energy, trends); (ii) announce 'Nose LOW'; (iii) apply the correct recovery strategy.
(2) Training tasks	The student pilot should: (i) regain situation awareness; (ii) recognise and analyse AOA, pitch, bank, energy state and trends; (iii) note natural and synthetic indications for AOA, attitude and energy; (iv) manage human factors, stress response (startle and surprise, counter-intuitive actions); (v) take manual control; (vi) identify and apply the Nose LOW recovery strategy; (vii) correct out-of-trim condition; (viii) decide if aircraft is stalled; (ix) manage g-load; (x) identify the correct direction to roll; (xi) roll to wings level to orient the lift vector upwards; (xii) manage power and drag; and (xiii) stabilise the flight path after recovery using basic pitch/power settings.
(3) Enabling objectives	The student pilot should: (i) perform control inputs deliberately; (ii) use up to full control deflections; (iii) avoid unnecessary low or high loads; (iv) apply control inputs in the correct sequence (see Table 2, Nose-LOW Recovery Strategy); and (v) apply counter-intuitive actions as necessary: (A) apply Stall Recovery in nose low attitude first if needed; (B) unloading instead of pulling; (C) unloading to increase roll rate; (D) avoid 'rolling-pull'; and (E) accept the priority of rolling to wings level first, before reducing power and before pulling.

Note: Refer to GM1 to Appendix 9, Table 3: Recommended nose-low recovery strategy template.

(h) Exercise 3 — Recovery from spiral dive

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**Exercise 3**

Recovery from **Spiral Dive**

(1) Training objectives	The student pilot should: (i) recognise the spiral dive as a result of improper nose-up elevator input during a Nose LOW turning situation; and (i) apply the Nose LOW Recovery Strategy.
(2) Training tasks	The student pilot should: (i) maintain/regain situation awareness; (ii) recognise and analyse AOA, pitch, bank, energy state and trends; (iii) manage human factors, stress response (startle and surprise, counter-intuitive actions); (iv) take manual control; (v) identify and apply the Nose LOW recovery strategy; and (vi) stabilise the flight path after recovery using basic pitch/power settings.
(3) Enabling objectives	The student pilot should: (i) perform control inputs deliberately and in the correct sequence; (ii) use up to full control deflections, if required; and (iii) apply counter-intuitive actions as necessary: (A) unloading instead of pulling; (B) unloading to increase roll rate; (C) avoid 'rolling-pull'; and (D) accepting the priority of rolling to wings level first, before reducing power and before pulling.



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(i) Exercise 4 — Stall Event Recovery

<b>Exercise 4</b> Recovery from <b>Stall event</b>	
(1) Training objectives	The student pilot should: (i) recognise and confirm the situation (AOA, attitude, energy, trends); (ii) announce 'Stall'; (iii) apply the Stall Event Recovery Strategy.
(2) Training tasks	The student pilot should: (i) regain situation awareness; (ii) recognise and analyse AOA, pitch, bank, energy state and trends; (iii) note natural and synthetic indications for high AOA/stall; (iv) manage human factors, stress response (startle and surprise, counter-intuitive actions); (v) recover from: (A) approach to stall (B) full stall, wings level and during turn (C) slipping stall (D) skidding stall (E) accelerated stall (F) secondary stall (vi) take manual control; (vii) identify and apply the Stall Event Recovery Template or the aircraft manufacturer Stall Recovery SOP; (viii) apply nose-down elevator input to reduce AOA; (ix) manage trim; (x) consider power reduction (if engine mounting induces a nose-up effect); (xi) accept altitude loss; (xii) identify the correct direction to roll to wings level; (xiii) manage power and drag; (xiv) manage g-load and energy to avoid secondary stall; and (xv) stabilise the flight path after recovery using basic pitch/power settings.
(3) Enabling objectives	The student pilot should: (i) perform control inputs deliberately; (ii) use up to full control deflections; (iii) apply control inputs in the correct sequence (see Table 3, Stall Event Recovery Strategy Template); and (iv) apply counter-intuitive actions as necessary: (A) unloading to reduce AOA; (B) unloading before rolling; (C) power reduction if necessary; (D) accepting altitude loss; and (E) waiting for airspeed increase before loading again.

Note: Refer to GM1 to Appendix 9, Table 1: Recommended stall event recovery template

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(j) Exercise 5 — Recovery from spin

**Exercise 5**

Recovery from incipient spin

(1) Training objectives	The pilot should: (i) recognise and confirm the spin (AOA, yaw, attitude, energy, roll, trends); (ii) apply the OEM Incipient Spin Recovery procedure.
(2) Training tasks	The pilot should: (i) be aware of the aircraft response to all possible pitch and roll control inputs and to thrust/power changes during (incipient) spin; (ii) maintain/regain situation awareness; (iii) recognise and analyse AOA, attitude, energy, yaw, roll, trends); (iv) note natural and synthetic indications for high AOA, stall, spin; (v) manage human factors, stress response (startle and surprise, counter-intuitive actions); (vi) take manual control; (vii) identify and apply the OEM Incipient Spin Recovery Procedure; (viii) manage AOA, g-load and energy to avoid secondary stall; and (ix) stabilise the flight path after recovery using basic pitch/power settings.
(3) Enabling objectives	The pilot should: (i) perform control inputs deliberately and in the correct sequence; (ii) use up to full control deflections as required by the procedure; (iii) apply counter-intuitive actions as necessary; (iv) avoid unreflected control inputs; and (v) allow time for control inputs to show results.

(k) Assessment of student performance

By collecting evidence from observable behaviours, the instructor will continuously assess whether the student meets the required competency standards under the given conditions.

**Pilot competencies and behavioural indicators in the context of the Advanced UPRT Course**

**(1) Application of procedures**

- (i) Follows the recommended Nose HIGH or Nose LOW recovery strategy or the Stall Event Recovery Template / STALL RECOVERY SOP
- (ii) Identifies and follows operating instructions in a timely manner
- (iii) Correctly operates aircraft systems and equipment
- (iv) Applies relevant procedural knowledge

**(2) Communication**

- (i) Adheres to callouts
- (ii) Verbalises the essential steps during the recoveries

**(3) Aeroplane flight path management — automation**

Disconnects autopilot and autothrust/autothrottle before initiating the recovery (to be simulated if the training aeroplane is not fitted with autothrust/autothrottle)

**(4) Aeroplane flight path management — manual control**

- (i) Detects deviations from the desired aircraft trajectory and takes appropriate action
- (ii) Controls the aircraft using appropriate attitude and power settings
- (iii) Contains the aircraft within the defined flight envelope

**(5) Leadership and teamwork**

- (i) Understands and agrees with the crew's roles and objectives
- (ii) Uses initiative and gives directions when required
- (iii) Admits mistakes and takes responsibility
- (iv) Communicates relevant concerns and intentions
- (v) Gives and receives feedback constructively
- (vi) Projects self-control in all situations

**(6) Problem-solving and decision-making**

- (i) Seeks accurate and adequate information from appropriate sources
- (ii) Identifies and verifies what and why things have gone wrong
- (iii) Perseveres in working through the event safely
- (iv) Sets priorities appropriately

**(7) Situation awareness and information management**

- (i) Identifies and assesses accurately the state of the aircraft and its systems
- (ii) Identifies and assesses accurately the aircraft's vertical and lateral position, and its anticipated flight path

- (iii) Anticipates accurately what could happen, plans and stays ahead of the situation
- (iv) Recognises and effectively responds to indications of reduced situation awareness.
- (8) Workload management**
  - (i) Maintains self-control in all situations Manages and recovers from stress response (startle surprise), interruptions, distractions, variations and errors effectively
  - (ii) Reviews, monitors and cross-checks actions conscientiously
  - (iii) Verifies that tasks are completed to the expected outcome
  - (iv) Offers and accepts assistance, delegates when necessary, and asks for help early
  - (v) Manages and recovers from interruptions, distractions, variations and failures effectively

## **SECTION 3 – SPECIFIC REQUIREMENTS FOR THE HELICOPTER CATEGORY**

### **FCL.720.H Experience requirements and prerequisites for the issue of type ratings – helicopters**

Unless otherwise determined in the operational suitability data established in accordance with MCAR-Part-21, an applicant for the issue of the first helicopter type rating shall comply with the following experience requirements and prerequisites for the issue of the relevant rating:

- (a) Multi-pilot helicopters. An applicant for a type rating for a multi-pilot helicopter type shall, before starting the type rating training course:
  - (1) have at least 70 hours as PIC on helicopters;
  - (2) except when the type rating course is combined with an MCC course:
    - (i) hold a certificate of satisfactory completion of an MCC course in helicopters; or
    - (ii) have completed at least 500 hours of flight time as a pilot in multi-pilot operations in any aircraft category.
  - (3) have passed the ATPL(H) theoretical knowledge examinations.
- (b) A graduate from an ATP(H)/IR, ATP(H), CPL(H)/IR or CPL(H) integrated course who does not comply with the requirement of point (a)(1), shall be entitled to undergo the type rating training course for a multi-pilot helicopter type rating and shall have the type rating issued with the privileges limited to exercising functions as co-pilot only. The limitation shall be removed once the pilot has complied with all of the following:
  - (1) completed 70 hours as PIC or pilot-in-command under supervision of helicopters;
  - (2) passed the multi-pilot skill test on the applicable helicopter type as PIC.
- (c) Multi-engine helicopters. An applicant for the issue of a first type rating for a multi-engine helicopter shall:
  - (1) before starting flight training:

- (i) have passed the ATPL(H) theoretical knowledge examinations; or
- (ii) hold a certificate of completion of a pre-entry course conducted by an ATO. The course shall cover the following subjects of the ATPL(H) theoretical knowledge course:
  - Aircraft General Knowledge: airframe/systems/power plant, and instrument/electronics,
  - Flight Performance and Planning: mass and balance, performance;
- (2) in the case of applicants who have not completed an ATP(H)/IR, ATP(H), or CPL(H)/IR integrated training course, have completed at least 70 hours as PIC on helicopters.

#### **FCL.735.H Multi-crew cooperation training course – helicopters**

- (a) The MCC training course shall comprise at least:
    - (1) for MCC/IR:
      - (i) 25 hours of theoretical knowledge instruction and exercises; and
      - (ii) 20 hours of practical MCC training or 15 hours, in the case of student pilots attending an ATP(H)/IR integrated course. When the MCC training is combined with the initial type rating training for a multi-pilot helicopter, the practical MCC training may be reduced to not less than 10 hours if the same FSTD is used for both MCC and type rating;
    - (2) for MCC/VFR:
      - (i) 25 hours of theoretical knowledge instruction and exercises; and
      - (ii) 15 hours of practical MCC training or 10 hours, in the case of student pilots attending an ATP(H)/IR integrated course. When the MCC training is combined with the initial type rating training for a multi-pilot helicopter, the practical MCC training may be reduced to not less than 7 hours if the same FSTD is used for both MCC and type rating.
  - (b) The MCC training course shall be completed within 6 months at an ATO.
- An FNPT II or III qualified for MCC, an FTD 2/3 or an FFS shall be used.

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- (c) Unless the MCC course has been combined with a multi-pilot type rating course, on completion of the MCC training course the applicant shall be given a certificate of completion.
- (d) An applicant having completed MCC training for any other category of aircraft shall be exempted from the requirement in (a)(1)(i) or (a)(2)(i), as applicable.
- (e) An applicant for MCC/IR training who has completed MCC/VFR training shall be exempted from the requirement in (a)(1)(i), and shall complete 5 hours of practical MCC/IR training.

**AMC1 FCL.735.A; FCL.735.H; FCL.735.As Multi-crew cooperation (MCC) training course**

- (a) Competency is a combination of knowledge, skills and attitudes required to perform a task to the prescribed standard.
- (b) The objectives of MCC training are to develop the technical and non-technical components of the knowledge, skills and attitudes required to operate a multicrew aircraft.
- (c) Training should comprise both theoretical and practical elements and be designed to achieve the competencies/training objectives (see Table 1 below).

Table 1 — Competencies/training objectives			
Competency/ objective	Performance indicators	Knowledge	Practical exercises
Communication	(a) Know what, how much and who to communicate to; (b) Ensure the recipient is ready and able to receive the information; (c) Pass messages and information clearly, accurately, timely and adequately; (d) Check if the other person has the correct understanding when passing important information; (e) Listen actively, patiently and demonstrate understanding	(a) Human Factors, TEM and CRM; (b) Application of TEM and CRM principles to training.	In a commercial air transport environment, apply multi-crew procedures, including principles of TEM and CRM to the following: (a) Pre-flight preparation: (1) FMS initialisation; (2) radio and navigation equipment preparation; (3) flight documentation; (4) computation of take-off performance data.

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**Table 1 — Competencies/training objectives**

Competency/ objective	Performance indicators	Knowledge	Practical exercises
	<p>when receiving information;</p> <p>(f) Ask relevant and effective questions, and offer suggestions;</p> <p>(g) Use appropriate body language, eye contact and tone;</p> <p>(h) Open and receptive to other people's view.</p>		<p>(b) Take-off and climb:</p> <p>(1) before take-off checks;</p> <p>(2) normal take-offs;</p> <p>(3) rejected take-offs;</p> <p>(4) take-offs with abnormal and emergency situations included.</p> <p>(c) Cruise: emergency descent.</p> <p>(d) Descent and approach:</p>
Leadership and team working	<p>(a) Friendly, enthusiastic, motivating and considerate of others;</p> <p>(b) Use initiative, give direction and take responsibility when required;</p> <p>(c) Open and honest about thoughts, concerns and intentions;</p> <p>(d) Give and receive criticism and praise well, and admit mistakes;</p> <p>(e) Confidently do and say what is important to him or her;</p> <p>(f) Demonstrate respect and tolerance towards other people;</p> <p>(g) Involve others in planning and share activities fairly.</p>		<p>(1) instrument flight procedures;</p> <p>(2) holding;</p> <p>(3) 3D Operations using raw data;</p> <p>(4) 3D Operations using flight director;</p> <p>(5) 3D Operations using autopilot;</p> <p>(6) one-engine-inoperative approach;</p> <p>(7) 2D Operations and circling;</p> <p>(8) computation of approach and landing data;</p> <p>(9) all engines go-around;</p> <p>(10) go-around with one engine inoperative;</p> <p>(11) wind shear during approach.</p> <p>(e) landing: transition from instrument to visual flight on reaching decision altitude or height or</p>
Situational awareness	<p>(a) Be aware of what the aircraft and its systems are doing;</p> <p>(b) Be aware of where the aircraft is and its environment;</p> <p>(c) Keep track of time and fuel;</p>		



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**Table 1 — Competencies/training objectives**

Competency/ objective	Performance indicators	Knowledge	Practical exercises
	(d) Be aware of the condition of people involved in the operation including passengers; (e) Recognise what is likely to happen, plan and stay ahead of the game; (f) Develop what-if scenarios and make pre-decisions; (g) Identify threats to the safety of the aircraft and of the people.		minimum descent altitude or height; (f) after landing and post flight procedures; (g) selected emergency and abnormal procedures.
Workload management	(a) Be calm, relaxed, careful and not impulsive; (b) Prepare, prioritise and schedule tasks effectively; (c) Use time efficiently when carrying out tasks; (d) Offer and accept assistance, delegate when necessary and ask for help early; (e) Review and monitor and cross-check actions conscientiously; (f) Follow procedures appropriately and consistently; (g) Concentrate on one thing at a time, ensure tasks are completed and does not become distracted; (h) Carry out instructions as directed.		
Problem-solving and decision-making	(a) Identify and verify why things have gone wrong and do not jump		

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**Table 1 — Competencies/training objectives**

Competency/ objective	Performance indicators	Knowledge	Practical exercises
	to conclusions or make assumptions; (b) Seek accurate and adequate information from appropriate resources; (c) Persevere in working through a problem; (d) Use and agree an appropriate decision making process; (e) Agree essential and desirable criteria and prioritises; (f) Consider as many options as practicable; (g) Make decisions when they need to, reviews and changes if required; (h) Consider risks but do not take unnecessary risks.		
Monitoring and cross-checking	(a) Monitor and cross-checks all actions; (b) Monitor aircraft trajectory in critical flight phases; (c) Take appropriate actions in response to deviations from the flight path.	(a) SOPs; (b) Aircraft systems; (c) Undesired aircraft states.	
Task sharing	(a) Apply SOPs in both PF and pilot monitoring (PM) roles; (b) Makes and responds to standard call-outs.	(a) PF and PM roles; (b) SOPs.	

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**Table 1 — Competencies/training objectives**

<b>Competency/ objective</b>	<b>Performance indicators</b>	<b>Knowledge</b>	<b>Practical exercises</b>
Use of check-lists	Utilise checklists appropriately according to SOPs.	(a) SOPs; (b) Checklist philosophy.	
Briefings	Prepare and deliver appropriate briefings.	(a) SOPs; (b) Interpretation of FMS data and in-flight documentation.	
Flight management	(a) Maintain a constant awareness of the aircraft automation state; (b) Manage automation to achieve optimum trajectory and minimum workload; (c) Take effective recovery actions from automation anomalies; (d) Manage aircraft navigation, terrain clearance; (e) Manage aircraft fuel state and take appropriate actions.	(a) Understanding of aircraft performance and configuration; (b) Systems; (c) SOPs; (d) Interpretation of FMS data and in-flight documentation; (e) Minimum terrain clearance; (f) Fuel management IFR and VFR regulation.	
FMS use	Programme, manage and monitor FMS in accordance with SOPs.	(a) Systems (FMS); (b) SOPs; (c) Automation.	
Systems normal operations	Perform and monitor normal systems operation in accordance with SOPs.	(a) Systems; (b) SOPs.	
Systems abnormal and emergency operations	(a) Perform and monitor abnormal systems operation in accordance with SOPs; (b) Utilise electronic and paper abnormal checklists in accordance with SOPs.	(a) Systems; (b) SOPs; (c) Emergency and abnormal procedures and checklists; (d) Recall items.	

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Table 1 — Competencies/training objectives			
Competency/ objective	Performance indicators	Knowledge	Practical exercises
Environment, weather and ATC	(a) Communicate effectively with ATC; (b) Avoid misunderstandings by requesting clarification; (c) Adhere to ATC instructions; (d) Construct a mental model of the local ATC and weather environment.	(a) Systems; (b) SOPs; (c) ATC environment and phraseology; (d) Procedures for hazardous weather conditions.	

**CERTIFICATE OF COMPLETION FORM**

<b>CERTIFICATE OF COMPLETION OF MCC</b>			
Applicant's last name(s):		First name(s):	
Type of licence:		Number:	State:
ME/IR training completed		<b>OR</b> ME/IR validity date: ME/IR skill test date:	
Issued on:		passed on:	
	Signature of applicant:		

The satisfactory completion of MCC-Training according to requirements is certified below:

<b>TRAINING</b>			
Multi-crew co-operation training received during period:			
from:	to:	at:	ATO / operator*
Location and date:		Signature of head of ATO or authorised instructor*:	

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Type and number of licence and state of issue:	Name(s) in capital letters of authorised instructor:
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\* Delete as appropriate

### **FCL.740.H Revalidation of type ratings – helicopters**

- (a) Revalidation. For the revalidation of type ratings for helicopters, applicants shall comply with one of the following, as applicable:
- (1) they shall take the following steps:
    - (i) within the validity period of the type rating, complete at least 2 hours as pilot in the relevant helicopter type;
    - (ii) within the 3 months immediately preceding the expiry date of the type rating, pass a proficiency check:
      - (A) which is conducted in accordance with Appendix 9 in the relevant type of helicopter or an FSTD representing that type;
      - (B) the duration of which may be counted towards the flight time specified in point (i);
  - (2) for type ratings for single-engine helicopters up to a maximum take-off mass of 3 175 kg, they shall meet one of the following conditions:
    - (i) comply with point (a)(1);
    - (ii) complete, in the relevant type of helicopter, both of the following:
      - (A) within the validity period of the type rating, at least 6 hours as PIC;
      - (B) within the 3 months immediately preceding the expiry date of the rating, a refresher training of at least 1 hour of total flight time with and to the satisfaction of an instructor who shall select those flight exercises that allow the applicant to refresh their competence in safely operating the aircraft and applying normal, abnormal and emergency procedures. Applicants may choose to complete the refresher training in the aircraft

or an FSTD representing the relevant type, or in a combination of both.

- (b) When applicants hold more than one type rating for SEP helicopters, they may achieve revalidation of all the relevant type ratings by passing the proficiency check in accordance with point (a)(1)(ii) or completing the refresher training in accordance with point (a)(2)(ii)(B) in only one of the relevant types held, provided that they have completed either of the following flight times as PIC in each of the other relevant types during the validity period:
- (1) if they completed a proficiency check in accordance with point (a)(1)(ii), at least 2 hours;
  - (2) if they completed a refresher training in accordance with point (a)(2)(ii)(B), at least 6 hours.

The proficiency check or the refresher training, as applicable, shall be performed each time on a different type. The new validity period of all type ratings revalidated in accordance with this point shall commence together with the validity period of the type rating for which the proficiency check or the refresher training is performed.

- (c) When applicants hold more than one type rating for SET helicopters with a maximum certified take-off mass up to 3 175 kg, they may achieve revalidation of all the relevant type ratings by passing the proficiency check in accordance with point (a)(1)(ii) or completing the refresher training in accordance with point (a)(2)(ii)(B) in only one of the relevant types held, provided that they have completed all of the following:
- (1) 300 hours as PIC on helicopters;
  - (2) 15 hours on each of the types held;
  - (3) either of the following flight times as PIC in each of the other relevant types during the validity period:
    - (i) if they completed a proficiency check in accordance with point (a)(1)(ii), at least 2 hours;
    - (ii) if they completed a refresher training in accordance with point (a)(2)(ii)(B), at least 6 hours.

The proficiency check shall be performed each time on a different type. The new validity period of all type ratings revalidated in accordance with this point shall

commence together with the validity period of the type rating for which the proficiency check or the refresher training is completed.

- (d) Applicants who successfully complete a skill test for the issue of an additional type rating or a proficiency check for the renewal of a type rating shall achieve revalidation for the relevant type ratings already held in the common groups, as specified in points (b) and (c).

The new validity period of all type ratings revalidated in accordance with this point shall commence together with the validity period of the type rating for which the skill test or proficiency check is completed.

- (e) The revalidation of an IR(H), if held, may be combined with a proficiency check for a type rating.
- (f) Applicants who fail to achieve a pass in all sections of a proficiency check before the expiry date of a type rating shall not exercise the privileges of that rating until a pass in the proficiency check has been achieved. In the case of points (b) and (c), applicants shall not exercise their privileges in any of the types.

**AMC1 FCL.740.H(a)(3) Revalidation of type ratings – helicopters**

**CREDITING OF THE PROFICIENCY CHECK TOWARDS SEP HELICOPTER TYPES**

Only the following SEP helicopter types can be considered for crediting of the proficiency check. Other SEP helicopters (for example, R22) should not be given credit for.

<b>Manufacturer</b>	<b>SEP Helicopter type</b>
Agusta-Bell	Bell47
Bell Helicopters	Bell47
Westland	Bell47
Brantley	Brantley B2
Enstrom	ENF28
Hélicoptères Guimbal	Cabri G2
Hiller	UH12
Robinson	R44
Hughes or Schweizer	HU269
Breda Nardi	HU269



## **SECTION 4 – SPECIFIC REQUIREMENTS FOR THE POWERED-LIFT AIRCRAFT CATEGORY**

### **FCL.720.PL Experience requirements and prerequisites for the issue of type ratings – powered-lift aircraft**

Unless otherwise determined in the operational suitability data established in accordance with MCAR-Part-21, an applicant for the first issue of a powered-lift type rating shall comply with the following experience requirements and prerequisites:

- (a) for pilots of aeroplanes:
  - (1) hold a CPL/IR(A) with ATPL theoretical knowledge or an ATPL(A);
  - (2) hold a certificate of completion of an MCC course;
  - (3) have completed more than 100 hours as pilot on multi-pilot aeroplanes;
  - (4) have completed 40 hours of flight instruction in helicopters;
- (b) for pilots of helicopters:
  - (1) hold a CPL/IR(H) with ATPL theoretical knowledge or an ATPL/IR(H);
  - (2) hold a certificate of completion of an MCC course;
  - (3) have completed more than 100 hours as a pilot on multi-pilot helicopters;
  - (4) have completed 40 hours of flight instruction in aeroplanes;
- (c) for pilots qualified to fly both aeroplanes and helicopters:
  - (1) hold at least a CPL(H);
  - (2) hold an IR and ATPL theoretical knowledge or an ATPL in either aeroplanes or helicopters;
  - (3) hold a certificate of completion of an MCC course in either helicopters or aeroplanes;
  - (4) have completed at least 100 hours as a pilot on multi-pilot helicopters or aeroplanes;

- (5) have completed 40 hours of flight instruction in aeroplanes or helicopters, as applicable, if the pilot has no experience as ATPL or on multi-pilot aircraft.

### **GM1 FCL.720.PL Experience requirements and prerequisites for the issue of type ratings – powered-lift aircraft**

The endorsement of a powered-lift type rating to an aeroplane or helicopter licence does not confer upon its holder the privileges to fly helicopters or aeroplanes, respectively.

### **FCL.725.PL Flight instruction for the issue of type ratings – powered-lift aircraft**

The flight instruction part of the training course for a powered-lift type rating shall be completed in both the aircraft and an FSTD representing the aircraft and adequately qualified for this purpose.

### **FCL.740.PL Revalidation of type ratings – powered-lift aircraft**

- (a) Revalidation. For revalidation of powered-lift type ratings, the applicant shall:
- (1) pass a proficiency check in accordance with Appendix 9 to this MCAR in the relevant type of powered-lift within the 3 months immediately preceding the expiry date of the rating;
  - (2) complete during the period of validity of the rating, at least:
    - (i) 10 route sectors as pilot of the relevant type of powered-lift aircraft; or
    - (ii) 1 route sector as pilot of the relevant type of powered-lift aircraft or FFS, flown with an examiner. This route sector may be flown during the proficiency check.
  - (3) A pilot working for a commercial air transport operator approved in accordance with the applicable air operations requirements who has passed the operators proficiency check combined with the proficiency check for the revalidation of the type rating shall be exempted from complying with the requirement in (2).
- (b) An applicant who fails to achieve a pass in all sections of a proficiency check before the expiry date of a type rating shall not exercise the privileges of that rating until the a pass in the proficiency check has been achieved.

## **SECTION 5 – SPECIFIC REQUIREMENTS FOR THE AIRSHIP CATEGORY**

### **FCL.720.As Prerequisites for the issue of type ratings – airships**

Unless otherwise determined in the operational suitability data established in accordance with Part-21, an applicant for the first issue of an airship type rating shall comply with the following experience requirements and prerequisites:

- (a) for multi-pilot airships:
  - (1) have completed 70 hours of flight time as PIC on airships;
  - (2) hold a certificate of satisfactory completion of MCC on airships.
- (3) An applicant who does not comply with the requirement in (2) shall have the type rating issued with the privileges limited to exercising functions as co-pilot only. The limitation shall be removed once the pilot has completed 100 hours of flight time as PIC or pilot-in-command under supervision of airships.

### **FCL.735.As Multi-crew cooperation training course – airships**

- (a) The MCC training course shall comprise at least:
  - (1) 12 hours of theoretical knowledge instruction and exercises; and
  - (2) 5 hours of practical MCC training;

An FNPT II, or III qualified for MCC, an FTD 2/3 or an FFS shall be used.
- (b) The MCC training course shall be completed within 6 months at an ATO.
- (c) Unless the MCC course has been combined with a multi-pilot type rating course, on completion of the MCC training course the applicant shall be given a certificate of completion.
- (d) An applicant having completed MCC training for any other category of aircraft shall be exempted from the requirements in (a).

**AMC1 FCL.735.A; FCL.735.H; FCL.735.As Multi-crew cooperation (MCC) training course**

- (a) Competency is a combination of knowledge, skills and attitudes required to perform a task to the prescribed standard.
- (b) The objectives of MCC training are to develop the technical and non-technical components of the knowledge, skills and attitudes required to operate a multicrew aircraft.
- (c) Training should comprise both theoretical and practical elements and be designed to achieve the competencies/training objectives (see Table 1 below).

Table 1 — Competencies/training objectives			
Competency/ objective	Performance indicators	Knowledge	Practical exercises
Communication	<ul style="list-style-type: none"><li>(a) Know what, how much and who to communicate to;</li><li>(b) Ensure the recipient is ready and able to receive the information;</li><li>(c) Pass messages and information clearly, accurately, timely and adequately;</li><li>(d) Check if the other person has the correct understanding when passing important information;</li><li>(e) Listen actively, patiently and demonstrate understanding when receiving information;</li><li>(f) Ask relevant and effective questions, and offer suggestions;</li><li>(g) Use appropriate body language, eye contact and tone;</li><li>(h) Open and receptive to other people's view.</li></ul>	<ul style="list-style-type: none"><li>(a) Human Factors, TEM and CRM;</li><li>(b) Application of TEM and CRM principles to training.</li></ul>	<p>In a commercial air transport environment, apply multi-crew procedures, including principles of TEM and CRM to the following:</p> <ul style="list-style-type: none"><li>(a) Pre-flight preparation:<ul style="list-style-type: none"><li>(1) FMS initialisation;</li><li>(2) radio and navigation equipment preparation;</li><li>(3) flight documentation;</li><li>(4) computation of take-off performance data.</li></ul></li><li>(b) Take-off and climb:<ul style="list-style-type: none"><li>(1) before take-off checks;</li><li>(2) normal take-offs;</li><li>(3) rejected take-offs;</li><li>(4) take-offs with abnormal and emergency situations included.</li></ul></li><li>(c) Cruise: emergency descent.</li></ul>

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**Table 1 — Competencies/training objectives**

Competency/ objective	Performance indicators	Knowledge	Practical exercises
Leadership and team working	(a) Friendly, enthusiastic, motivating and considerate of others; (b) Use initiative, give direction and take responsibility when required; (c) Open and honest about thoughts, concerns and intentions; (d) Give and receive criticism and praise well, and admit mistakes; (e) Confidently do and say what is important to him or her; (f) Demonstrate respect and tolerance towards other people; (g) Involve others in planning and share activities fairly.		(d) Descent and approach: (1) instrument flight procedures; (2) holding; (3) 3D Operations using raw data; (4) 3D Operations using flight director; (5) 3D Operations using autopilot; (6) one-engine-inoperative approach; (7) 2D Operations and circling; (8) computation of approach and landing data; (9) all engines go-around; (10) go-around with one engine inoperative; (11) wind shear during approach.
Situational awareness	(a) Be aware of what the aircraft and its systems are doing; (b) Be aware of where the aircraft is and its environment; (c) Keep track of time and fuel; (d) Be aware of the condition of people involved in the operation including passengers; (e) Recognise what is likely to happen, plan and stay ahead of the game; (f) Develop what-if scenarios and make pre-decisions;		(e) landing: transition from instrument to visual flight on reaching decision altitude or height or minimum descent altitude or height; (f) after landing and post flight procedures; (g) selected emergency and abnormal procedures.

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**Table 1 — Competencies/training objectives**

Competency/ objective	Performance indicators	Knowledge	Practical exercises
	(g) Identify threats to the safety of the aircraft and of the people.		
Workload management	(a) Be calm, relaxed, careful and not impulsive; (b) Prepare, prioritise and schedule tasks effectively; (c) Use time efficiently when carrying out tasks; (d) Offer and accept assistance, delegate when necessary and ask for help early; (e) Review and monitor and cross-check actions conscientiously; (f) Follow procedures appropriately and consistently; (g) Concentrate on one thing at a time, ensure tasks are completed and does not become distracted; (h) Carry out instructions as directed.		
Problem-solving and decision-making	(a) Identify and verify why things have gone wrong and do not jump to conclusions or make assumptions; (b) Seek accurate and adequate information from appropriate resources; (c) Persevere in working through a problem;		

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**Table 1 — Competencies/training objectives**

Competency/ objective	Performance indicators	Knowledge	Practical exercises
	(d) Use and agree an appropriate decision making process; (e) Agree essential and desirable criteria and prioritises; (f) Consider as many options as practicable; (g) Make decisions when they need to, reviews and changes if required; (h) Consider risks but do not take unnecessary risks.		
Monitoring and cross-checking	(a) Monitor and cross-checks all actions; (b) Monitor aircraft trajectory in critical flight phases; (c) Take appropriate actions in response to deviations from the flight path.	(a) SOPs; (b) Aircraft systems; (c) Undesired aircraft states.	
Task sharing	(a) Apply SOPs in both PF and pilot monitoring (PM) roles; (b) Makes and responds to standard call-outs.	(a) PF and PM roles; (b) SOPs.	
Use of checklists	Utilise checklists appropriately according to SOPs.	(a) SOPs; (b) Checklist philosophy.	
Briefings	Prepare and deliver appropriate briefings.	(a) SOPs; (b) Interpretation of FMS data and in-flight documentation.	
Flight management	(a) Maintain a constant awareness of the	(a) Understanding of aircraft performance	

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**Table 1 — Competencies/training objectives**

Competency/ objective	Performance indicators	Knowledge	Practical exercises
	aircraft automation state; (b) Manage automation to achieve optimum trajectory and minimum workload; (c) Take effective recovery actions from automation anomalies; (d) Manage aircraft navigation, terrain clearance; (e) Manage aircraft fuel state and take appropriate actions.	and configuration; (b) Systems; (c) SOPs; (d) Interpretation of FMS data and in-flight documentation; (e) Minimum terrain clearance; (f) Fuel management IFR and VFR regulation.	
FMS use	Programme, manage and monitor FMS in accordance with SOPs.	(a) Systems (FMS); (b) SOPs; (c) Automation.	
Systems normal operations	Perform and monitor normal systems operation in accordance with SOPs.	(a) Systems; (b) SOPs.	
Systems abnormal and emergency operations	(a) Perform and monitor abnormal systems operation in accordance with SOPs; (b) Utilise electronic and paper abnormal checklists in accordance with SOPs.	(a) Systems; (b) SOPs; (c) Emergency and abnormal procedures and checklists; (d) Recall items.	
Environment, weather and ATC	(a) Communicate effectively with ATC; (b) Avoid misunderstandings by requesting clarification; (c) Adhere to ATC instructions; (d) Construct a mental model of the local ATC and weather environment.	(a) Systems; (b) SOPs; (c) ATC environment and phraseology; (d) Procedures for hazardous weather conditions.	



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**CERTIFICATE OF COMPLETION FORM**

<b>CERTIFICATE OF COMPLETION OF MCC</b>			
Applicant's last name(s):		First name(s):	
Type of licence:		Number:	State:
ME/IR training completed		<b>OR</b> ME/IR validity date: ME/IR skill test date:	
Issued on:		passed on:	
	Signature of applicant:		

The satisfactory completion of MCC-Training according to requirements is certified below:

<b>TRAINING</b>			
Multi-crew co-operation training received during period:			
from:	to:	at:	ATO / operator*
Location and date:		Signature of head of ATO or authorised instructor*:	
Type and number of licence and state of issue:		Name(s) in capital letters of authorised instructor:	

\* Delete as appropriate

### **FCL.740.As Revalidation of type ratings – airships**

- (a) Revalidation. For revalidation of type ratings for airships, the applicant shall:
  - (1) pass a proficiency check in accordance with Appendix 9 to this MCAR in the relevant type of airship within the 3 months immediately preceding the expiry date of the rating; and
  - (2) complete at least 2 hours as a pilot of the relevant airship type within the validity period of the rating. The duration of the proficiency check may be counted towards the 2 hours.
  - (3) The revalidation of an IR(As), if held, may be combined with a proficiency check for the revalidation of a class or type rating.
- (b) An applicant who fails to achieve a pass in all sections of a proficiency check before the expiry date of a type rating shall not exercise the privileges of that rating until a pass in the proficiency check has been achieved.

## **SUBPART I – ADDITIONAL RATINGS**

### **FCL.800 Aerobatic rating**

- (a) Holders of a pilot licence with privileges to fly aeroplanes or TMGs shall undertake aerobatic flights only if they hold an aerobatic rating in accordance with this point.
- (b) Applicants for an aerobatic rating shall have completed:
  - (1) after the issue of the licence, at least 30 hours of flight time as PIC in aeroplanes or TMGs;
  - (2) a training course at DTO or at an ATO, including:
    - (i) theoretical knowledge instruction appropriate for the rating;
    - (ii) at least 5 hours of aerobatic instruction in aeroplanes or TMGs flown with engine power.
- (c) The privileges of the aerobatic rating shall be limited to aerobatic flight in either aeroplanes or TMGs flown with engine power, depending on which aircraft the requirements of (b)(1) and (b)(2)(ii) were complied with. This limitation shall be lifted upon application if a pilot has successfully completed at least 3 dual training flights in aeroplanes or TMGs flown with engine power, as applicable, covering the full aerobatic training syllabus.
- (d) Applicants for an aerobatic rating who also hold a TMG class rating as well as advanced aerobatic privileges for sailplanes with privileges as specified in point SFCL.200(d) of MCAR-Part-SFCL shall:
  - (1) be exempted from getting their aerobatic rating limited to aeroplanes, as specified in paragraph (c) if they have complied with the requirements of (b)(1) and (b)(2)(ii) in aeroplanes, or
  - (2) receive full credit towards the requirements in paragraph (b) for the issue of an aerobatic rating restricted to TMGs flown with engine power. This limitation shall be lifted upon application if a pilot has completed the training as specified in paragraph (c).

## **AMC1 FCL.800 Aerobatic rating**

### **THEORETICAL KNOWLEDGE AND FLYING TRAINING**

- (a) The aim of the aerobatic training is to qualify licence holders to perform aerobatic manoeuvres.
- (b) The DTO or the ATO should issue a certificate of satisfactory completion of the instruction to licence endorsement.

- (c) Theoretical knowledge

The theoretical knowledge syllabus should cover the revision or explanation of:

- (1) human factors and body limitation:
  - (i) spatial disorientation;
  - (ii) airsickness;
  - (iii) body stress and G-forces, positive and negative;
  - (iv) effects of grey- and blackouts.
- (2) technical subjects:
  - (i) legislation affecting aerobatic flying to include environmental and noise subjects;
  - (ii) principles of aerodynamics to include slow flight, stalls and spins, flat and inverted;
  - (iii) general airframe and engine limitations (if applicable).
- (3) limitations applicable to the specific aircraft category (and type):
  - (i) air speed limitations (aeroplane, TMG and sailplane, as applicable);
  - (ii) symmetric load factors (type-related, as applicable);
  - (iii) rolling Gs (type-related, as applicable).
- (4) aerobatic manoeuvres and recovery:
  - (i) entry parameters;

- (ii) planning systems and sequencing of manoeuvres;
  - (iii) rolling manoeuvres;
  - (iv) looping manoeuvres;
  - (v) combination manoeuvres;
  - (vi) entry and recovery from developed spins, flat, accelerated and inverted.
- (5) emergency procedures:
  - (i) recovery from unusual attitudes;
  - (ii) drills to include the use of parachutes (if worn) and aircraft abandonment.
- (d) Flying training

The exercises of the aerobatic flying training syllabus should be repeated as necessary until the applicant achieves a safe and competent standard. Having completed the flight training, the student pilot should be able to perform a solo flight containing a sequence of aerobatic manoeuvres. The dual training and the supervised solo training flights should be tailored to the category of aircraft and limited to the permitted manoeuvres of that type of aircraft. The exercises should comprise at least the following practical training items:

- (1) confidence manoeuvres and recoveries:
  - (i) slow flights and stalls;
  - (ii) steep turns;
  - (iii) side slips;
  - (iv) engine restart in-flight (if applicable);
  - (v) spins and recovery;
  - (vi) recovery from spiral dives;
  - (vii) recovery from unusual attitudes.
- (2) aerobatic manoeuvres:

- (i) Chandelle;
- (ii) Lazy Eight;
- (iii) rolls;
- (iv) loops;
- (v) inverted flight;
- (vi) Hammerhead turn;
- (vii) Immelmann.

### **FCL.805 Sailplane towing and banner towing ratings**

- (a) Holders of a pilot licence with privileges to fly aeroplanes or TMGs shall only tow sailplanes or banners when they hold the appropriate sailplane towing or banner towing rating.
- (b) Applicants for a sailplane towing rating shall have completed:
  - (1) at least 30 hours of flight time as PIC and 60 take-offs and landings in aeroplanes, if the activity is to be carried out in aeroplanes, or in TMGs, if the activity is to be carried out in TMGs, completed after the issue of the licence;
  - (2) a training course at a DTO or at an ATO, including:
    - (i) theoretical knowledge instruction on towing operations and procedures;
    - (ii) at least 10 instruction flights towing a sailplane, including at least 5 dual instruction flights; and
    - (iii) except for holders of an SPL in accordance with MCAR-Part-SFCL, 5 familiarisation flights in a sailplane which is launched by an aircraft.
- (c) Applicants for a banner towing rating shall have completed:
  - (1) at least 100 hours of flight time and 200 take-offs and landings as PIC on aeroplanes or TMG, after the issue of the licence. At least 30 of these hours shall be in aeroplanes, if the activity is to be carried out in aeroplanes, or in TMG, if the activity is to be carried out in TMGs;

- (2) a training course at a DTO or at an ATO including:
  - (i) theoretical knowledge instruction on towing operations and procedures;
  - (ii) at least 10 instruction flights towing a banner, including at least 5 dual flights.
- (d) The privileges of the sailplane and banner towing ratings shall be limited to aeroplanes or TMGs appropriately to aircraft on which the flight instruction was completed. For banner towing, the privileges shall be limited to the towing method used for flight instruction. The privileges shall be extended if pilots have successfully completed at least three dual training flights covering the full towing training syllabus in either aircraft and towing method for banner towing.
- (e) In order to exercise the privileges of the sailplane or banner towing ratings, the holder of the rating shall have completed a minimum of 5 tows during the last 24 months.
- (f) When the pilot does not comply with the requirement in (e), before resuming the exercise of his/her privileges, the pilot shall complete the missing tows with or under the supervision of an instructor.
- (g) Applicants for a sailplane towing or banner towing rating on TMGs in accordance with this point shall receive full credit towards the requirements of paragraph (b) or (c), as applicable, if they hold a sailplane towing or banner towing rating in accordance with point SFCL.205 of MCAR-Part-SFCL, as applicable, or if they have fulfilled all the requirements for the issue of that rating.

### **AMC1 FCL.805 Sailplane towing and banner towing rating**

#### **THEORETICAL KNOWLEDGE AND FLYING TRAINING**

- (a) The aim of the towing instruction is to qualify licence holders to tow banners or sailplanes.
- (b) The DTO or the ATO should issue a certificate of satisfactory completion of the instruction to licence endorsement.
- (c) Theoretical knowledge: towing of sailplanes

The theoretical knowledge syllabus for towing of sailplanes should cover the revision or explanation of:

- (1) regulations about towing flights;
- (2) equipment for the towing activity;
- (3) sailplane towing techniques, including:
  - (i) signals and communication procedures;
  - (ii) take-off (normal and crosswind);
  - (iii) in-flight launch procedures;
  - (iv) descending on tow;
  - (v) sailplane release procedure;
  - (vi) tow rope release procedure;
  - (vii) landing with tow rope connected (if applicable);
  - (viii) emergency procedures during tow, including equipment malfunctions;
  - (ix) safety procedures;
  - (x) flight performance of the applicable aircraft type when towing sailplanes;
  - (xi) look-out and collision avoidance;
  - (xii) performance data sailplanes, including:
    - (A) suitable speeds;
    - (B) stall characteristics in turns.
- (d) Theoretical knowledge: banner towing

The theoretical knowledge syllabus for banner towing should cover the revision or explanation of:

  - (1) regulations about banner towing;
  - (2) equipment for the banner towing activity;
  - (3) ground crew coordination;



- (4) pre-flight procedures;
- (5) banner towing techniques, including:
  - (i) take-off launch;
  - (ii) banner pickup manoeuvres;
  - (iii) flying with a banner in tow;
  - (iv) release procedure;
  - (v) landing with a banner in tow (if applicable);
  - (vi) emergency procedures during tow, including equipment malfunctions;
  - (vii) safety procedures;
  - (viii) flight performance of the applicable aircraft type when towing a heavy or light banner;
  - (ix) prevention of stall during towing operations.
- (e) Flying training: towing of sailplanes

The exercises of the towing training syllabus for towing sailplanes should be repeated as necessary until the student achieves a safe and competent standard and should comprise at least the following practical training items:

  - (1) take-off procedures (normal and crosswind take-offs);
  - (2) 360° circles on tow with a bank of 30° and more;
  - (3) descending on tow;
  - (4) release procedure of the sailplane;
  - (5) landing with the tow rope connected (if applicable);
  - (6) tow rope release procedure in-flight;
  - (7) emergency procedures (simulation);
  - (8) signals and communication during tow.

(f) Flying training: banner towing

The exercises of the towing training syllabus for banner towing should be repeated as necessary until the student achieves a safe and competent standard and should comprise at least the following practical training items:

- (1) pickup manoeuvres;
- (2) towing in-flight techniques;
- (3) release procedures;
- (4) flight at critically low air speeds;
- (5) maximum performance manoeuvres;
- (6) emergency manoeuvres to include equipment malfunctions (simulated);
- (7) specific banner towing safety procedures;
- (8) go-around with the banner connected;
- (9) loss of engine power with the banner attached (simulated).

### **FCL.810 Night rating**

(a) Aeroplanes, TMGs, airships.

- (1) Applicants shall have completed a training course within a period of up to 6 months at a DTO or at an ATO to exercise the privileges of an LAPL or a PPL for aeroplanes, TMGs or airships in VFR conditions at night. The course shall comprise:
  - (i) theoretical knowledge instruction;
  - (ii) at least 5 hours of flight time in the appropriate aircraft category at night, including at least 3 hours of dual instruction, including at least 1 hour of cross-country navigation with at least one dual cross-country flight of at least 50 km (27 NM) and 5 solo take-offs and 5 solo full-stop landings.
- (2) Before completing the training at night, LAPL holders shall have completed the basic instrument flight training required for the issue of the PPL.

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- (3) When applicants hold both an SEP aeroplane-land and a TMG class rating, they may meet the requirements in point (1) in either class or in both classes.
  - (4) Applicants for a night rating for aeroplanes or TMGs in accordance with this subparagraph shall receive full credit towards the requirements of subparagraphs (1) and (2) if they hold a TMG night rating in accordance with point SFCL.210 of MCAR-Part-SFCL or if they have fulfilled all the requirements for the issue of that rating.
- (b) Helicopters. If the privileges of a PPL for helicopters are to be exercised in VFR conditions at night, the applicant shall have:
- (1) completed at least 100 hours of flight time as pilot in helicopters after the issue of the licence, including at least 60 hours as PIC on helicopters and 20 hours of cross-country flight;
  - (2) completed a training course at a DTO or at an ATO. The course shall be completed within a period of six months and comprise
    - (i) 5 hours of theoretical knowledge instruction;
    - (ii) 10 hours of helicopter dual instrument instruction time; and
    - (iii) 5 hours of flight time at night, including at least 3 hours of dual instruction, including at least 1 hour of cross-country navigation and 5 solo night circuits. Each circuit shall include a take-off and a landing.
  - (3) An applicant who holds or has held an IR in an aeroplane or TMG, shall be credited with 5 hours towards the requirement in (2)(ii) above.

### **AMC1 FCL.810(a) Night rating**

#### **AEROPLANE NIGHT RATING COURSE**

- (a) The aim of the course is to qualify holders of MCAR-Part-FCL licences with privileges to fly aeroplanes or TMGs to exercise their privileges at night.
- (b) The ATO or DTO should issue a certificate of satisfactory completion of the instruction that can be used for licence endorsement.
- (c) Theoretical knowledge

The theoretical knowledge syllabus should cover the revision or explanation of:

- (1) night VMC minima;
- (2) rules about airspace control at night and facilities available;
- (3) rules about aerodrome ground, runway, and obstruction lighting;
- (4) aircraft navigation lights and collision avoidance rules;
- (5) physiological aspects of night vision and orientation;
- (6) dangers of disorientation at night;
- (7) dangers of weather deterioration at night;
- (8) instrument systems or functions and errors;
- (9) instrument lighting and emergency cockpit lighting systems;
- (10) map marking for use under cockpit lighting;
- (11) practical navigation principles;
- (12) radio navigation principles;
- (13) planning and use of safety altitude; and
- (14) danger from icing conditions, as well as from avoidance and escape manoeuvres.

(d) Flying training

The exercises of the night rating flight syllabus should be repeated as necessary until the student achieves a safe and competent standard.

- (1) In all cases, exercises 4 to 7 of the night rating flight syllabus should be completed in an aeroplane or TMG.
- (2) For exercises 1 to 3, up to 50 % of the required flight training may be completed in an FSTD(A). However, each item of exercises 1 to 3 should be completed in an aeroplane or TMG in flight.
- (3) Starred items (\*) should be completed in simulated IMC and may be completed in daylight.

- (4) The flying exercises should comprise:
- (i) exercise 1:
    - (A) revise basic manoeuvres when flying by sole reference to instruments\*;
    - (B) explain and demonstrate transition from visual flight to instrument flight\*; and
    - (C) explain and revise recovery from unusual attitudes by sole reference to instruments\*;
  - (ii) exercise 2:

explain and demonstrate the use of radio navigation aids when flying by sole reference to instruments, to include position finding and tracking\*;
  - (iii) exercise 3:

explain and demonstrate the use of radar assistance\*;
  - (iv) exercise 4:
    - (A) explain and demonstrate night take-off techniques;
    - (B) explain and demonstrate night circuit techniques;
    - (C) explain and demonstrate night approaches with or without visual approach aids; and
    - (D) practise take-offs, circuits, as well as approaches and landings;
  - (v) exercise 5:

explain and demonstrate night emergency procedures including:

    - (A) simulated engine failure (to be terminated with recovery at a safe altitude);
    - (B) simulated engine failure at various phases of flight;
    - (C) simulated inadvertent entry to IMC (not on base leg or final approach);

- (D) internal and external lighting failure; and
- (E) other malfunctions and emergency procedures, as required by the AFM;
- (vi) exercise 6:
  - solo night circuits; and
- (vii) exercise 7:
  - (A) explain and demonstrate night cross-country techniques; and
  - (B) practise night cross-country dual flight and optionally supervised solo to a satisfactory standard.

### **AMC1 FCL.810(b) Night rating**

#### **HELICOPTER NIGHT RATING COURSE**

- (a) The aim of the course is to qualify helicopter licence holders to exercise the privileges of the licence at night.
- (b) The DTO or the ATO should issue a certificate of satisfactory completion of the instruction to licence endorsement.
- (c) Theoretical knowledge

The theoretical knowledge syllabus should cover the revision or explanation of:

- (1) night VMC minima;
- (2) rules about airspace control at night and facilities available;
- (3) rules about aerodrome ground, runway, landing site and obstruction lighting;
- (4) aircraft navigation lights and collision avoidance rules;
- (5) physiological aspects of night vision and orientation;
- (6) dangers of disorientation at night;
- (7) dangers of weather deterioration at night;
- (8) instrument systems or functions and errors;

- (9) instrument lighting and emergency cockpit lighting systems;
  - (10) map marking for use under cockpit lighting;
  - (11) practical navigation principles;
  - (12) radio navigation principles;
  - (13) planning and use of safety altitude;
  - (14) danger from icing conditions, avoidance and escape manoeuvres.
- (d) Flying training

The exercises of the night rating flight syllabus should be repeated as necessary until the student achieves a safe and competent standard:

- (1) In all cases, exercises 4 to 6 of the night rating flight syllabus should be completed in a helicopter in flight.
- (2) For exercises 1 to 3, up to 50 % of the required flight training may be completed in an FSTD(H). However, each item of exercises 1 to 3 should be completed in a helicopter in-flight.
- (3) Items marked (\*) should be completed in simulated IMC and may be completed in daylight.
- (4) The flying exercises should comprise:
  - (i) Exercise 1:
    - (A) revise basic manoeuvres when flying by sole reference to instruments\*;
    - (B) explain and demonstrate transition to instrument flight from visual flight\*;
    - (C) explain and revise recovery from unusual attitudes by sole reference to instruments\*.
  - (ii) Exercise 2:

Explain and demonstrate the use of radio navigation aids when flying by sole reference to instruments, to include position finding and tracking\*.

- (iii) Exercise 3:  
Explain and demonstrate the use of radar assistance\*.
- (iv) Exercise 4:
  - (A) explain and demonstrate the use and adjustment of landing light;
  - (B) explain and demonstrate night hovering:
    - (a) higher and slower than by day;
    - (b) avoidance of unintended sideways or backwards movements.
  - (C) explain and demonstrate night take-off techniques;
  - (D) explain and demonstrate night circuit technique;
  - (E) explain and demonstrate night approaches (constant angle) with or without visual approach aids to:
    - (a) heliports;
    - (b) illuminated touchdown areas.
  - (F) practise take-off's, circuits and approaches;
  - (G) explain and demonstrate night emergency procedures to include:
    - (a) simulated engine failure (to be terminated with power recovery at a safe altitude);
    - (b) simulated engine failure, including SE approach and landing (ME only);
    - (c) simulated inadvertent entry to IMC (not on base leg or final);
    - (d) simulated hydraulic control failure (to include landing);
    - (e) internal and external lighting failure;



- (f) other malfunctions and emergency procedures as required by the aircraft flight manual.
- (v) Exercise 5:  
Solo night circuits.
- (vi) Exercise 6:
  - (A) explain and demonstrate night cross-country techniques;
  - (B) practise night cross-country dual flight and either flight as SPIC or supervised solo to a satisfactory standard.

### **FCL.815 Mountain rating**

- (a) Privileges. The privileges of the holder of a mountain rating are to conduct flights with aeroplanes or TMGs to and from surfaces which are designated to require such a rating by the appropriate authorities designated by the State.

Holders of an LAPL or a PPL with privileges to fly aeroplanes or TMGs may obtain the initial mountain rating either on:

- (1) wheels, to grant the privilege to fly to and from such surfaces when they are not covered by snow; or
  - (2) skis, to grant the privilege to fly to and from such surfaces when they are covered by snow.
  - (3) The privileges of the initial rating may be extended to either wheel or ski privileges when the pilot has undertaken an appropriate additional familiarisation course, including theoretical knowledge instruction and flight training, with a mountain flight instructor.
- (b) Training course. Applicants for a mountain rating shall have completed, within a period of 24 months, a course of theoretical knowledge instruction and flight training at a DTO or at an ATO. The content of the course shall be appropriate to the privileges of the mountain rating applied for.
  - (c) Skill test. After the completion of the training, the applicant shall pass a skill test with an FE qualified for this purpose. The skill test shall contain:
    - (1) a verbal examination of theoretical knowledge;

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- (2) 6 landings on at least 2 different surfaces designated as requiring a mountain rating other than the surface of departure.
- (d) In order to exercise the privileges of the mountain rating, the holder of the rating shall, during the last 2 years, have complied with either of the following conditions:
  - (1) completed at least six landings on a surface designated to require a mountain rating;
  - (2) passed a proficiency check that complies with the requirements in point (c). The completion of the proficiency check shall be entered in the logbook of the pilot and signed by the responsible examiner.

### **AMC1 FCL.815 Mountain rating**

#### **THEORETICAL KNOWLEDGE AND FLYING TRAINING**

<b>THEORETICAL KNOWLEDGE</b>	
WHEEL	SKI
1. Equipment	
W.1.1 Personal equipment for the flight	S.1.1 Personal equipment for the flight
W.1.2 Aircraft equipment for the flight	S.1.2 Aircraft equipment for the flight
2. Take-off techniques	
W.2.1 Technique for approach and landing on a mountain surface	S.2.1 Technique for approach and landing on a mountain surface S.2.2 Landing technique on skis
W.2.2 Rolling techniques of the aircraft on various runway profiles	S.2.3 Rolling techniques of the aircraft on skis about the snow nature
W.2.3 Take-off technique	S.2.4 Take-off technique on surfaces covered with snow
W.2.4 Aircraft and engine performances about altitude	S.2.5. Aircraft and engine performances about altitude
3. Rules	
W.3.1 Mountain rating	S.3.1 Mountain rating
W.3.2 Overflight rules	S.3.2 Overflight rules
W.3.3 Surfaces classification	S.3.3 Surfaces classification
W.3.4 PIC responsibilities	S.3.4 PIC responsibilities
W.3.5 Responsibilities of the surface manager	S.3.5 Responsibilities of the surface manager
W.3.6 Flight plan	S.3.6 Flight plan S.3.7 Certification of the ski mounted aeroplanes
4. Meteorology	
W.4.1 Movements of the air mass	S.4.1 Movements of the air mass

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<b>THEORETICAL KNOWLEDGE</b>	
W.4.2 Flight consequences	S.4.2 Flight consequences
W.4.3 Relief effect on the movement of the air masses	S.4.3 Relief effect on the movement of the air masses
W.4.4 Altimetry	S.4.4 Altimetry
5. Human Performance and Limitations	
W.5.1 The cold	S.5.1 The cold
W.5.2 The food	S.5.2 The food
W.5.3 The hypoxia	S.5.3 The hypoxia
W.5.4 The radiance	S.5.4 The radiance
W.5.5 The thirst	S.5.5 The thirst
W.5.6 The tiredness	S.5.6 The tiredness
W.5.7 Turbulence effects in altitude	S.5.7 Turbulence effects in altitude
6. Navigation	
W.6.1 Progress of the flight	S.6.1 Progress of the flight
W.6.2 Dead reckoning	S.6.2 Dead reckoning
W.6.3 The path over the relief	S.6.3 The path over the relief
W.6.4 Progress in the valleys	S.6.4 Progress in the valleys
W.6.5 Detection of obstacles (high voltage lines, chairlifts, cables, etc.).	S.6.5 Detection of obstacles (high voltage lines, chairlifts, cables, etc.)
7. Specific items	
	S.7.1 Knowledge of the snow and assessment of the snow nature in-flight S.7.2 Knowledge of the glacier S.7.3 Life of the glacier S.7.4 Formation of the cracks S.7.5 Snow bridges S.7.6 Avalanches
8. Survival	
	S.8.1 Ways of survival (psychological aspects) S.8.2 Use of the equipments S.8.3 Removal of snow from the aircraft S.8.4 Building of a shelter S.8.5 How to eat and feed
<b>FLIGHT INSTRUCTION</b>	
<b>WHEEL</b>	<b>SKI</b>
I.- Navigation	
W.I.1 Flight techniques in the valleys	S.I.1 Flight techniques in the valleys
W.I.2 Flight over mountain passes and ridges.	S.I.2 Flight over mountain passes and ridges
W.I.3 U-turn in narrow valleys	S.I.3 U-turn in narrow valleys
	S.I.4 Choice of the flight path of aerology

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<b>THEORETICAL KNOWLEDGE</b>	
W.I.4 Choice of the flight path of aerology W.I.5 W.I.5 Map reading	S.I.5 Map reading
<b>II. – Arrival and reconnaissance</b>	
W.II.1 Choice of the altitude of arrival	S.II.1 Choice of the arrival altitude
W.II.2 Choice of the arrival and overflight pattern	S.II.2 Choice of the arrival and overflight pattern
W.II.3 Choice of the landing pattern	S.II.3 Description of the circuit pattern
W.II.4 Aerology awareness	S.II.4 Aerology awareness
W.II.5 Evaluation of the length of the runway	S.II.5 Evaluation of the runway length
W.II.6 Evaluation of the runway profile (slope and banking)	S.II.6 Evaluation of the runway profile (slope and banking)
W.II.7 Collision avoidance.	S.II.7 Collision avoidance
W.II.8 Definition of the references for the landing (touchdown point)	S.II.8 Definition of the references for the landing (touchdown point)
W.II.9 Determination of the circuit pattern altitude	S.II.9 Determination of the circuit pattern altitude
W.II.10 Choice of the final speed depending on the runway profile	S.II.10 Choice of the final speed depending on the runway profile S.II.11 Choice of the take-off axis S.II.12. Choice of the landing axis S.II.13 Choice of the parking area S.II.14 Observation of the obstacles on the ground (cracks, snow bridges, avalanches) S.II.15 Estimation of the snow nature S.II.16 Observation of the way to reach a refuge from the landing area
<b>III – Approach and landing</b>	
W.III.1 Landing pattern altitude	S.III.1 Landing pattern altitude
W.III.2 Precision of flight along the landing path	S.III.2 Precision of flight along the landing path
W.III.3 Corrections on the landing path (accuracy and effectiveness)	S.III.3 Corrections on the landing path (accuracy and effectiveness)
W.III.4 Landing (precision of the flare and of the touchdown point)	S.III.4 Landing (precision of the flare and of the touchdown point)
W.III.5 Taxiing (use of the engine power) on various profiles	S.III.5 Taxi of the aircraft on various snows and various runway profiles
W.III.6 Parking of the aircraft (depending on the runway profile, the traffic, etc.)	S.III.6 Parking of the aircraft (depending on the snow nature and the profile of the apron) S.III.7 Turns on various snow nature and various ground profiles
<b>IV. – Take-off</b>	

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THEORETICAL KNOWLEDGE	
W.IV.1 Safety checks before take-off	S. IV.1 Safety checks before take-off.
W.IV.2 Lining up on the runway	S.IV.2 Lining up on the runway
W.IV.3 Control of the runway axis during take-off	S.IV.3 Control of the runway axis during take-off
W.IV.4 Choice and use of the visual references of the take-off axis	S.IV.4 Choice and use of the visual references of the take-off axis
	S.IV.5 Acceleration depending on the nature of the snow
	S.IV.6 Short take-off
	S.IV.7 Take-off avoiding the skid of the skis
V. - Survival	
	S.V.1 Use of the snowshoes
	S.V.2 Use of the markings

**AMC2 FCL.815 Mountain rating**

**SKILL TEST AND PROFICIENCY CHECK**

The skill test for the issue or the proficiency check for the revalidation or renewal of a mountain rating should contain the following elements:

(a) oral examination

This part should be done before the flight and should cover all the relevant parts of the theoretical knowledge. At least one question for each of the following sections should be asked:

- (1) specific equipment for a mountain flight (personal and aircraft);
- (2) rules of the mountain flight.

If the oral examination reveals a lack in theoretical knowledge, the flight test should not be done and the skill test is failed.

(b) practical skill test

During the flight test, two sites different from the departure airport should be used for recognition, approach, landing and take-off. For the mountain rating ski or the extension from wheel to ski, one of the two different sites should be a glacier.

### **FCL.820 Flight test rating**

- (a) Holders of a pilot licence for aeroplanes or helicopters shall only act as PIC in category 1 or 2 flight tests, as defined in MCAR-Part-21, when they hold a flight test rating.
- (b) The obligation to hold a flight test rating established in point (a) shall only apply to flight tests conducted on:
  - (1) helicopters certificated or to be certificated in accordance with the standards of CS-27 or CS-29 or equivalent airworthiness codes; or
  - (2) aeroplanes certificated or to be certificated in accordance with:
    - (i) the standards of CS-25 or equivalent airworthiness codes; or
    - (ii) the standards of CS-23 or equivalent airworthiness codes, except for aeroplanes with a maximum take-off mass of 2 000 kg or less.
- (c) The privileges of the holder of a flight test rating are to, within the relevant aircraft category:
  - (1) in the case of a category 1 flight test rating, conduct all categories of flight tests, as defined in MCAR-Part-21, either as PIC or co-pilot;
  - (2) in the case of a category 2 flight test rating:
    - (i) conduct category 1 flight tests, as defined in Part-21:
      - as a co-pilot, or
      - as PIC, in the case of aeroplanes referred to in (b)(2)(ii), except for those within the commuter category or having a design diving speed above 0,6 mach or a maximum ceiling above 25 000 feet;
    - (ii) conduct all other categories of flight tests, as defined in Part-21, either as PIC or co-pilot;
  - (3) conduct flights without a type or class rating as defined in Subpart H, except that the flight test rating shall not be used for commercial air transport operations.
- (d) Applicants for the first issue of a flight test rating shall:

- (1) hold at least a CPL and an IR in the appropriate aircraft category;
  - (2) have completed at least 1 000 hours of flight time in the appropriate aircraft category, of which at least 400 hours as PIC;
  - (3) have completed a training course at an ATO appropriate to the intended aircraft and category of flights. The training shall cover at least the following subjects:
    - Performance,
    - Stability and control/Handling qualities,
    - Systems,
    - Test management,
    - Risk/Safety management.
- (e) The privileges of holders of a flight test rating may be extended to another category of flight test and another category of aircraft when they have completed an additional course of training at an ATO.

## **AMC1 FCL.820 Flight test rating**

### **TRAINING COURSE**

#### **GENERAL**

- (a) Competency-based training:
- (1) Training courses for the flight test rating should be competency-based. The training programme should follow as much as possible the syllabus outlined below, but may be adapted taking into account the previous experience, skill and theoretical knowledge level of the applicants.
  - (2) It should also be recognised that the syllabi below assume that suitable flight test experience will be gained subsequent to attendance at the course. Should the applicant be significantly experienced already, then consideration should be made of that experience and it is possible that course content might be reduced in areas where that experience has been obtained.
  - (3) Furthermore, it should be noted that flight test ratings are specific to both a certain category of aircraft (aeroplanes or helicopters) and to a certain

category of flight test (category 1 or 2). Therefore, holders of a flight test rating wishing to extend their privileges to further categories of aircraft or to further categories of flight test (this is only relevant for holders of a category 2 flight test rating since the category one flight test rating includes the privileges for category 2 test flights) should not be requested to undertake the same course as an 'ab-initio' applicant. In these cases, the ATO should develop specific 'bridge courses' taking into account the same principles mentioned above.

- (4) To allow proper consideration of the applicant's previous experience, a pre-entry assessment of the applicant's skills should be undertaken, on the basis of which the ATO may evaluate the level of the applicant to better tailor the course. Thus, the syllabi listed below should be regarded as a list of individual demonstrable competencies and qualifications rather than a list of mandatory training objectives.

(b) Continuous evaluation

Training courses for the flight test rating should be built on a continuous evaluation model to guarantee that successful completion of the course ensures that the applicant has reached the level of competence (both theoretical and practical) to be issued a flight test rating.

## **CONTENT OF THE COURSE**

- (c) In addition, the content of the course should vary taking into account whether the applicant seeks privileges for a category 1 or 2 flight test rating, as well as the relevant category of aircraft, and their level of complexity. To better take these factors into account, training courses for the flight test rating have been divided into two conditions:

- (1) condition 1 courses apply to category 1 flight test ratings on:

- (i) helicopters certificated in accordance with the standards of CS-27 or CS-29 or equivalent airworthiness codes;
- (ii) aeroplanes certificated in accordance with:
  - (A) the standards of CS-25 or equivalent airworthiness codes; or
  - (B) the standards of CS-23 or equivalent airworthiness codes, within the commuter category or having an MD above 0.6 or a maximum ceiling above 25 000 ft.

- (2) condition 2 training courses apply to:



- (i) category 2 flight test ratings for:
  - (A) helicopters certificated in accordance with the standards of CS-27 or CS-29 or equivalent airworthiness codes;
  - (B) aeroplanes certificated in accordance with:
    - (a) the standards of CS-25 or equivalent airworthiness codes; or
    - (b) the standards of CS-23 or equivalent airworthiness codes (included those mentioned in (c)(1)(ii)(B)), except for aeroplanes with a maximum take-off mass of less than 2 000 kg.
- (ii) category 1 flight tests for aeroplanes certificated in accordance with the standards of CS-23, with a maximum take-off mass of more than 2 000kg, with the exclusion of those mentioned in (c)(1)(ii)(B) (which are subject to condition 1 courses).

## **AEROPLANES**

- (d) Condition 1 courses for aeroplanes
  - (1) These courses should include approximately:
    - (i) 350 hours of ground training;
    - (ii) 100 hours of flight test training, during which at least 15 flights should be made without an instructor on board;
    - (iii) principles of test management and risk and safety managements should be integrated throughout the course. In addition, principles and methods applicable to the certification activity, as well as safety assessments should be taught.
  - (2) These courses should include instruction on at least 10 different aeroplane types, of which at least one should be certificated in accordance with CS-25 standards or equivalent airworthiness codes.
  - (3) During the course the student should be required to develop at least five substantial flight test reports.

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(4) The student should be evaluated through examinations on all of the theoretical knowledge subjects, and undertake a final in-flight test upon completion of the syllabus.

(5) Syllabus. The following subjects should be covered in the course:

**CONDITION 1 - AEROPLANES**

Theoretical knowledge	(a) aerodynamics; (b) stability and control or handling qualities; (c) engines and performance; (d) measurements and flight test instrumentation (including telemetry).	
Flight test techniques and flight training	(a) performance: (at least one flight test report should be developed)	(1) air speed calibration; (2) climb ME; (3) take-off and landing, including turboprop or turbofan OEI.
	(b) engines	Turboprop or turbofan limitations and relight envelope
	(c) handling qualities (at least two flight test reports should be developed)	(1) flight controls characteristics; (2) longitudinal handling qualities; (3) longitudinal manoeuvre stability; (4) take-off and landing MET or ME turbofan, including $V_{mcq}$ and $V_{mu}$ ; (5) lateral, directional handling qualities; (6) handling qualities evaluation; (7) variable stability demo flights including HOFCS; (8) stalls; (9) spins; (10) $V_{mca}$ .
	(d) systems (at least one flight test report should be developed)	At least three different systems, for example: (1) autopilot or AFCS; (2) glass cockpit evaluation; (3) radio navigation, instruments qualification and integrated avionics; (4) TAWS; (5) ACAS.
	(e) high speed certification test	
	(f) final evaluation exercise (a flight test report should be developed)	

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(e) Condition 2 courses for aeroplanes

(1) These courses should include approximately:

- (i) 150 hours of ground training;
- (ii) 50 hours of flight test training, during which at least eight flights should be made without an instructor on board.

Principles of test management and risk and safety managements should be integrated throughout the course. In addition, principles and methods applicable to the certification activity, as well as safety assessments should be taught.

- (2) These courses should include instruction on at least seven different aeroplane types, of which at least one should be certificated in accordance with CS-25 standards or equivalent airworthiness codes.
- (3) During the course the student should be required to develop at least three substantial flight test reports.
- (4) The student should be evaluated through examinations on all of the theoretical knowledge subjects, and undertake a final in-flight test upon completion of the syllabus.
- (5) Syllabus. The following subjects should be covered in the course:

CONDITION 2 - AEROPLANES			
Theoretical knowledge	<ul style="list-style-type: none"><li>(a) aerodynamics;</li><li>(b) stability and control or handling qualities;</li><li>(c) engines and performance;</li><li>(d) measurements and flight test instrumentation (including telemetry).</li></ul>		
Flight test techniques and flight training	(a) performance: (at least one flight test report should be developed)	(1) air speed calibration;	(2) climb ME;
	(b) handling qualities	(3) take-off and landing MET or ME turbofan.	(1) flight control characteristics;
			(2) longitudinal static, dynamic stability and control or handling qualities;
			(3) lateral, directional stability and control or handling qualities;
			(4) stalls;
			(5) spins.

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**CONDITION 2 - AEROPLANES**

	(c) systems (at least one flight test report should be developed)	At least three different systems, for example: (1) autopilot or AFCS; (2) glass cockpit evaluation; (3) radio navigation, instruments qualification and integrated avionics; (4) TAWS; (5) ACAS.
	(d) final evaluation exercise (a) flight test report should be developed)	

**HELICOPTERS**

(f) Condition 1 courses for helicopters:

(1) These courses should include approximately:

- (i) 350 hours of ground training;
- (ii) 100 hours of flight test training, during which at least 20 flights should be made without an instructor on board.

Principles of test management and risk and safety managements should be integrated throughout the course. In addition, principles and methods applicable to the certification activity, as well as safety assessments should be taught.

- (2) These courses should include instruction on at least eight different helicopter types, of which at least one should be certificated in accordance with CS-29 standards or equivalent airworthiness codes.
- (3) During the course the student should be required to develop at least five substantial flight test reports.
- (4) The student should be evaluated through examinations on all of the theoretical knowledge subjects, and undertake a final in-flight test upon completion of the syllabus.
- (5) Syllabus. The following subjects should be covered in the course:

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<b>CONDITION 1 - HELICOPTERS</b>		
Theoretical knowledge	(a) aerodynamics; (b) stability and control or handling qualities; (c) engines and performance; (d) measurements and flight test instrumentation (including telemetry).	
Flight test techniques and flight training	(a) performance: (at least one flight test report should be developed)	(1) air speed calibration; (2) level flight, climb and descent, vertical and hover performance;
	(b) engines	(1) digital engine governing; (2) turbine or piston engine evaluation.
	(c) handling qualities (at least one flight test report should be developed)	(1) flight control characteristics; (2) longitudinal static, dynamic stability and control or handling qualities; (3) lateral, directional stability and control or handling qualities; (4) ADS 33; (5) teetering rotor assessment; (6) rigid rotor assessment; (7) variable stability demo flights including HOFCS.
	(d) systems (at least one flight test report should be developed)	At least three different systems, for example: (1) navigation management systems; (2) autopilot or AFCS; (3) night vision goggles or electro-optics; (4) glass cockpit evaluation;
	(e) height and velocity envelope and EOL, including relights	
	(f) category A procedure	
	(g) vibrations and rotor adjustments	
	(h) auto rotations	
	(i) final evaluation exercise (a flight test report should be developed)	

(g) Condition 2 courses for helicopters

- (1) These courses should include approximately:
  - (i) 150 hours of ground training;
  - (ii) 50 hours of flight test training, during which at least eight flights should be made without an instructor on board.

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Principles of test management and risk and safety management should be integrated throughout the course. In addition, principles and methods applicable to the certification activity, as well as safety assessments should be taught.

- (2) These courses should include instruction on at least four different helicopters types, of which at least one should be certificated in accordance with CS-29 standards or equivalent airworthiness codes.
- (3) During the course the student should be required to develop at least three substantial flight test reports.
- (4) The student should be evaluated through examinations on all of the theoretical knowledge subjects, and undertake a final in-flight test upon completion of the syllabus.
- (5) Syllabus. The following subjects should be covered in the course:

**CONDITION 2 - HELICOPTERS**

Theoretical knowledge	(a) aerodynamics; (b) stability and control or handling qualities; (c) engines and performance; (d) measurements and flight test instrumentation (including telemetry).	
Flight test techniques and flight training	(a) performance: (at least one flight test report should be developed)	(1) air speed calibration; (2) level flight, climb and descent, vertical and hover performance.
	(b) engines	(1) digital engines governing; (2) turbine or piston engine evaluation.
	(c) handling qualities	(1) flight control characteristics; (2) longitudinal static, dynamic stability and control or handling qualities; (3) lateral, directional stability and control or handling qualities.
	(d) systems (at least one flight test report should be developed)	At least three different systems, for example: (1) navigation management systems; (2) autopilot or AFCS; (3) night vision goggles or electro-optics; (4) glass cockpit evaluation.
	(e) vibration and rotor adjustments	
	(f) final evaluation exercise (a flight test report should be developed)	

**FCL.835 Basic instrument rating (BIR)**

(a) Privileges and conditions

- (1) The privileges of a BIR holder are to conduct flights under IFR on single-pilot aeroplanes for which class ratings are held, with the exception of the following:
  - (i) high-performance aeroplanes;
  - (ii) aeroplane variants if operational suitability data has determined that an IR is required.
- (2) BIR privileges shall only be exercised in accordance with point FCL.205.A.
- (3) BIR privileges may be exercised at night only if the pilot holds a night rating in accordance with point FCL.810.
- (4) The privileges of a multi-engine BIR shall also be valid on single-engine aeroplanes for which the pilot holds a valid single-engine class rating.
- (5) The exercise of BIR privileges shall be subject to all of the following conditions:
  - (i) the decision height (DH) or minimum descent height (MDH) used in aerodrome operating minima shall be at least 200 ft greater than what would otherwise be calculated according to point 'NCO.OP.110 Aerodrome operating minima – aeroplanes and helicopters' and point 'NCO.OP.111 Aerodrome operating minima – NPA, APV, CAT I operations' of MCAR-Part-NCO; and
  - (ii) the visibility used in aerodrome operating minima shall not be less than 1 500 m;
  - (iii) the pilot-in-command shall not commence a flight under IFR or undertake a VFR to IFR transition, unless:
    - (A) at the aerodrome of departure, the visibility is at least 1 500 m and the cloud ceiling is at least 600 ft, or the published circling minimum applicable to the aeroplane category, whichever is the greater; and
    - (B) at the destination aerodrome and at any required alternate aerodrome the available current meteorological information indicates, for the period from 1 hour before until 1 hour after

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the estimated time of arrival, or from the actual time of departure to 1 hour after the estimated time of arrival, whichever period is shorter, a visibility of at least 1 500 m and a cloud ceiling of at least 600 ft, or the published circling minimum applicable to the aeroplane category, or the DH/MDH incremented by 200 ft in accordance with (i), whichever is the greater.

- (b) Prerequisites. Applicants for the BIR shall hold at least a PPL(A).
- (c) Training course. Applicants for the BIR shall have completed at an ATO:
  - (1) theoretical knowledge instruction in accordance with point FCL.615(a); and
  - (2) flight instruction that comprises the following instrument flight instruction modules:
    - (i) module 1 – the core flying training module of flight handling skills by sole reference to instruments;
    - (ii) module 2 – the applied flying training module of IFR departure, holding, 2D and 3D approach procedures;
    - (iii) module 3 – the applied flying training module of en-route IFR flight procedures; and
    - (iv) module 4 – if a multi-engine BIR is sought, the applied flying training module with one engine inoperative shall include asymmetric instrument approach and go around procedures; and
  - (3) flight instruction that complies with the following requirements:
    - (i) The module specified in paragraph (c)(2)(i) shall be completed first. The modules specified in paragraphs (c)(2)(ii) and (c)(2)(iii), and, if applicable, (c)(2)(iv), may be completed in an order chosen by the applicant.
    - (ii) The modules specified in paragraph (c)(2) may be completed in aeroplanes, FSTDs or a combination of these. In any case, the applicant shall receive training in the aeroplane to be used for the skill test.
    - (iii) The modules specified in paragraphs (c)(2)(i), (c)(2)(ii) and (c)(2)(iv) may be commenced outside an ATO but shall be completed at an



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ATO. The module specified in point (c)(2)(iii) may be completed outside an ATO.

- (iv) Prior to commencing the module specified in paragraph (c)(2)(iv), a pilot who does not hold a multi-engine aeroplane class or type rating shall have received the multi-engine training specified in Subpart H of this MCAR-Part-FCL.
- (d) Theoretical knowledge. Prior to taking the skill test and through examinations in the subjects referred to in point FCL.615(b), the applicants shall demonstrate a level of theoretical knowledge that is appropriate to the privileges granted. The theoretical knowledge examination shall consist of one examination paper associated with each module as specified in paragraphs (c)(2)(i), (c)(2)(ii) and (c)(2)(iii).
- (e) Skill test. After the completion of the training course specified in paragraph (c), the applicants shall pass a skill test in an aeroplane in accordance with Appendix 7 to this MCAR. For a multi engine BIR, the skill test shall be taken in a multi-engine aeroplane. For a single-engine BIR, the skill test shall be taken in a single-engine aeroplane. A multi-engine centreline thrust aeroplane shall be considered to be a single-engine aeroplane for the purposes of this paragraph.
- (f) By way of derogation from paragraph (d), holders of a single-engine BIR who also hold a multi engine class rating and who wish to obtain a multi-engine BIR for the first time shall complete a training course at an ATO that comprises the training as specified in paragraph (c)(2)(iv) and shall pass the skill test referred to in paragraph (e).
- (g) Validity, revalidation and renewal
  - (1) A BIR shall be valid for 1 year.
  - (2) Applicants for the revalidation of a BIR shall:
    - (i) within a period of three months immediately preceding the expiry date of the rating, pass a proficiency check in accordance with Appendix 9 to this MCAR; or
    - (ii) within the validity period, complete 6 hours as PIC under IFR including three instrument approach procedures and complete a training flight of at least one hour with an instructor who holds privileges to provide training for the BIR.
  - (3) For each alternate subsequent revalidation, the holder of the BIR shall pass a proficiency check in accordance with paragraph (2)(i) in an aeroplane.

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- (4) If a pilot chooses to fulfil the revalidation requirements specified in paragraph (g)(2)(i) earlier than what is prescribed in that paragraph, the new validity period shall commence from the date of the proficiency check.
- (5) Applicants who fail to pass the relevant sections of a BIR proficiency check before the expiry date of the BIR shall not exercise the BIR privileges until they have passed the proficiency check.
- (6) If a BIR has expired, in order to renew their privileges, applicants shall:
  - (i) where necessary to reach the level of proficiency needed, complete refresher training provided by an ATO or, if the BIR is expired for three years or less, by an instructor who holds privileges to provide training for the BIR; and
  - (ii) pass a proficiency check in an aeroplane.
- (7) For a multi-engine BIR, the proficiency check for the revalidation or renewal as well as the flying training required in paragraph (g)(2)(ii) shall be completed in a multi-engine aeroplane.
- (8) The proficiency check for the revalidation or renewal of a BIR may be combined with a proficiency check for the revalidation or renewal of a single-pilot aeroplane class rating on which BIR privileges may be exercised in accordance with point FCL.835(a)(1).
- (h) Applicants for the BIR who hold a PPL or CPL issued in accordance with MCAR-Part-FCL and a valid IR(A) issued in accordance with the requirements of Annex 1 to the Chicago Convention by a third country may be credited in full towards the training course referred to in paragraph (c)(2). In order to be issued with the BIR, the applicants shall:
  - (1) successfully complete the skill test referred to in paragraph (e);
  - (2) demonstrate orally to the examiner during the skill test that they have acquired an adequate level of theoretical knowledge of air law, meteorology, and flight planning and performance; and
  - (3) have experience of at least 25 hours of flight time under IFR as PIC on aeroplanes.
- (j) The holder of an IR shall receive full credits for the requirement in paragraph (c)(2).

## **AMC1 FCL.835 Basic instrument rating (BIR)**

### **BASIC INSTRUMENT RATING (BIR) COMPETENCIES**

This AMC provides the competency criteria required for the relevant training modules of the BIR.

**(a) Modules**

The following modules are applicable:

- (1) Module 1: Pre-flight operations and general handling;
- (2) Module 2: Departure, precision (3D) approach procedures and non-precision (2D) approach procedures;
- (3) Module 3: En-route IFR procedures;
- (4) Module 4: Optional flight with one engine inoperative (multi-engine aeroplanes only).

Upon completion of the training, an applicant for a BIR should have received instruction on the same class of aeroplane to be used in the test.

**(b) Flight tolerances**

The following limits should apply and it should be borne in mind that such tolerances are expected only at the end of the training. Due consideration should be given to make allowance for turbulent conditions and the handling qualities and performance of the aircraft used:

Height

Generally	± 100 feet
Starting a go-around at decision height or altitude	+ 50 feet/– 0 feet
Minimum descent height, MAP or altitude	+ 50 feet/– 0 feet

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On radio aids	±5°
For 'angular' deviations	Half-scale deflection, azimuth and glide path (e.g. LPV, ILS, MLS, GLS)
2D (LNAV) and 3D (LNAV/VNAV) 'linear' lateral deviations	Cross-track error/deviation shall normally be limited to ± ½ the RNP value associated with the procedure. Brief deviations from this standard up to a maximum of one time the RNP value are allowable.
3D linear vertical deviations (e.g. RNP APCH (LNAV/VNAV) using Baro VNAV)	Not more than – 75 feet below the vertical profile at any time, and not more than + 75 feet above the vertical profile at or below 1 000 feet above aerodrome level.

Heading

All engines operating	± 5°
With simulated engine failure	± 10°

Speed

All engines operating	± 5 knots
With simulated engine failure	+ 10 knots/– 5 knots

Given that the intention of the training for the BIR is to be entirely competency-based, the student and instructor need detailed guidance on these competencies. The following information is intended to provide that guidance. Each element of the training modules is described in text followed by a table which gives guidance on the competencies required and how to assess them using the key competencies model of:

**OBJECTIVE** (of the training item), and **SKILL — KNOWLEDGE — ATTITUDE** (to achieve the objective)

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(c) **Sample table**

Training element	
Title of assessed item taken from training module	
OBJECTIVE	This cell describes the applicant's proficiency to be assessed by the training organisation or instructor.
SKILL	This cell describes the competency criteria that involve the applicant demonstrating: <ul style="list-style-type: none"><li>— manual aircraft control;</li><li>— effective flight path management through proper use of flight management system guidance and automation; and</li><li>— application of procedures.</li></ul>
KNOWLEDGE	This cell describes the knowledge needed to meet the objective's proficiency requirements.
ATTITUDE	This cell describes the competency criteria encapsulated by airmanship, crew resource management (CRM), and threat and error management (TEM), such as: <ul style="list-style-type: none"><li>— situation awareness;</li><li>— effective communication;</li><li>— leadership and teamwork;</li><li>— effective workload management;</li><li>— effective problem-solving and decision-making.</li></ul>
General	
In most phases of flight there are competencies that apply to a group of manoeuvres, e.g. turns, or even to the whole phase of flight. In order to avoid repetition, the common competencies are grouped under the 'General' item heading.	

(d) **Content of the training**

(1) **Module 1: Pre-flight operations and general handling**

**Use of flight manual (or equivalent), especially for aircraft performance calculation, and mass and balance**

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**Module 1: Pre-flight operations and general handling**

**Use of flight manual (or equivalent), especially for aircraft performance, and mass and balance**

<b>OBJECTIVE</b>	<p>(A) Proficient in the use of the flight manual (or equivalent).</p> <p>(B) Proficient in the mass and balance schedule.</p> <p>(C) Proficient in the aircraft performance calculation.</p>
<b>SKILL</b>	<p>(A) Use proficiently performance charts, tables, graphs or other data, when available, relating to items such as:</p> <ul style="list-style-type: none"> <li>(1) accelerate-stop distance available;</li> <li>(2) landing distance available;</li> <li>(3) take-off performance;</li> <li>(4) one engine inoperative;</li> <li>(5) climb performance;</li> <li>(6) cruise performance;</li> <li>(7) fuel consumption, range, and endurance;</li> <li>(8) go-around from rejected landing;</li> <li>(9) operational factors affecting aircraft performance;</li> <li>(10) other performance data appropriate to the test aircraft;</li> <li>(11) airspeeds used during specific phases of flight;</li> <li>(12) effects of meteorological conditions upon performance characteristics and correctly application of these factors to a specific chart, table, graph or other performance data;</li> <li>(13) impact of relevant NOTAMs on the conduct of the flight;</li> <li>(14) aircraft documentation.</li> </ul>
<b>KNOWLEDGE</b>	<p>(A) Part-NCO (non-commercial air operations)</p> <p>(B) Pilot operating manual (POM) or flight manual chapters dedicated to:</p> <ul style="list-style-type: none"> <li>(15) limitations;<sup>1</sup></li> <li>(16) performance calculation in general;</li> <li>(17) performance calculation and associated procedures when specific conditions exist.</li> </ul>
<b>ATTITUDE</b>	<p>(A) Situation awareness: Understand the responsibilities of proper pre-departure planning and preparations.</p> <p>(B) Effective communication: Ensure appropriate and clear communication with all ground service personnel (ATC, dispatch, MET).</p> <p>(C) Leadership and teamwork: Manage passengers and ground personnel, as applicable.</p> <p>(D) Effective workload management:</p>

<sup>1</sup> The numbering of (15)-(17) under point (B) is an editorial error and should read (1)-(3). This will be corrected with the next update of AMC & GM to Part-FCL.

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	Provide sufficient time and manage the workload for pre-flight procedures (including documentation) to be completed in an efficient manner.
(E)	Effective problem-solving and decision-making: (1) Make appropriate decisions on all identified threats; (2) Plan and implement suitable mitigation actions.

## Pre-flight inspection

Module 1: Pre-flight operations and general handling	
Pre-flight inspection	
<b>OBJECTIVE</b>	Full initial pre-flight inspection in accordance with the approved checklist assuming the risk to IFR flights such as icing conditions, database, etc.
<b>SKILL</b>	(A) Perform all elements of the aeroplane pre-flight inspections. (B) Confirm that the aeroplane is in a serviceable and safe condition for IFR flight.
<b>KNOWLEDGE</b>	(A) Confirm the validity of database and receiver autonomous integrity monitoring (RAIM) prediction, if applicable. (B) Be aware of the possible effects of equipment defects or unserviceability.
<b>ATTITUDE</b>	(A) Situation awareness: (1) Note the position of the aircraft, any surrounding hazards, and location of emergency equipment, and take appropriate action to minimise potential risks; (2) Note effects of engine start on the surrounding environment; (3) Note the limitations of software and equipment such as flight director (FD), autopilot (AP), etc. (B) Effective communication: (1) Demonstrate correct communication; (2) Make a correct passenger and departure briefing. (C) Leadership and teamwork: Demonstrate correct coordination with ATC (where applicable). (D) Effective workload management: (1) Confirm from the checklist that all pre-flight requirements have been fulfilled; (2) Demonstrate an organised approach to performing inspection of aircraft and equipment. (E) Effective problem-solving and decision-making: (1) Identify possible defects and threats; (2) Take corrective action.

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## Taxiing

Module 1: Pre-flight operations and general handling	
Taxiing	
<b>OBJECTIVE</b>	<p>(A) Be proficient in all recommended taxiing checks and procedures.</p> <p>(B) Comply with ATC instructions, airport markings and signals.</p>
<b>SKILL</b>	<p>(A) Obtain appropriate clearance before taxiing and before crossing or entering active runways.</p> <p>(B) Comply with instructions issued by ATC.</p> <p>(C) Maintain correct and positive aircraft control.</p> <p>(D) Take due consideration of environmental conditions (e.g. surface wind, contamination, surface condition, etc.).</p> <p>(E) Maintain adequate separation from other aircraft, obstructions, and persons.</p> <p>(F) Accomplish the applicable briefing or checklist items, and follow the recommended procedures.</p>
<b>KNOWLEDGE</b>	<p>(A) The need to correctly perform taxiing checks.</p> <p>(B) Understanding the following:</p> <ol style="list-style-type: none"> <li>(1) runway hold lines and stop bar lighting as applicable;</li> <li>(2) localiser and glide slope sensitive and critical areas;</li> <li>(3) beacons, as well as other surface control markings and lighting;</li> <li>(4) taxiing speeds;</li> <li>(5) rules and procedures in the event of loss of communication (priority, lighting signals);</li> <li>(6) rules for manoeuvring in reduced meteorological conditions.</li> </ol>
<b>ATTITUDE</b>	<p>(A) Situation awareness:</p> <ol style="list-style-type: none"> <li>(1) Maintain constant vigilance and lookout during the taxiing operation;</li> <li>(2) Use headings in poor visibility conditions to confirm the path;</li> <li>(3) Maintain awareness of taxiing speeds appropriate to the conditions and limitations.</li> </ol> <p>(B) Effective communication: Demonstrate correct ATC communication (where applicable).</p> <p>(C) Leadership and teamwork: Demonstrate correct coordination with ATC (where applicable).</p> <p>(D) Effective workload management: Divide attention properly inside and outside the cockpit.</p> <p>(E) Effective problem-solving and decision-making:</p> <ol style="list-style-type: none"> <li>(1) Stop the aircraft to check position when in doubt;</li> <li>(2) Assess major risks: collision with other aircraft, obstacles, and aircraft security.</li> </ol>



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**Transition to instrument flight**

Module 1: Pre-flight operations and general handling	
Transition to instrument flight (must be performed by sole reference to instruments)	
<b>OBJECTIVE</b>	Establish the climb, complete a smooth transition to instrument flight, and complete post-take-off checks and drills.
<b>SKILL</b>	Following the initial take-off procedure: (A) Compare the visual attitude achieved with the attitude indicator display; (B) Assess the performance instrument information to confirm that the aircraft has achieved the desired climb parameters; (C) Commence appropriate instrument scanning techniques.
<b>KNOWLEDGE</b>	(A) Demonstrate the required technical knowledge of the function of the instruments in order to safely fly the aircraft by sole reference to instruments. (B) Understand the need to compare the attitude indicator with the real world. (C) Understand the need to verify that the expected performance has been achieved.
<b>ATTITUDE</b>	(A) Situation awareness: Monitor aircraft flight path at all stages of the transition to instrument flight. (B) Effective communication: Demonstrate effective communication (as applicable). (C) Leadership and teamwork: Demonstrate effective coordination (as applicable). (D) Effective problem-solving and decision-making: (1) Correctly assess take-off and climb hazards, particularly those related to other aircraft, aerodrome infrastructure, obstacles, and weather; (2) Have a strategy to mitigate the threats.

**ATC liaison — compliance, radio-telephony (RTF) procedures**

Module 1: Pre-flight operations and general handling	
ATC liaison — compliance, radio-telephony (RTF) procedures (must be performed by sole reference to instruments)	
<b>OBJECTIVE</b>	(A) Ability to communicate clearly with ATC using appropriate RTF phraseology in order to perform the flight as planned in compliance with ATC instructions. (B) In the event of changes to the plan, such changes should be negotiated with ATC to ensure continued compliance.

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<b>SKILL</b>	<p>(A) ICAO language proficiency level 4 or greater.</p> <p>(B) The ability to use standard and, where applicable, non-standard RTF procedures.</p> <p>(C) Understand the implications of the received clearance, and be able to action the same safely and effectively.</p> <p>(D) Interpretation of charts and maps.</p>
<b>KNOWLEDGE</b>	<p>(A) Specific ATC phrases, e.g. ETA vs EAT.</p> <p>(B) Aircraft category for instrument approaches.</p> <p>(C) Performance of the aircraft and its ability to meet the ATC clearance.</p> <p>(D) ICAO standard phraseology and national differences.</p> <p>(E) Pilot or controller responsibilities including tower, en-route, and appropriate clearances.</p> <p>(F) Adequate knowledge of RTF failure procedures.</p>
<b>ATTITUDE</b>	<p>(A) Situation awareness: Establish communication with ATC on the correct frequencies and at the appropriate times.</p> <p>(B) Effective communication: Read back correctly, in a timely manner, the ATC clearance in the sequence received.</p> <p>(C) Leadership and teamwork: Demonstrate correct coordination with ATC (where applicable).</p> <p>(D) Effective workload management: Copy correctly, in a timely manner, the ATC clearance as issued.</p> <p>(E) Effective problem-solving and decision-making: Interpret correctly the ATC clearance received and, when necessary, request clarification, verification, or change.</p>

**Control of the aeroplane by reference solely to instruments, including: level flight at various speeds, level turns at rate 1 and up to 30 degrees angle of bank, trim**

**Module 1: Pre-flight operations and general handling  
(must be performed by sole reference to instruments)**

**Control of the aeroplane by reference solely to instruments, including: level flight at various speeds, level turns at rate 1 and up to 30 degrees angle of bank, trim**

<b>OBJECTIVE</b>	<p>(A) Smooth control of heading, altitude, speed, power, trim and ancillary controls.</p> <p>(B) Correct use of autopilot, where appropriate.</p> <p>(C) Demonstrate correct technique for instrument flight manoeuvring within specified limits.</p> <p>(D) Maintain balanced and trimmed flight.</p>
<b>SKILL</b>	<p>(A) Maintain altitude, heading and balance, by sole reference to instruments, using correct instrument confirmation, and coordinated control application.</p> <p>(B) Maintain altitude, heading and balance, whilst accelerating or decelerating to specific speeds, as determined by the aircraft flight manual, or as specified by the examiner.</p>

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	<p>(C) Complete coordinated level turns at rate 1 and maintain entry speed onto specified headings.</p> <p>(D) Complete coordinated level turns at up to 30 degrees bank whilst maintaining entry speed onto specified headings.</p> <p>(E) Demonstrate correct procedure for pre-flight functional check of autopilot or flight director.</p> <p>(F) Demonstrate correct operating procedure for autopilot or flight director in all modes.</p>
<b>KNOWLEDGE</b>	<p>(A) Procedures for controlling the aircraft in accordance with the POM, aircraft flight manual and operations manual, as appropriate.</p> <p>(B) Autopilot system fitted to the aircraft.</p> <p>(C) Procedures for controlling the aircraft with automatic flight control systems, in accordance with the POM, aircraft flight manual and operations manual, as appropriate.</p>
<b>ATTITUDE</b>	<p>(A) Situation awareness:</p> <p>(1) Maintain awareness of the autopilot modes selected, where applicable;</p> <p>(2) Understand the need for trimmed, in-balance flight when manually flying the aircraft.</p> <p>(B) Effective communication:</p> <p>As applicable to the specific situation.</p> <p>(C) Leadership and teamwork:</p> <p>As applicable to the specific situation.</p> <p>(D) Effective workload management:</p> <p>Use an appropriate 'division of attention' when completing flight log, etc., whilst manually controlling the aircraft.</p> <p>(E) Effective problem-solving and decision-making:</p> <p>Prioritise activities to allow maintenance of correct instrument scan.</p>

### **Climbing and descending turns with sustained rate-1 turn**

**Module 1: Pre-flight operations and general handling**  
**(must be performed by sole reference to instruments)**

**Climbing and descending turns with sustained rate-1 turn**

<b>OBJECTIVE</b>	<p>Complete a coordinated climb or descent and turn at rate 1 using:</p> <p>(A) the recommended climbing speed; or</p> <p>(B) descent speed and nominated rates of descent for the aircraft.</p>
<b>SKILL</b>	<p>(A) Establish the recommended entry airspeed in straight and level flight.</p> <p>(B) Roll into a coordinated climbing or descending turn with a bank angle commensurate with the speed to produce a rate-1 turn. Maintain the bank angle in a stable, balanced turn.</p> <p>(C) Apply smooth, coordinated pitch, bank, and power adjustments to maintain the specified attitude and airspeed.</p> <p>(D) Roll out of the turn and stabilise the aircraft in straight and level flight.</p>

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	(E) Recover accurately onto the desired heading and at the desired airspeed for straight and level flight.
<b>KNOWLEDGE</b>	(A) Speed and bank angle relationship to establish a rate-1 turn. (B) Recommended climb speed and power settings. (C) Recommended speed and power settings for descent at nominated descent rates.
<b>ATTITUDE</b>	(A) Effective workload management: Demonstrate orientation throughout the manoeuvre. (B) Effective problem-solving and decision-making: React to departure from stabilised steep turn attitude.

**Recovery from unusual attitudes, including sustained 45° bank turns and steep descending turns**

<b>Module 1: Pre-flight operations and general handling (must be performed by sole reference to instruments)</b>	
<b>Recovery from unusual attitudes, including sustained 45° bank turns and steep descending turns</b>	
<b>OBJECTIVE</b>	Recover from unusual attitudes, including sustained 45° bank turns and steep descending turns using the correct technique to minimise height loss.
<b>SKILL</b>	(A) Interpretation of the instrument displays to identify the reason behind the unusual attitude. (B) Application of the correct recovery technique. (C) Avoid any indication of an approaching stall, abnormal flight attitude, or exceeding any structural or operating limitation during any part of the manoeuvre.
<b>KNOWLEDGE</b>	Correct recovery technique using 'full' panel instruments, as appropriate.
<b>ATTITUDE</b>	(A) Situation awareness: <ol style="list-style-type: none"> <li>(1) recognition of unusual attitude;</li> <li>(2) after recovery: why did the aircraft enter the unusual attitude, e.g. distraction, instrument failure, mishandling, hypoxia?</li> <li>(3) after recovery: is the aircraft above safety altitude?</li> </ol>

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	(4) which is a safe direction to fly whilst assessing the situation?
(B)	Effective workload management: Address the situation to recover situation awareness.
(C)	Effective communication: (1) Advise other crew members of the situation; (2) Advise ATC if appropriate.
(D)	Leadership and teamwork: Communicate and coordinate, as appropriate, during the recovery manoeuvre.
(E)	Effective problem-solving and decision-making: React promptly to departure from controlled flight.

**Recovery from approach to stall in level flight, climbing/descending turns and in landing configuration**

**Module 1: Pre-flight operations and general handling**  
**(must be performed by sole reference to instruments)**

**Recovery from approach to stall in level flight, climbing/descending turns and in landing configuration (may be performed in an FSTD, if approved for this procedure)**

<b>OBJECTIVE</b>	<p>(A) Demonstrate how to conduct appropriate safety checks before stalling.</p> <p>(B) Establish the required aircraft configuration and stall entry, as appropriate, from straight and level or manoeuvring flight.</p> <p>(C) Maintain heading (or 10–30° bank angle, as required) to stall entry.</p> <p>(D) Recognise the symptoms of stall or approaching stall, and initiate the correct recovery action.</p> <p>(E) Recover, using the correct techniques, to return to a clean configuration best rate climb, or as otherwise directed by the examiner.</p> <p>(F) Complete all the necessary checks and drills.</p>
<b>SKILL</b>	<p>(A) Select an entry altitude in accordance with safety requirements. When accomplished in an FSTD, the entry altitude may be at low, intermediate or high altitude as appropriate for the aircraft and the configuration.</p> <p>(B) Slowly establish the pitch attitude (using trim, elevator or stabiliser), bank angle, and power setting that will induce stall at the desired target airspeed. Normal trim should be used as the aircraft speed reduces, with trim at different, or as stated in the flight manual restrictions.</p> <p>(C) Recognise and announce the first indication of a stall appropriate to the specific aircraft design and initiate recovery.</p> <p>(D) Recover to a reference airspeed, altitude and heading, allowing only the acceptable altitude or airspeed loss and heading deviation using the procedures described in the aircraft flight manual or operator safety manual, as applicable.</p> <p>(E) Demonstrate smooth, positive control during entry, approach to a stall, and recovery.</p>

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<b>KNOWLEDGE</b>	<p>(A) Academic knowledge.</p> <p>(B) Limitations.</p> <p>(C) Safety procedures before starting with stall exercises.</p> <p>(D) Stall recovery procedures and techniques.</p> <p>(E) Flight manual.</p> <p>(F) Operator safety manual.</p>
<b>ATTITUDE</b>	<p>(A) Situation awareness: Ensure the aircraft is in a safe area and clear of hazards prior to accomplishing an approach to a stall.</p> <p>(B) Effective communication: Communicate and coordinate.</p> <p>(C) Leadership and teamwork: Coordinate to ensure that there is adequate separation from other aircraft before initiating the stall.</p> <p>(D) Effective workload management: As applicable to the specific situation.</p> <p>(E) Effective problem-solving and decision-making: As applicable to the specific situation.</p>

**Limited panel instrument flight: stabilised climb or descent, level turns at rate 1 onto given headings, recovery from unusual attitudes**

**Module 1: Pre-flight operations and general handling**  
**(must be performed by sole reference to instruments)**

**Limited panel instrument flight: stabilised climb or descent, level turns at rate 1 onto given headings, recovery from unusual attitudes — only applicable to aeroplanes**  
**NB: Most modern light aircraft are now fitted with a ‘standby’ horizon in addition to or instead of turn rate gyros. Where this is the case, the pilot under training is to be taught these exercises using the ‘standby’ horizon.**

<b>OBJECTIVE</b>	Demonstrate continued control of the aircraft by interpreting aircraft attitude from aircraft standby instruments.
<b>SKILL</b>	<p>(A) Complete flight in straight and level, and climbing and descending, at nominated speeds. Fly turns at rate 1 onto nominated headings using the correct technique and demonstrating correct instrument scan and interpretation.</p> <p>(B) Recover from unusual attitudes including sustained 45° bank turns and steep descending and climbing turns using the correct technique to minimise height loss.</p>

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<b>KNOWLEDGE</b>	<p>(A) Demonstrate the theoretical knowledge and understand the dangers of ‘looping error’.</p> <p>(B) Variation of techniques.</p> <p>(C) Limitations of the use of direct-reading compass systems.</p>
<b>ATTITUDE</b>	<p>(A) Situation awareness:</p> <p style="padding-left: 20px;">(1) recognition of the reason behind the unusual attitude;</p> <p style="padding-left: 20px;">(2) after recovery: why did the aircraft enter the unusual attitude, e.g. distraction, instrument failure, mishandling, etc.?</p> <p style="padding-left: 20px;">(3) after recovery: is the aircraft above safety altitude?</p> <p style="padding-left: 20px;">(4) which is a safe direction to fly whilst assessing the situation?</p> <p>(B) Effective workload management:</p> <p style="padding-left: 20px;">Address the situation to recover situation awareness.</p> <p>(C) Effective communication:</p> <p style="padding-left: 20px;">Advise ATC if appropriate.</p> <p>(D) Leadership and teamwork:</p> <p style="padding-left: 20px;">Communicate and coordinate as appropriate.</p> <p>(E) Effective problem-solving and decision-making:</p> <p style="padding-left: 20px;">React promptly to departure from controlled flight.</p>

(2) **Module 2: Departure, precision (3D) approach procedures and non-precision (2D) approach procedures**

**Weather minima**

Module 2: Departure and arrivals, 3D approach and 2D approach	
Weather minima	
<b>OBJECTIVE</b>	<p>Confirmation of weather affecting departure, route, destination and diversion; acceptability for the flight.</p> <p>Determination of the expected instrument approach minimum heights/altitudes in accordance with NCO requirements.</p>
<b>SKILL</b>	<p>Ability to interpret published weather charts such as synoptic charts and coded messages (TAF, METAR, SNOWTAM, etc.).</p>
<b>KNOWLEDGE</b>	<p>(A) Air masses and local weather effects.</p> <p>(B) Weather codes.</p> <p>(C) NCO requirements.</p>

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<b>ATTITUDE</b>	<p>(A) Situation awareness:</p> <p>(1) Be able to interpret and understand the weather factors and all the associated potential hazards likely to affect the planned flight;</p> <p>(2) Assess correctly whether the weather minima required at destination and diversion airfields are satisfactory for the conduct of the flight.</p> <p>(B) Effective communication: As applicable to the specific situation.</p> <p>(C) Leadership and teamwork: As applicable to the specific situation.</p> <p>(D) Effective workload management: As applicable to the specific situation.</p> <p>(E) Effective problem-solving and decision-making: Make appropriate decisions based on available weather information.</p>
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**Pre-take-off briefing, take-off**

Module 2: Departure and arrivals, 3D approach and 2D approach	
Pre-take-off briefing, take-off	
<b>OBJECTIVE</b>	<p>(A) Perform a safe take-off in compliance with ATC clearance, procedure margins and within the flight manual limits taking into account environmental conditions.</p> <p>(B) Obtain ATC clearance for departure, flight deck preparation, confirmation of departure, and passenger emergency briefing. Actions to be taken with regard to the aeroplane if an emergency occurs during departure should be covered in the pre-flight main briefing.</p>
<b>SKILL</b>	<p>(A) Obtain appropriate take-off clearance using standard RTF phraseology, and perform all required pre-take-off checks (including visually scanning for other aircraft).</p> <p>(B) Position the aircraft correctly for take-off taking into account any crosswind condition.</p> <p>(C) Apply the controls correctly to maintain longitudinal alignment on the centre line of the runway prior to initiating and during the take-off.</p> <p>(D) Set the throttle(s) to take-off power with appropriate checks (e.g. verify the expected engine performance, monitor engine controls, settings and instruments during take-off to ensure all predetermined parameters are maintained).</p> <p>(E) Use the correct take-off technique by applying recommended speeds for rotation, lift-off and initial climb.</p> <p>(F) Adjust the controls to attain the desired pitch attitude at the predetermined air-speed to obtain the desired performance.</p> <p>(G) Ensure a safe climb and departure in accordance with clearance and with due regard for other air traffic, noise abatement and wake turbulence avoidance procedures, adjusting power and aircraft configuration, and maintain desired path (or heading) as appropriate.</p> <p>(H) Complete all necessary post-take-off checks.</p>



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	(I) Perform or call for and verify the accomplishment of landing gear and flap retractions, power adjustments, and other required pilot-related activities at the required airspeeds within the tolerances established in the flight manual.
<b>KNOWLEDGE</b>	(A) Limitations, procedure margins. (B) Normal procedures (understand the different techniques dependent on varying flap settings and environmental conditions). (C) Abnormal and emergency procedures. (D) Performance. (E) Applicable rules on wake turbulence separation.
<b>ATTITUDE</b>	(A) Situation awareness: (1) Monitor engine parameters for any deviations; (2) Monitor aircraft acceleration during take-off; (3) Monitor aircraft ground and flight path at all stages of the take-off procedure. (B) Effective communication: Demonstrate effective communication with ATC (as applicable). (C) Leadership and teamwork: Demonstrate effective coordination with ATC (as applicable). (D) Effective problem-solving and decision-making: Correctly assess take-off and climb hazards, particularly those related to other aircraft, aerodrome infrastructure, obstacles and weather, and have a strategy to mitigate the threats.

### Instrument departure procedures, altimeter setting

#### Module 2: Departure and arrivals, 3D approach and 2D approach

#### Instrument departure procedures, altimeter setting (must be performed by sole reference to instruments)

<b>OBJECTIVE</b>	Complete the standard instrument departure (SID) procedure or follow the ATC departure instructions; use the correct altimeter-setting procedure; maintain aeroplane control, speed, heading and level.
<b>SKILL</b>	(A) Identify any navigation aids used. (B) Follow any noise routing or departure procedures and ATC clearances. (C) Take appropriate anti-icing/de-icing actions. (D) Use the current and appropriate navigation publications for the proposed departure. (E) Make correct use of instruments, flight director, autopilot, navigation equipment and communication equipment appropriate to the performance of the departure. (F) Intercept and follow, in a timely manner, all courses, radials and bearings (QDM/QDRs) appropriate to the departure route and ATC clearance.

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	<p>(G) Comply, in a timely manner, with all ATC clearances, instructions and restrictions.</p> <p>(H) Perform the aircraft briefing or checklist items appropriate to the departure.</p> <p>(I) Adhere to airspeed restrictions and adjustments required by regulations, ATC and the flight manual.</p> <p>(J) Maintain the appropriate airspeed, altitude, headings and accurately track radials, courses, and bearing.</p> <p>(K) Complete the appropriate checklist.</p>
<b>KNOWLEDGE</b>	<p>(A) Weather phenomena, particularly the conditions favouring the formation of ice on the airframe and engines.</p> <p>(B) Limitations of the use of ground-based navigation aids.</p> <p>(C) Limitations of the use of RNAV (GNSS) derived navigational information.</p> <p>(D) Division of airspace and altimeter-setting procedures associated with the current airspace environment.</p> <p>(E) The departure procedure in use and the safety implications of not adhering to the procedure.</p> <p>(F) Altimetry procedures in accordance with the applicable regulations.</p>
<b>ATTITUDE</b>	<p>(A) Situation awareness:</p> <p>(1) Understanding of any clearance limits or variations to SID/initial departure clearance instructed by ATC;</p> <p>(2) Awareness of the aircraft performance and the ability to conform to ATC clearances (speed, height, time limits, etc.).</p> <p>(B) Effective communication:</p> <p>Demonstrate correct communication with ATC (where applicable).</p> <p>(C) Leadership and teamwork:</p> <p>Demonstrate correct coordination with ATC (where applicable).</p> <p>(D) Effective workload management:</p> <p>Prioritise attention properly between aircraft control, navigation and communication tasks.</p> <p>(E) Effective problem-solving and decision-making:</p> <p>Make the necessary decisions to mitigate the effect of changing conditions that may affect aircraft (weather, navigation aid serviceability, ATC, etc.).</p>

### Holding procedure

**Common to both 3D and 2D procedures (must be performed by sole reference to instruments)**

**Holding procedure**

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<b>OBJECTIVE</b>	Complete the appropriate entry procedure followed by a standard ICAO holding fix, using information in order to maintain the protected area.
<b>SKILL</b>	<ul style="list-style-type: none"> <li>(A) Make appropriate adjustments in order to arrive over the holding fix as close as possible to the 'expected approach time', if required.</li> <li>(B) Recognise arrival at the clearance limit or holding fix.</li> <li>(C) Comply with ATC reporting requirements.</li> <li>(D) Change to the recommended holding airspeed appropriate for the aircraft and holding altitude, so as to cross the holding fix at or below the maximum holding airspeed.</li> <li>(E) Follow the appropriate entry procedures in accordance with standard operational procedures or as required by ATC.</li> <li>(F) Use the correct timing criteria where required by the holding procedure or ATC.</li> <li>(G) Use wind-drift correction techniques accurately to maintain the appropriate joining and holding pattern and to establish and maintain the correct tracks and bearings.</li> <li>(H) Maintain the appropriate airspeed, altitude and headings accurately to establish and maintain the correct tracks and bearings.</li> <li>(I) Make appropriate adjustments to the procedure timing to allow for the effects of known wind.</li> </ul>
<b>KNOWLEDGE</b>	<ul style="list-style-type: none"> <li>(A) Holding endurance, including but not necessarily limited to fuel on board.</li> <li>(B) Fuel flow while holding.</li> <li>(C) Fuel required to alternate, etc.</li> </ul>
<b>ATTITUDE</b>	<ul style="list-style-type: none"> <li>(A) Situation awareness: Establish communication with ATC on the correct frequencies and at the appropriate times.</li> <li>(B) Effective communication: <ul style="list-style-type: none"> <li>(1) Read back correctly, in a timely manner, the ATC clearance in the sequence received;</li> <li>(2) Communicate with ATC as appropriate.</li> </ul> </li> <li>(C) Leadership and teamwork: Demonstrate correct coordination with ATC (where applicable).</li> <li>(D) Effective workload management: Monitor to ensure that the flight profile complies with the cleared holding pattern.</li> <li>(E) Effective problem-solving and decision-making: React to navigation errors or unexpected systems malfunctions.</li> </ul>

**Setting and checking of navigation aids, identification of facilities**

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Module 2: 3D approach procedures (must be performed by sole reference to instruments)	
Setting and checking of navigation aids, identification of facilities	
<b>OBJECTIVE</b>	(A) Use of navigation aids with regard to promulgated range, identification and interpretation. (B) Use the RAIM prediction, if applicable. (C) Use the correct RNP approach specifications (LPV, LNAV/VNAV).
<b>SKILL</b>	(A) Set and identify relevant navigation aids. (B) Confirm the availability and serviceability of selected navigation equipment.
<b>KNOWLEDGE</b>	(A) Systems: communication, navigation and auto-flight systems. (B) RNP approach specifications (LPV, LNAV/VNAV).
<b>ATTITUDE</b>	(A) Situation awareness: (1) Establish communication with ATC on the correct frequencies and at the appropriate times; (2) Select radio aids appropriate to the intended approach; (3) PBN limitations; (4) Temperature limitations (LNAV/VNAV). (B) Effective workload management: Monitor to ensure safe flight profile whilst selecting and checking radio aids. (C) Effective communication: (1) Read back correctly, in a timely manner, the ATC clearance in the sequence received; (2) Communicate with ATC as appropriate. (D) Leadership and teamwork: Demonstrate correct coordination with ATC (where applicable). (E) Effective problem-solving and decision-making: React to deviation errors or unexpected systems malfunctions.

**Arrival procedures, altimeter checks**

Module 2: 3D approach procedures (must be performed by sole reference to instruments)
Arrival procedures, altimeter checks

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<b>OBJECTIVE</b>	Descent planning and consideration of minimum sector altitude (MSA) or terminal arrival altitude (TAA). Completion of the published arrival procedure or as instructed by ATC, including altimeter setting or protected area, ATC liaison and RTF procedures.
<b>SKILL</b>	<ul style="list-style-type: none"> <li>(A) Set and cross-check the appropriate altimeter settings.</li> <li>(B) Use the correct RTF procedures and terminology and comply with all ATC instructions and clearances.</li> <li>(C) Establish the appropriate aircraft configuration and airspeed for the phase of the approach.</li> <li>(D) Comply with the published arrival procedure or as required by ATC.</li> <li>(E) Interpretation of arrival charts.</li> </ul>
<b>KNOWLEDGE</b>	<ul style="list-style-type: none"> <li>(A) Altimetry procedures in accordance with the applicable regulations.</li> <li>(B) Knowledge of legends used in the approach charts.</li> <li>(C) Understanding of ATC procedures and RTF phraseology for the type of approach to be completed.</li> <li>(D) Knowledge of RNP arrival procedure.</li> </ul>
<b>ATTITUDE</b>	<ul style="list-style-type: none"> <li>(A) Situation awareness: Establish communication with ATC on the correct frequencies and at the appropriate times.</li> <li>(B) Effective communication: <ul style="list-style-type: none"> <li>(1) Read back correctly, in a timely manner, the ATC clearance in the sequence received;</li> <li>(2) Communicate with ATC, as appropriate.</li> </ul> </li> <li>(C) Leadership and teamwork: Demonstrate correct coordination with ATC (where applicable).</li> <li>(D) Effective workload management: Monitor to ensure that the flight profile complies with the approach procedure.</li> <li>(E) Effective problem-solving and decision-making: react to deviation errors or unexpected systems malfunctions.</li> </ul>

**Approach and landing briefing, including descent, approach, landing checks and missed approach**

**Module 2: 3D approach procedures**  
**(must be performed by sole reference to instruments)**

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<b>Approach and landing briefing, including descent, approach, landing checks and missed approach</b>	
<b>OBJECTIVE</b>	The approach briefing including weather and confirmation of instrument approach procedure minima, and applicable procedures.
<b>SKILL</b>	(A) Complete the checks for landing and configure the aircraft appropriately. (B) Complete a short self-briefing with regard to arrival, holding, approach, minima, weather conditions, associated performances, taxiing and missed approach procedure.
<b>KNOWLEDGE</b>	(A) Use of checklist as appropriate. (B) Determination of approach minima. (C) Make the necessary adjustments to the published approach minima criteria for the aircraft approach category, and with due regard for: <ol style="list-style-type: none"> <li>(1) NOTAMs;</li> <li>(2) inoperative navigation equipment;</li> <li>(3) inoperative visual aids associated with the landing environment;</li> <li>(4) reported weather conditions;</li> <li>(5) aircraft status (effects of any inoperative systems).</li> </ol>
<b>ATTITUDE</b>	(A) Situation awareness: <ol style="list-style-type: none"> <li>(1) Establish communication with ATC on the correct frequencies and at the appropriate times;</li> <li>(2) Aircraft technical status.</li> </ol> (B) Effective communication: <ol style="list-style-type: none"> <li>(1) Read back correctly, in a timely manner, the ATC clearance in the sequence received;</li> <li>(2) Communicate with ATC as appropriate.</li> </ol> (C) Leadership and teamwork: Demonstrate correct coordination with ATC (where applicable). (D) Effective workload management: Monitor to ensure that the flight profile complies with the approach procedure. (E) Effective problem-solving and decision-making: React to deviation errors or unexpected systems malfunctions.

**Compliance with published approach procedure**

**Module 2: 3D approach procedures**  
**(must be performed by sole reference to instruments)**

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Compliance with published approach procedure	
<b>OBJECTIVE</b>	(A) Compliance with the published 3D approach procedure. (B) Vertical and horizontal profile to the nominated minima in accordance with protected areas.
<b>SKILL</b>	(A) Manage the appropriate source of navigation system. (B) Complete the manoeuvring pattern as required to establish the final approach segment within the specified flight tolerances. (C) Establish a predetermined rate of descent at the point where the glide path begins, in order to follow the glide path. (D) Intercept and track within the prescribed limits. (E) Interpretation of approach chart.
<b>KNOWLEDGE</b>	(A) Systems: communication, navigation and auto-flight systems. (B) Correctly interpret and understand the procedure to be flown from the approach chart for runway and procedure in use. (C) Autopilot and flight director limitations. (D) Software and capacity system.
<b>ATTITUDE</b>	(A) Situation awareness: Establish communication with ATC on the correct frequencies and at the appropriate times; (B) Effective communication: (1) Read back correctly, in a timely manner, the ATC clearance in the sequence received; (2) Communicate with ATC as appropriate. (C) Leadership and teamwork: Demonstrate correct coordination with ATC (where applicable). (D) Effective workload management: Monitor to ensure that the flight profile complies with the cleared procedure. (E) Effective problem-solving and decision-making: React to navigation errors or unexpected systems malfunctions.

**Altitude, speed, heading control (stabilised approach)**

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**Module 2: 3D approach procedures**

**(must be performed by sole reference to instruments)**

**Altitude, speed, heading control (stabilised approach)**

<b>OBJECTIVE</b>	<ul style="list-style-type: none"> <li>(A) Establish a stabilised approach, in trim for the aeroplane configuration and speed, using the correct techniques for attitude, heading and power control.</li> <li>(B) Correct assessment of track and vertical path.</li> </ul>
<b>SKILL</b>	<ul style="list-style-type: none"> <li>(A) Establish the final approach and maintain the approach path in horizontal and vertical profile to minima.</li> <li>(B) Control the aircraft as necessary to achieve a stable approach path.</li> <li>(C) Arrive at the minima on a stabilised approach in order to make a correct decision to perform a landing, go-around or circling approach safely.</li> <li>(D) Prepare backup radio aids for continued approach in the event of radio aid or display equipment failure.</li> <li>(E) Use correct RTF procedures and terminology and comply with all ATC instructions and clearances.</li> </ul>
<b>KNOWLEDGE</b>	<ul style="list-style-type: none"> <li>(A) Horizontal and vertical tolerances.</li> <li>(B) Actions to be taken in the event of radio aid or display equipment failure.</li> <li>(C) Procedure in the event of loss of communication with ATC.</li> <li>(D) Procedure in the event of loss of integrity.</li> </ul>
<b>ATTITUDE</b>	<ul style="list-style-type: none"> <li>(A) Situation awareness: Confirm that approach is stabilised.</li> <li>(B) Effective communication: Advise ATC if appropriate.</li> <li>(C) Leadership and teamwork:               <ul style="list-style-type: none"> <li>(1) Demonstrate correct coordination with ATC (where applicable);</li> <li>(2) Procedures for loss of approach capability.</li> </ul> </li> <li>(D) Effective workload management: Monitor to ensure that the flight profile remains safe.</li> <li>(E) Effective problem-solving and decision-making: Make appropriate decision to abandon approach if required.</li> </ul>

**Setting and checking of navigation aids, identification of facilities**



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Module 2: 2D approach procedures (must be performed by sole reference to instruments)	
Setting and checking of navigation aids, identification of facilities	
<b>OBJECTIVE</b>	(A) Use of navigation aids with regard to promulgated range, identification and interpretation. (B) Use the RAIM prediction, if applicable. (C) Use the correct RNP approach specifications. (D) Calculate the true altitude as required.
<b>SKILL</b>	(A) Set and identify relevant navigation aids. (B) Confirm the availability and serviceability of selected navigation equipment.
<b>KNOWLEDGE</b>	(A) Systems: communication, navigation and auto-flight systems. (B) RNP approach specifications (LNAV). (C) True altitude corrections for temperature.
<b>ATTITUDE</b>	(A) Situation awareness: (1) Establish communication with ATC on the correct frequencies and at the appropriate times; (2) Select radio aids appropriate to the intended approach. (B) Effective workload management: Monitor to ensure safe flight profile whilst selecting and checking radio aids. (C) Effective communication: (1) Read back correctly, in a timely manner, the ATC clearance in the sequence received; (2) Communicate with ATC as appropriate. (D) Leadership and teamwork: Demonstrate correct coordination with ATC (where applicable). (E) Effective problem-solving and decision-making: React to deviation errors or unexpected systems malfunctions.

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**Arrival procedures, altimeter checks**

Module 2: 2D approach procedures (must be performed by sole reference to instruments)	
Arrival procedures, altimeter checks	
<b>OBJECTIVE</b>	(A) Descent planning and consideration of MSA or TAA. (B) Completion of the published arrival procedure or as instructed by ATC, including altimeter setting or protected area, ATC liaison and RTF procedures.
<b>SKILL</b>	(A) Set and cross-check the appropriate altimeter settings. (B) Use the correct RTF procedures and terminology and comply with all ATC instructions and clearances. (C) Establish the appropriate aircraft configuration and airspeed for the phase of the approach. (D) Comply with the published arrival procedure or as required by ATC. (E) Interpretation of arrival charts.
<b>KNOWLEDGE</b>	(A) Altimetry procedures, in accordance with the applicable regulations. (B) Knowledge of the legends used in the approach charts. (C) Understanding of ATC procedures and RTF phraseology for the type of approach to be completed. (D) Knowledge of RNP arrival procedure.
<b>ATTITUDE</b>	(A) Situation awareness: (1) Establish communication with ATC on the correct frequencies and at the appropriate times; (2) PBN protected area. (B) Effective communication: (1) Read back correctly, in a timely manner, the ATC clearance in the sequence received; (2) Communicate with ATC as appropriate. (C) Leadership and teamwork: Demonstrate correct coordination with ATC (where applicable). (D) Effective workload management: Monitor to ensure that the flight profile complies with the approach procedure. (E) Effective problem-solving and decision-making: React to deviation errors or unexpected systems malfunctions.

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**Approach and landing briefing, including descent, approach, landing checks and missed approach**

Module 2: 2D approach procedures (must be performed by sole reference to instruments)	
Approach and landing briefing, including descent, approach, landing checks and missed approach	
<b>OBJECTIVE</b>	The approach briefing including weather and confirmation of instrument approach procedure minima, and applicable procedures.
<b>SKILL</b>	(A) Complete the landing and configure the aircraft as appropriate. (B) Complete a short self-briefing with regard to arrival, holding, approach, minima, weather conditions, associated performances, taxiing and missed approach procedure.
<b>KNOWLEDGE</b>	(A) Use of checklist as appropriate. (B) Determination of approach minima. (C) Adjustments necessary to the published approach minima criteria for the aircraft approach category, and with due regard for: <ol style="list-style-type: none"> <li>(1) NOTAMs;</li> <li>(2) inoperative navigation equipment;</li> <li>(3) inoperative visual aids associated with the landing environment;</li> <li>(4) reported weather conditions.</li> </ol>
<b>ATTITUDE</b>	(A) Situation awareness: <ol style="list-style-type: none"> <li>(1) Establish communication with ATC on the correct frequencies and at the appropriate times;</li> <li>(2) Aircraft technical status.</li> </ol> (B) Effective communication: <ol style="list-style-type: none"> <li>(1) Read back correctly, in a timely manner, the ATC clearance in the sequence received;</li> <li>(2) Communicate with ATC as appropriate.</li> </ol> (C) Leadership and teamwork: Demonstrate correct coordination with ATC (where applicable). (D) Effective workload management: Monitor to ensure that the flight profile complies with the approach procedure. (E) Effective problem-solving and decision-making: React to deviation errors or unexpected systems malfunctions.

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**Compliance with published approach procedure**

Module 2: 2D approach procedures (must be performed by sole reference to instruments)	
Compliance with published 2D approach procedure	
<b>OBJECTIVE</b>	(A) Compliance with the published approach procedure. (B) Vertical and horizontal profile to the nominated minima in accordance with protected areas. (C) Use of the CDFA technique where appropriate.
<b>SKILL</b>	(A) Manage the appropriate source of navigation system. (B) Select and comply with the appropriate 2D instrument approach procedure. (C) Complete the manoeuvring pattern as required to establish the final approach segment within the specified flight tolerances and protected area. (D) Establish a predetermined rate of descent in order to follow the published path. (E) Intercept and track the final approach track within the prescribed limits. (F) Interpretation of approach chart. (G) Ability to interpret deviation. (H) Correct selection of navigation input to the display.
<b>KNOWLEDGE</b>	(A) Systems: communication, navigation and auto-flight systems. (B) Correctly interpret and understand the procedure to be flown from the approach chart for runway and procedure in use. (C) CDFA technique where appropriate. (D) Autopilot and flight director limitations.
<b>ATTITUDE</b>	(A) Situation awareness: Establish communication with ATC on the correct frequencies and at the appropriate times; (B) Effective communication: (1) Read back correctly, in a timely manner, the ATC clearance in the sequence received; (2) Communicate with ATC as appropriate. (C) Leadership and teamwork: Demonstrate correct coordination with ATC (where applicable). (D) Effective workload management: Monitor to ensure that the flight profile complies with the cleared procedure. (E) Effective problem-solving and decision-making; React to navigation errors or unexpected systems malfunctions.

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**Altitude, speed and heading control (stabilised approach)**

Module 2: 2D approach procedures (must be performed by sole reference to instruments)	
Altitude, speed and heading control (stabilised approach)	
<b>OBJECTIVE</b>	<ul style="list-style-type: none"> <li>(A) Establish a stabilised approach, in trim for the aeroplane configuration and speed, using the correct techniques for attitude, heading and power control.</li> <li>(B) Correct assessment of track and rate of descent or vertical path angle.</li> </ul>
<b>SKILL</b>	<ul style="list-style-type: none"> <li>(A) Establish the final approach and maintain the approach path in horizontal and vertical profile to minima.</li> <li>(B) Control the aircraft as necessary to achieve a stable final approach.</li> <li>(C) Arrive at the minima on a stabilised approach in order to make a correct decision to perform a landing, go-around or circling approach safely.</li> <li>(D) Prepare backup radio aids for continued approach in the event of radio aid or display equipment failure.</li> <li>(E) Use correct RTF procedures and terminology, and comply with all ATC instructions and clearances.</li> </ul>
<b>KNOWLEDGE</b>	<ul style="list-style-type: none"> <li>(A) Horizontal and vertical tolerances.</li> <li>(B) Actions to be taken in the event of radio aid/display equipment failure.</li> <li>(C) Procedure in the event of loss of communication with ATC.</li> <li>(D) Procedure in the event of loss of integrity.</li> </ul>
<b>ATTITUDE</b>	<ul style="list-style-type: none"> <li>(A) Situation awareness: Confirm that the approach is stabilised.</li> <li>(B) Effective communication: Advise ATC if appropriate.</li> <li>(C) Leadership and teamwork: <ul style="list-style-type: none"> <li>(1) Demonstrate correct coordination with ATC (where applicable);</li> <li>(2) Procedures for loss-of-approach capability.</li> </ul> </li> <li>(D) Effective workload management: Monitor to ensure that the flight profile remains safe.</li> <li>(E) Effective problem-solving and decision-making: Make appropriate decision to abandon approach if required.</li> </ul>

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**Approach timing**

**Module 2: Specificities of conventional 2D approach procedures  
(must be performed by sole reference to instruments)**

**Approach timing**

<b>OBJECTIVE</b>	Monitor or control the approach procedure using timing as necessary.
<b>SKILL</b>	Where DME information from ground-based beacons (VOR or NDB) or marker is not available, the applicant makes appropriate adjustments to the procedure timing to allow for the effects of known wind.
<b>KNOWLEDGE</b>	(A) Use of wind-effect correction techniques. (B) Use of wind-drift correction techniques to maintain the correct tracks, bearings and approximate distances.
<b>ATTITUDE</b>	(A) Situation awareness: (1) Understand when approach timing techniques are required; (2) Understand the impact required on the descent technique for the intermediate approach phase. (B) Effective workload management: Use an appropriate 'division of attention' whilst controlling the aircraft in order to apply wind-corrected timing. (C) Effective communication: As applicable to the specific situation. (D) Leadership and teamwork: As applicable to the specific situation. (E) Effective problem-solving and decision-making: As applicable to the specific situation.

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**Go-around and missed approach action**

**Module 2: Common to both 3D and 2D procedures  
(must be performed by sole reference to instruments)**

**Go-around and missed approach action**

<b>OBJECTIVE</b>	<p>Make a smooth transition to a climb at the correct speed and complete the checks when:</p> <ol style="list-style-type: none"> <li>(1) reaching the minima;</li> <li>(2) directed by ATC;</li> <li>(3) being in an unstabilised approach;</li> <li>(4) experiencing a loss of integrity; or</li> <li>(5) any other reasons affecting safety approach.</li> </ol>
<b>SKILL</b>	<ol style="list-style-type: none"> <li>(A) Initiate go-around action in case of unstabilised approach or loss of integrity.</li> <li>(B) Initiate go-around action at or above minima if safe landing is not possible.</li> <li>(C) Control the aircraft as necessary to achieve a stable and trimmed initial climb profile.</li> <li>(D) Ensure a safe climb and departure in accordance with ATC clearance and with due regard for other air traffic, noise abatement and wake turbulence avoidance procedures adjusting power and aircraft configuration, and maintain desired path (or heading) as appropriate.</li> <li>(E) Complete all necessary procedures and checks.</li> <li>(F) Select the missed approach if available.</li> </ol>
<b>KNOWLEDGE</b>	<ol style="list-style-type: none"> <li>(A) Go-around procedure.</li> <li>(B) Aircraft limitations for landing gear retraction, flap retraction and power plant.</li> <li>(C) Necessary RTF procedures.</li> <li>(D) Performance limitation.</li> <li>(E) Climb gradient.</li> <li>(F) Protected areas.</li> <li>(G) RNP approach specifications.</li> </ol>
<b>ATTITUDE</b>	<ol style="list-style-type: none"> <li>(A) Situation awareness: Monitor aircraft flight path at all stages of the go-around.</li> <li>(B) Effective communication: <ol style="list-style-type: none"> <li>(1) Demonstrate effective communication (as applicable);</li> <li>(2) Communicate with ATC when safe to do so.</li> </ol> </li> <li>(C) Leadership and teamwork: Demonstrate effective coordination with ATC (as applicable).</li> <li>(D) Effective problem-solving and decision-making: Correctly assess go-around and climb hazards, particularly those related to other aircraft, aerodrome infrastructure, obstacles and weather, and have a strategy to mitigate the threats.</li> </ol>

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## Landing

**Module 2: Common to both 3D and 2D procedures**  
**(must be performed by sole reference to instruments)**

### Landing

<b>OBJECTIVE</b>	<p>(A) Visual landing or circle for landing, as appropriate, in a safe and controlled manner.</p> <p>(B) Define a strategy for track management in case of missed approach or go-around in the circle to land.</p>
<b>SKILL</b>	<p>Landing:</p> <p>(A) acquire the required visual references and continue to land the aircraft;</p> <p>(B) make a smooth transition from instrument to visual flight;</p> <p>(C) join smoothly, if necessary, the visual approach flight path;</p> <p>(D) maintain a stable (speed, power, heading) approach until the flare;</p> <p>(E) complete post-landing checklist.</p>
<b>KNOWLEDGE</b>	<p>(A) Flight manual.</p> <p>(B) Limitations.</p> <p>(C) Normal procedures: Demonstrate adequate judgement and knowledge of the aircraft performance and systems in order to comply with published approach procedures for the equipment used for the approach.</p>
<b>ATTITUDE</b>	<p>(A) Situation awareness:</p> <p>(1) Establish communication with ATC on the correct frequencies and at the appropriate times;</p> <p>(2) Controlled flight into terrain (CFIT);</p> <p>(3) Balked landing.</p> <p>(B) Effective communication:</p> <p>(1) Read back correctly, in a timely manner, the ATC clearance in the sequence received;</p> <p>(2) Communicate with ATC as appropriate.</p> <p>(C) Leadership and teamwork: Demonstrate correct coordination with ATC (where applicable).</p> <p>(D) Effective workload management: Monitor to ensure that the flight profile complies with the approach procedure.</p> <p>(E) Effective problem-solving and decision-making: React to deviation errors or unexpected systems malfunctions.</p>



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**ATC liaison — compliance, RTF procedures**

**Module 2: Common to both 3D and 2D procedures  
(must be performed by sole reference to instruments)**

**ATC liaison — compliance, RTF procedures**

<b>OBJECTIVE</b>	(A) Use correct and standard RTF phraseology throughout. (B) Where appropriate, obtain ATC clearances and appropriate level of service. (C) Where required, comply with ATC clearances and instructions.
<b>SKILL</b>	(A) Comply with all ATC instructions and clearances. (B) Use correct RTF for ILS reporting procedure.
<b>KNOWLEDGE</b>	(A) ICAO standard phraseology. (B) Pilot/controller responsibilities to include tower en-route control and clearance. (C) Demonstrate adequate knowledge of two-way communications failure procedures.
<b>ATTITUDE</b>	(A) Situation awareness: Establish communication with ATC on the correct frequencies and at the appropriate times. (B) Effective communication: Read back correctly, in a timely manner, the ATC clearance in the sequence received. (C) Leadership and teamwork: Demonstrate correct coordination with ATC (where applicable). (D) Effective workload management: Copy correctly, in a timely manner, the ATC clearance as issued. (E) Effective problem-solving and decision-making: Interpret correctly the ATC clearance received and, when necessary, request clarification, verification, or change.

**(3) Module 3: En-route IFR procedures**

**Use of air traffic services document and weather document**

<b>Module 3: En-route IFR procedures</b>	
<b>Use of air traffic services document and weather document</b>	
<b>OBJECTIVE</b>	(A) Use of the correct documents, including maps. (B) Use of charts and approach procedure plates to prepare flight plan and flight log. (C) Collating and interpreting weather documents to determine the route weather.
<b>SKILL</b>	(A) Ensure all required paperwork is correctly completed prior to the flight. (B) Interpretation of weather charts and coded messages (TAF, METAR, etc.).
<b>KNOWLEDGE</b>	(A) Weather factors that may affect the safe conduct of the flight (thunderstorms, fog, strong winds, gust factor, crosswinds at departure and destination aerodromes, snow, icing, etc.). (B) Type of approach to be flown, how to calculate approach minima from charts, operational limitations of ground-based aids when planning route, ability to interpret SID and STAR charts. (C) Coordination with ATC when submitting flight plan, implications of 'calculated take-off time', etc.
<b>ATTITUDE</b>	(A) Situation awareness: Note potential weather hazards and act accordingly, submit flight plan in good time for planned departure. (B) Effective communication: Communicate with ATC and ground crew to ensure timely start. (C) Leadership and teamwork: Demonstrate correct crew coordination with ATC (where applicable). (D) Effective workload management: Prioritise tasks to produce a safe and effective plan for the conduct of the flight. (E) Effective problem-solving and decision-making: (1) Identify possible defects and threats; (2) Take corrective action.

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**Preparation of ATC flight plan and IFR flight plan or log**

Module 3: En-route IFR procedures	
Preparation of ATC flight plan and IFR flight plan or log	
<b>OBJECTIVE</b>	Preparation of the ATC IFR flight plan for the route, including any off-airway sectors, and preparation of a full navigation and RTF flight log.
<b>SKILL</b>	<ul style="list-style-type: none"> <li>(A) Prepare the flight navigation log, update maps and charts, flight plan, and fuel plan.</li> <li>(B) Obtain and assess all elements of the prevailing and forecast weather conditions for the route and evaluate threats (e.g. icing conditions, convection, wind conditions, potential deterioration below minima).</li> <li>(C) Complete an appropriate flight navigation log.</li> <li>(D) Complete the required ATC flight plan(s) and ensure that all required airfields are addressed.</li> <li>(E) Determine that the aeroplane is correctly fuelled, loaded and legal for the flight.</li> <li>(F) Confirm any aeroplane performance criteria and limitations applicable in relation to runway and weather conditions.</li> </ul>
<b>KNOWLEDGE</b>	Demonstrate sufficient knowledge of the regulatory requirements relating to instrument flight.
<b>ATTITUDE</b>	<ul style="list-style-type: none"> <li>(A) Situation awareness:               <ul style="list-style-type: none"> <li>(1) Understand the responsibilities of proper pre-departure planning and preparations;</li> <li>(2) Appropriate threat and error management for the flight</li> </ul> </li> <li>(B) Effective communication:               <ul style="list-style-type: none"> <li>Ensure appropriate and clear communication with all ground service personnel (ATC, dispatch, MET).</li> </ul> </li> <li>(C) Leadership and teamwork.</li> <li>(D) Effective workload management:               <ul style="list-style-type: none"> <li>Provide sufficient time, and manage the workload for departure procedures (including documentation) to be completed in an efficient manner.</li> </ul> </li> <li>(E) Effective problem-solving and decision-making:               <ul style="list-style-type: none"> <li>Make appropriate decisions on all identified threats, and plan and implement suitable mitigation actions.</li> </ul> </li> </ul>

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**Tracking, including interception, e.g. NDB, VOR, RNAV**

Module 3: En-route IFR procedures	
Tracking, including interception, e.g. NDB, VOR, RNAV	
<b>OBJECTIVE</b>	<ul style="list-style-type: none"> <li>(A) Intercept and maintain the route or amended route, including tracking to and from a position derived from NDB or VOR or RNAV (GNSS) using aircraft display.</li> <li>(B) Follow the flight-planned route or any other ATC route requirements within the specified limits.</li> <li>(C) Identify and use navigation systems correctly.</li> <li>(D) Use the correct altimeter setting procedures and show awareness of protected areas.</li> </ul>
<b>SKILL</b>	<ul style="list-style-type: none"> <li>(A) Use the current and appropriate navigation publications for the proposed flight.</li> <li>(B) Intercept, in a timely manner, all courses, radials and bearings appropriate to the procedure, route, and ATC clearance.</li> <li>(C) Comply, in a timely manner, with all ATC clearances, instructions and restrictions.</li> <li>(D) Perform the aircraft briefing or checklist items appropriate to the arrival.</li> <li>(E) Adhere to airspeed restrictions and adjustments required by regulations, ATC and aircraft flight manual.</li> <li>(F) Maintain the appropriate airspeed, altitude and heading, and accurately track radials, courses and bearing (QDM/QDRs).</li> </ul>
<b>KNOWLEDGE</b>	<ul style="list-style-type: none"> <li>(A) Basic instrument rating knowledge.</li> <li>(B) Proper ATC phraseology.</li> <li>(C) Demonstrate adequate knowledge of: <ul style="list-style-type: none"> <li>(1) flight manual;</li> <li>(2) limitations;</li> <li>(3) instrument patterns;</li> <li>(4) two-way communications failure procedures.</li> </ul> </li> <li>(D) Systems: communication, navigation and auto-flight systems.</li> <li>(E) PBN specifications.</li> </ul>
<b>ATTITUDE</b>	<ul style="list-style-type: none"> <li>(A) Situation awareness: <ul style="list-style-type: none"> <li>(1) Establish communication with ATC on the correct frequencies and at the appropriate times;</li> <li>(2) Awareness of aircraft position in space.</li> </ul> </li> <li>(B) Effective communication: <ul style="list-style-type: none"> <li>(1) Read back correctly, in a timely manner, the ATC clearance in the sequence received;</li> <li>(2) Communicate with ATC as appropriate.</li> </ul> </li> <li>(C) Leadership and teamwork: <ul style="list-style-type: none"> <li>Demonstrate correct coordination with ATC (where applicable).</li> </ul> </li> <li>(D) Effective workload management: <ul style="list-style-type: none"> <li>Monitor to ensure that the flight profile complies with the cleared en-route routing.</li> </ul> </li> <li>(E) Effective problem-solving and decision-making: <ul style="list-style-type: none"> <li>React to navigation errors or unexpected systems malfunctions.</li> </ul> </li> </ul>

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**Use of radio aids**

Module 3: En-route IFR procedures (must be performed by sole reference to instruments)	
Use of radio aids	
<b>OBJECTIVE</b>	(A) Correct use of RNAV system and radio aids with regard to promulgated range, identification and interpretation. (B) Use of ATIS/VOLMET where available.
<b>SKILL</b>	(A) Use the current and appropriate navigation publications for the proposed flight. (B) Select a combination of radio aids that allow the aircraft position to be correctly determined. (C) Manage the display of such aids so that the navigational information is readily available. (D) Correctly identify the chosen radio aids using Morse code where appropriate, i.e. when there is no 'auto-ident'. (E) Correctly assess the functionality of radio aids, including RNAV, before using them for navigation. (F) Correctly check receiver autonomous integrity monitoring (RAIM) of GNSS systems, if applicable. (G) Correctly input navigation planning data into the GNSS system where appropriate.
<b>KNOWLEDGE</b>	(A) Demonstrate the theoretical knowledge and understanding of: <ol style="list-style-type: none"> <li>(1) the limitations and errors of VOR and NDB, the limitations and errors of VOR and NDB receivers in the aircraft, and the resulting potential navigational error;</li> <li>(2) information pertinent to radio aids or RNAV operations contained in NOTAMs;</li> <li>(3) correct identification of ground-based radio aids;</li> <li>(4) the radio aid equipment and associated displays fitted to the aircraft.</li> </ol> (B) Identify when a ground-based radio aid is radiating but the signal is not available for navigation.
<b>ATTITUDE</b>	(A) Situation awareness: <ol style="list-style-type: none"> <li>(1) Monitor flight progress and select the appropriate navigation systems to enable successful completion of the planned route;</li> <li>(2) Awareness of aircraft position in space.</li> </ol> (B) Effective communication: As applicable to the specific situation. (C) Leadership and teamwork: As applicable to the specific situation. (D) Effective workload management: Use an appropriate 'division of attention' appropriately whilst controlling the aircraft and reset navigation aids. (E) Effective problem-solving and decision-making: React to navigation errors or unexpected systems malfunctions.

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**Level flight, control of heading, attitude and airspeed, power-setting, trim technique**

<b>Module 3: En-route IFR procedures</b>	
<b>Level flight, control of heading, attitude and airspeed, power-setting, trim technique</b>	
<b>OBJECTIVE</b>	(A) Smooth control of heading, attitude and airspeed, power, trim and ancillary controls. (B) Correct use of autopilot where appropriate. (C) Demonstrate correct technique for instrument flight manoeuvring within specified limits. (D) Maintain balanced and trimmed flight.
<b>SKILL</b>	(A) Maintain altitude, heading and balance, by sole reference to instruments, using correct instrument confirmation, and coordinated control application. (B) Maintain altitude, heading and balance, whilst accelerating or decelerating to specific speeds, as determined by the aircraft flight manual. (C) Demonstrate correct procedure for pre-flight functional check of autopilot, flight director and aircraft navigation system, as applicable. (D) Demonstrate correct operating procedure for aircraft navigation systems, autopilot or flight director in all modes.
<b>KNOWLEDGE</b>	(A) Procedures for controlling the aircraft in accordance with the aircraft flight manual and flight manual, as appropriate. (B) Autopilot, flight director and navigation system fitted to the aircraft.
<b>ATTITUDE</b>	(A) Situation awareness: (1) Maintain awareness of the autopilot modes selected, where applicable; (2) Understand the need for trimmed, in-balance flight when manually flying the aircraft; (3) Maintain adequate scan rate before, during and after execution of any manoeuvre by reference to instruments and autopilot performance. (B) Effective communication: As applicable to the specific situation. (C) Leadership and teamwork: As applicable to the specific situation. (D) Effective workload management: Use an appropriate 'division of attention' when completing flight log, etc., whilst manually controlling the aircraft. (E) Effective problem-solving and decision-making: Prioritise activities to allow maintenance of correct instrument scan.

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**Altimeter setting**

Module 3: En-route IFR procedures	
Altimeter setting	
OBJECTIVE	Follow the altimeter-setting procedure, and cross-check and monitor en-route protected areas.
SKILL	(A) Correct use and interpretation of altimeter subscale setting. (B) Cross-check against a second altimeter.
KNOWLEDGE	(A) National procedures, if different, regarding altimeter settings for the airspace the aircraft is occupying. (B) Effects of extremely low temperatures on altimeter indications. (C) Limitations and errors in altimeters due to construction or systems installed in the aircraft, etc.
ATTITUDE	(A) Situation awareness: (1) Understand the airspace structure and make appropriate altimeter settings; (2) Be aware of minimum safe altitude, sector safe altitude, etc. (B) Effective workload management: As applicable to the specific situation. (C) Effective communication: Use appropriate RTF procedures to update pressure settings. (D) Leadership and teamwork: As applicable to the specific situation. (E) Effective problem-solving and decision-making: Where necessary, identify and make appropriate decisions when confronted with system failures.

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**Timing and revision of estimated time of arrival (ETA) (en-route hold, if required)**

Module 3: En-route IFR procedures	
Timing and revision of estimated time of arrival (ETA) (en-route hold, if required)	
<b>OBJECTIVE</b>	Understand the flight plan, and that the clearance is to be completed correctly.
<b>SKILL</b>	(A) Use appropriate and up-to-date aeronautical charts. (B) Extract and record pertinent information from NOTAMs, the aerodrome or facility directory, and other flight publications. (C) Plot a course for the intended route of flight. (D) Select the most favourable altitudes. (E) Compute headings, flight time, and fuel requirements.
<b>KNOWLEDGE</b>	(A) Weather reports and forecasts. (B) Pilot and radar reports. (C) Winds and temperatures aloft. (D) ATC procedures related to timing, e.g. update of ETA if changed by $\pm 3$ minutes, clearance limit, etc.
<b>ATTITUDE</b>	(A) Situation awareness: (1) Establish communication with ATC on the correct frequencies and at the appropriate times; (2) Identify airspace, obstructions, and terrain features. (B) Effective communication: (1) Read back correctly, in a timely manner, the ATC clearance in the sequence received; (2) Demonstrate correct communication with ATC (where applicable). (C) Leadership and teamwork: Demonstrate correct coordination with ATC (where applicable). (D) Effective workload management: Select the appropriate navigation systems or facilities and communication frequencies. (E) Effective problem-solving and decision-making: Deal with unexpected navigation errors or systems malfunctions.



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**Monitoring of flight progress, flight log, fuel usage and management, systems management**

<b>Module 3: En-route IFR procedures</b>	
<b>Monitoring of flight progress, flight log, fuel usage and management, systems management</b>	
<b>OBJECTIVE</b>	(A) Maintain a flight log by recording sufficient information. (B) Monitor the engine and aircraft systems throughout the flight. (C) Monitor fuel consumption versus fuel available and fuel required throughout the flight.
<b>SKILL</b>	(A) Follow the flight plan route in accordance with ATC. (B) Navigate by means of an appropriate navigation system for the cleared route. (C) Use the correct altimetry procedures. (D) Verify the aircraft's position in relation to the flight-planned route. (E) Correctly assess track error and make suitable adjustments to heading. (F) Correct and record the differences between pre-flight fuel, ground speed, and heading and time calculations and those determined en-route. (G) Complete all appropriate checklists. (H) Manage the flight in accordance with minimum altitude.
<b>KNOWLEDGE</b>	(A) Part-SERA requirements and national rules regarding use of aerodromes procedures. (B) Policy concerning IFR flights (e.g. national procedures in the AIP). (C) Services expected in different classes of airspace. (D) Danger restricted, and prohibited areas. (E) Minimum altitude and protected areas.
<b>ATTITUDE</b>	(A) Situation awareness: (1) Establish communication with ATC on the correct frequencies and at the appropriate times; (2) Identify airspace and minimum altitudes. (B) Effective communication: (1) Read back correctly, in a timely manner, the ATC clearance in the sequence received; (2) Demonstrate correct communication (where applicable). (C) Leadership and teamwork: Demonstrate correct coordination with ATC (where applicable). (D) Effective workload management: Select appropriate navigation systems or facilities and communication frequencies. (E) Effective problem-solving and decision-making: Deal with unexpected navigation errors or systems malfunctions.

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**Ice protection procedures, simulated if necessary**

Module 3: En-route IFR procedures	
Ice protection procedures, simulated if necessary	
<b>OBJECTIVE</b>	<p>(A) Monitoring of outside air temperature (OAT), icing risk and ice accretion rate (on FSTD if necessary); correct use of anti-icing and de-icing procedures.</p> <p>(B) Manage flight in icing conditions.</p>
<b>SKILL</b>	<p>(A) Assessment of ice accretion on aircraft.</p> <p>(B) Appropriate selection of anti-icing or de-icing systems.</p> <p>(C) Adapt the aircraft speed to stay within the flight manual limitations, if any.</p> <p>(D) Adapt the performance within the icing conditions.</p> <p>(E) Decision-making to avoid icing conditions.</p>
<b>KNOWLEDGE</b>	<p>(A) Weather reports and forecasts.</p> <p>(B) ATC, pilot and radar reports.</p> <p>(C) Surface analysis charts.</p> <p>(D) Ground radar summary charts.</p> <p>(E) Significant weather prognostics.</p> <p>(F) Forecast upper wind and temperature for aviation (WITEM).</p> <p>(G) Freezing level.</p> <p>(H) SIGMETs.</p> <p>(I) ATIS and VOLMET reports.</p> <p>(J) Aircraft anti-icing and de-icing system limitations.</p> <p>(K) Significant weather chart (TEMSI).</p>
<b>ATTITUDE</b>	<p>(A) Situation awareness:</p> <ol style="list-style-type: none"> <li>(1) Understand the environmental conditions which can lead to the formation of ice on the aircraft;</li> <li>(2) Assess when ice accretion is outside the capability of the aircraft systems.</li> </ol> <p>(B) Effective communication:</p> <ol style="list-style-type: none"> <li>(1) Liaise with ATC to avoid known icing conditions;</li> <li>(2) Request change of route or level to avoid icing conditions.</li> </ol> <p>(C) Leadership and teamwork:</p> <p>Demonstrate correct coordination with ATC (where applicable).</p> <p>(D) Effective workload management:</p> <p>Select appropriate navigation systems or facilities and communication frequencies.</p> <p>(E) Effective problem-solving and decision-making:</p> <ol style="list-style-type: none"> <li>(1) Deal with unexpected encounters with icing conditions or systems malfunctions;</li> <li>(2) Seek reroute or change of level in a timely manner.</li> </ol>

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**ATC liaison — compliance, RTF procedures**

Module 3: En-route IFR procedures	
ATC liaison — compliance, RTF procedures	
OBJECTIVE	ATC liaison using the correct RTF procedures and phraseology, and compliance with ATC procedures and clearances.
SKILL	(A) Follow the flight-planned route or any other ATC route requirements within the specified operating limits. (B) Identify and use navigation systems correctly. (C) Monitor whether ATC clearance is in accordance with a safe flight. (D) Use the correct RTF procedures and phraseology.
KNOWLEDGE	ICAO (language proficiency level 4, as a minimum) and national RTF procedures.
ATTITUDE	(A) Situation awareness: (1) Establish communication with ATC on the correct frequencies and at the appropriate times; (2) Identify airspace, and understand ATC clearances. (B) Effective communication: (1) Read back correctly, in a timely manner, the ATC clearance in the sequence received; (2) Demonstrate correct communication with ATC (where applicable). (C) Leadership and teamwork: Demonstrate correct coordination with ATC (where applicable). (D) Effective workload management: Select the appropriate navigation systems or facilities and communication frequencies. (E) Effective problem-solving and decision-making: Deal with unexpected navigation errors or systems malfunctions.

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**(4) Module 4: Optional flight with one engine inoperative (multi-engine aeroplanes only)**

**Simulated engine failure after take-off or during go-around**

**Module 4: Optional flight with one engine inoperative (multi-engine aeroplanes only)**  
**(must be performed by sole reference to instruments)**  
**(Multi-engine aeroplanes only)**

**Simulated engine failure after take-off or during go-around (at a safe altitude unless conducted in an adapted FSTD)**

<b>OBJECTIVE</b>	<p>(A) Maintain the flight path after take-off or during go-around with one engine in-operative.</p> <p>(B) Comply with ATC instructions.</p>
<b>SKILL</b>	<p>(A) Maintain control following engine failure with sole reference to instruments.</p> <p>(B) Prepare a strategy in case of engine failure or go-around.</p> <p>(C) Calculate one-engine-inoperative performance.</p> <p>(D) Adapt minima on take-off or in approach in accordance with the performance.</p> <p>(E) Carry out the recommended emergency procedures.</p>
<b>KNOWLEDGE</b>	<p>(A) Operating manual:</p> <ol style="list-style-type: none"> <li>(1) all systems;</li> <li>(2) limitations;</li> <li>(3) abnormal procedures;</li> <li>(4) Part-NCO;</li> <li>(5) performance;</li> <li>(6) CS-23.</li> </ol> <p>(B) Operator policy dedicated to failure during take-off: in particular, operator engine-out path during take-off.</p>
<b>ATTITUDE</b>	<p>(A) Situation awareness:</p> <ol style="list-style-type: none"> <li>(1) Recognise engine failure, and confirm correct engine;</li> <li>(2) Performance limitations;</li> <li>(3) Strategy threats.</li> </ol> <p>(B) Effective communication:</p> <p>Communicate appropriately with ATC.</p> <p>(C) Leadership and teamwork:</p> <p>Demonstrate correct coordination with ATC (where applicable).</p> <p>(D) Effective workload management:</p> <ol style="list-style-type: none"> <li>(1) Apply appropriate abnormal or emergency procedures, time permitting, to resolve reason for engine failure;</li> <li>(2) Management of flight path close to the ground.</li> </ol> <p>(E) Effective problem-solving and decision-making:</p> <p>Identify critical situation and make timely decision on suitable actions to carry out a safe asymmetric flight path.</p>

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**Approach, go-around and procedural missed approach with one engine inoperative**

**Module 4: Optional flight with one engine inoperative (multi-engine aeroplanes only)**  
**(must be performed by sole reference to instruments)**  
**(Multi-engine aeroplanes only)**

**Approach, go-around and procedural missed approach with one engine inoperative**

<b>OBJECTIVE</b>	<ul style="list-style-type: none"> <li>(A) Manage IFR approach path during engine failure.</li> <li>(B) Maintain a stable approach in the correct configuration.</li> <li>(C) Make a clear decision to land or go around no later than the appropriate committal height or minima.</li> <li>(D) Complete asymmetric approach and go-around into visual circuit, circling approach or further instrument approach, maintaining control and correct speeds.</li> <li>(E) Initiate go-around action in case of destabilised approach.</li> <li>(F) Complete procedures and checks.</li> </ul>
<b>SKILL</b>	<ul style="list-style-type: none"> <li>(A) Apply the appropriate power setting for the flight condition and establish a pitch attitude necessary to achieve the desired performance.</li> <li>(B) Retract the wing flaps or drag devices and landing gear, if appropriate, in the correct sequence.</li> <li>(C) Accomplish the appropriate procedures or checklist items in a timely manner in accordance with the flight manual.</li> </ul>
<b>KNOWLEDGE</b>	<ul style="list-style-type: none"> <li>(A) Flight manual:               <ul style="list-style-type: none"> <li>(1) all systems;</li> <li>(2) limitations;</li> <li>(3) abnormal procedures;</li> <li>(4) patterns;</li> <li>(5) Part-NCO;</li> <li>(6) performance;</li> <li>(7) CS-23.</li> </ul> </li> <li>(B) Operator policy dedicated to approach stabilisation criteria.</li> </ul>
<b>ATTITUDE</b>	<ul style="list-style-type: none"> <li>(A) Situation awareness: Recognise whether the approach profile is stabilised.</li> <li>(B) Effective communication: Communicate appropriately with ATC.</li> <li>(C) Leadership and teamwork: Demonstrate correct coordination with ATC (where applicable).</li> <li>(D) Effective workload management: Apply appropriate abnormal procedures for asymmetric approach and go-around.</li> <li>(E) Effective problem-solving and decision-making:               <ul style="list-style-type: none"> <li>(1) Identify whether a critical situation is occurring due to inappropriate approach profile;</li> <li>(2) Make a timely decision to execute a go-around.</li> </ul> </li> </ul>

## Approach and landing with one engine inoperative

**Module 4: Optional flight with one engine inoperative (multi-engine aeroplanes only)**  
**(must be performed by sole reference to instruments)**  
**(Multi-engine aeroplanes only)**

### Approach and landing with one engine inoperative

<b>OBJECTIVE</b>	<p>(A) Establish the approach and landing configuration appropriate for the selected runway and prevailing meteorological conditions, and adjust the engine controls as required.</p> <p>(B) Complete the applicable pre-landing checklist.</p> <p>(C) Maintain a stabilised approach at the desired airspeed.</p> <p>(D) Maintain the operating engine(s) within acceptable operating limits.</p> <p>(E) Accomplish a smooth, positively controlled transition from instrument reference to visual reference.</p> <p>(F) Join smoothly, if necessary, the visual approach flight path.</p> <p>(G) Complete the applicable post-landing briefing or checklist items in a timely manner, after clearing the runway, and as recommended by the manufacturer.</p>
<b>SKILL</b>	<p>(A) Consider the actual weather and wind conditions, landing surface and obstructions.</p> <p>(B) Maintain a stable approach in the correct configuration.</p> <p>(C) Plan and follow suitable approach pattern and orientation with the landing runway.</p> <p>(D) Establish the correct approach configuration, adjusting speed and rate of descent to maintain a stabilised approach path.</p> <p>(E) Make a clear decision to land or go around no later than the appropriate committal height or minima.</p> <p>(F) Select and achieve the appropriate touchdown area at the required speed.</p>
<b>KNOWLEDGE</b>	<p>(A) Flight manual:</p> <ul style="list-style-type: none"> <li>(1) all systems;</li> <li>(2) limitations;</li> <li>(3) abnormal procedures;</li> <li>(4) patterns;</li> <li>(5) Part-NCO;</li> <li>(6) performance;</li> <li>(7) CS-23.</li> </ul> <p>(B) Understand the factors affecting asymmetric committal height/altitude (ACH/A).</p>
<b>ATTITUDE</b>	<p>(A) Situation awareness: Recognise whether the approach profile is stabilised, leading to a safe asymmetric landing.</p> <p>(B) Effective communication: Liaise with ATC.</p> <p>(C) Leadership and teamwork: Demonstrate correct coordination with ATC (where applicable).</p>

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	(D) Effective workload management: Apply appropriate abnormal procedures for asymmetric approach and landing.
	(E) Effective problem-solving and decision-making: Make appropriate decision at asymmetric committal height (ACH) to commit to final flap selection and landing.

**ATC liaison — compliance, RTF procedures**

**Module 4: Optional flight with one engine inoperative (multi-engine aeroplanes only)**  
**(must be performed by sole reference to instruments)**  
**(Multi-engine aeroplanes only)**

**ATC liaison — compliance, RTF procedures**

<b>OBJECTIVE</b>	(A) Inform ATC of abnormal flight condition and any assistance required. (B) Comply with ATC procedures and instructions.
<b>SKILL</b>	(A) Use standard RTF phraseology as far as possible and plain language as required when declaring an emergency. (B) Seek assistance as appropriate.
<b>KNOWLEDGE</b>	ICAO (language proficiency level 4 or higher) standard phraseology.
<b>ATTITUDE</b>	(A) Situation awareness: Communicate with ATC that an emergency has occurred. (B) Effective communication: Read back correctly, in a timely manner, the ATC clearance in the sequence received. (C) Leadership and teamwork: Demonstrate correct coordination with ATC (where applicable). (D) Effective workload management: Copy correctly, in a timely manner, the ATC clearance as issued. (E) Effective problem-solving and decision-making: Interpret correctly the ATC clearance received and ensure that it is compliant with aircraft in an asymmetric configuration.

## **SUBPART J – INSTRUCTORS**

### **SECTION 1 – COMMON REQUIREMENTS**

#### **FCL.900 Instructor certificates**

- (a) General. A person shall only carry out:
  - (1) flight instruction in aircraft when he/she holds:
    - (i) a pilot licence issued or accepted in accordance with this MCAR;
    - (ii) an instructor certificate appropriate to the instruction given, issued in accordance with this Subpart;
  - (2) synthetic flight instruction or MCC instruction when he/she holds an instructor certificate appropriate to the instruction given, issued in accordance with this Subpart.
- (b) Special conditions:
  - (1) The Authority may issue a specific certificate granting privileges for flight instruction when compliance with the requirements established in this Subpart is not possible in the case of the introduction of:
    - (i) new aircraft in the State or in an operator's fleet; or
    - (ii) new training courses in this MCAR-Part-FCL.

Such a certificate shall be limited to the training flights necessary for the introduction of the new type of aircraft or the new training course and its validity shall not, in any case, exceed 1 year.;
  - (2) Holders of a certificate issued in accordance with (b)(1) who wish to apply for the issue of an instructor certificate shall comply with the prerequisites and revalidation requirements established for that category of instructor. Notwithstanding FCL.905.TRI(b), a TRI certificate issued in accordance with this (sub)paragraph will include the privilege to instruct for the issue of a TRI or SFI certificate for the relevant type.
- (c) Instruction provided outside the State:
  - (1) By way of derogation from point (a), in the case of flight instruction provided during a training course approved in accordance with this MCAR outside



the State responsible under the Chicago Convention, the Authority shall issue an instructor certificate to applicants who:

- (i) holds a pilot licence that meets all of the following criteria:
    - (A) it complies with Annex 1 to the Chicago Convention;
    - (B) in any case, it is at least a CPL in the relevant aircraft category with a relevant rating or certificate;
  - (ii) complies with the requirements established in this Subpart for the issue of the relevant instructor certificate;
  - (iii) demonstrates to the Authority an adequate level of knowledge of Mauritian and European aviation safety rules to be able to exercise instructional privileges in accordance with this MCAR.
- (2) The certificate shall be limited to providing flight instruction during a training course approved in accordance with this MCAR which meets all of the following conditions:
- (i) it is provided outside the State responsible under the Chicago Convention;
  - (ii) it is provided to student pilots who have sufficient knowledge of the language in which flight instruction is provided.

## **GM1 FCL.900 Instructor certificates**

### **GENERAL**

- (a) Nine instructor categories are recognised:
- (1) FI certificate: aeroplane (FI(A)), helicopter (FI(H)), airship (FI(As)), sailplane (FI(S)) and balloon (FI(B));
  - (2) TRI certificate: aeroplane (TRI(A)), helicopter (TRI(H)), powered-lift aircraft (TRI(PL));
  - (3) CRI certificate: aeroplane (CRI(A));
  - (4) IRI certificate: aeroplane (IRI(A)), helicopter (IRI(H)) and airship (IRI(As));
  - (5) SFI certificate: aeroplane (SFI(A)), helicopter (SFI(H)) and poweredlift aircraft (SFI(PL));

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- (6) MCCI certificate: aeroplanes (MCCI(A)), helicopters (MCCI(H)), powered-lift aircraft(MCCI(PL)) and airships (MCCI(As));
  - (7) STI certificate: aeroplane (STI(A)) and helicopter (STI(H));
  - (8) MI certificate: (MI);
  - (9) FTI certificate: (FTI).
- (b) For categories (1) to (4) and for (8) and (9) the applicant needs to hold a pilot licence. For categories (5) to (7) no licence is needed, only an instructor certificate.
- (c) A person may hold more than one instructor certificate.

**SPECIAL CONDITIONS**

- (a) When new aircraft are introduced, requirements such as to hold a licence and rating equivalent to the one for which instruction is being given, or to have adequate flight experience, may not be possible to comply with. In this case, to allow for the first instruction courses to be given to applicants for licences or ratings for these aircraft, the Authority needs the possibility to issue a specific certificate that does not have to comply with the requirements established in this Subpart.
- (b) The Authority should only give these certificates to holders of other instruction qualifications. As far as possible, preference should be given to persons with at least 100 hours of experience in similar types or classes of aircraft.
- (c) When the new aircraft type introduced in an operator's fleet already existed in the State, the Authority should only give the specific certificate to an applicant that is qualified as PIC on that aircraft.
- (d) The certificate should ideally be limited in validity to the time needed to qualify the first instructors for the new aircraft in accordance with this Subpart, but in any case it should not exceed the 1 year established in the rule.

**GM1 FCL.900(c); FCL.1000(c) Instruction or examination outside the territory of the State**

Instruction or examination outside the territory of the State is possible within the scope of:

- ATOs that have their principal place of business outside the territory of the State;  
or

- ATOs that have their principal place of business in the State and one or more additional training sites outside the territory of the State.

## **GM1 FCL.900(c)(1) Instructor certificates**

### **INSTRUCTION OUTSIDE THE TERRITORY OF THE STATE**

The Authority may issue an unrestricted flight instructor (FI) certificate (FI(A) for aeroplanes or FI(H) for helicopters) to an applicant that has at least 100 hours of experience in flight instruction and 25 hours in solo-flight supervision.

## **FCL.915 General prerequisites and requirements for instructors**

(a) General.

Applicants for the issue of an instructor certificate shall be at least 18 years of age.

(b) Additional requirements for instructors that provide flight instruction in aircraft.

Applicants for the issue of or holders of an instructor certificate with privileges to conduct flight instruction in an aircraft shall:

- (1) for licence training, hold at least the licence or, in the case of point FCL.900(c), the equivalent licence, for which flight instruction is to be given;
- (2) for a rating training, hold the relevant rating or, in the case of point FCL.900(c), the equivalent rating, for which flight instruction is to be given;
- (3) except in the case of flight test instructors (FTIs), have:
  - (i) completed at least 15 hours of flight time as pilots of the class or type of aircraft on which flight instruction is to be given, of which a maximum of 7 hours may be in an FSTD representing the class or type of aircraft, if applicable; or
  - (ii) passed an assessment of competence for the relevant category of instructor on that class or type of aircraft;
- (4) be entitled to act as PIC in the aircraft during such flight instruction; and
- (5) when providing flight instruction in a variant of the SEP aeroplane class with a particular type of engine referred to in Article 2, point (8c), of this Regulation, have complied with one of the following conditions:

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- (i) completed at least 5 hours of flight time as pilots in that variant;
  - (ii) passed an assessment of competence for the relevant category of instructor in that variant.
- (c) Credit towards further instructor certificates and for the purpose of revalidation:
  - (1) Full credit towards the teaching and learning skills may be granted to:
    - (i) holders of an instructor certificate who apply for further instructor certificates; and
    - (ii) applicants for an instructor certificate who already hold an instructor certificate issued in accordance with MCAR-Part-BFCL or MCAR-Part-SFCL.
  - (2) Hours flown as an examiner during skill tests or proficiency checks shall be credited in full towards revalidation requirements for all instructor certificates held.
- (d) Credit for extension to further types shall take into account the relevant elements as defined in the operational suitability data established in accordance with MCAR-Part-21.
- (e) Additional requirements for instructing in a training course in accordance with FCL.745.A:
  - (1) In addition to (b), before acting as instructors for a training course according to FCL.745.A, holders of an instructor certificate shall:
    - (i) have at least 500 hours of flight time as pilots of aeroplanes, including 200 hours of flight instruction;
    - (ii) after complying with the experience requirements in point (e)(1)(i), have completed a UPRT instructor training course at an ATO, during which the competence of applicants shall have been assessed continuously; and
    - (iii) upon completion of the course, have been issued with a certificate of course completion by the ATO, whose Head of Training (HT) shall have entered the privileges specified in point (e)(1) in the logbook of the applicants.
  - (2) The privileges referred to in point (e)(1) shall only be exercised if instructors have, during the last year, received refresher training at an ATO during

which the competence required to instruct on a course in accordance with point FCL.745.A is assessed to the satisfaction of the HT.

- (3) Instructors holding the privileges specified in point (e)(1) may act as instructors for a course as specified in point (e)(1)(ii), provided that they:
  - (i) have 25 hours of flight instruction experience during training according to FCL.745.A;
  - (ii) have completed an assessment of competence for this privilege; and
  - (iii) comply with the recency requirements in point (e)(2).
- (4) These privileges shall be entered in the logbook of the instructors and signed by the examiner.

### **AMC1 FCL.915(e) General prerequisites and requirements for instructors**

#### **ADDITIONAL REQUIREMENTS FOR INSTRUCTING IN A TRAINING COURSE IN ACCORDANCE WITH FCL.745.A — GENERAL**

- (a) The objective of the course required by point FCL.915(e)(1) is to train instructors to deliver training on the advanced UPRT course according to point FCL.745.A using the train-to-proficiency concept.
- (b) Training should be both theoretical and practical. Practical elements should include the development of specific instructor skills, particularly in the area of teaching upset recovery techniques and strategies, whilst exploring the associated physiological and psychological aspects.
- (c) Within 6 months preceding the start of the course, the instructor should have completed a pre-course assessment with an instructor holding the privilege in accordance with FCL.915(e)(1) to assess their ability to undertake the course.
- (d) The training course should comprise:
  - (1) theoretical knowledge instruction on the theoretical knowledge elements presented in the advanced UPRT course and the additional elements required for an instructor to deliver effective training;
  - (2) flight instruction on the exercises used in the advanced UPRT course; and

- (3) flight instruction on recovery from upsets that could result from students mis-handling the aircraft during the advanced UPRT course including spin recovery.
- (e) The content of the theoretical knowledge and flight instruction should be tailored to the competence of the applicant as demonstrated during both pre-course and continuous assessment.
- (f) Successful completion of the course requires that the instructor:
  - (1) demonstrates the resilience to be able to recover from any feasible upset in the aircraft to be used for training;
  - (2) demonstrates the ability to provide instruction to achieve the objectives of the advanced UPRT course to a wide range of trainees; and
  - (3) manages the physiological and psychological well-being of students during training.
- (g) The instructor should be issued with a certificate following successful completion of the course.

### **AMC2 FCL.915(e) General prerequisites and requirements for instructors**

#### **ADDITIONAL REQUIREMENTS FOR INSTRUCTING IN A TRAINING COURSE IN ACCORDANCE WITH FCL.745.A – SYLLABUS**

The following tables contain theoretical knowledge (Table 1) and practical training exercises (Table 2) that should be taught in the context of the advanced UPRT course as per point FCL.745.A.

TABLE 1: THEORETICAL KNOWLEDGE	
1.	Completion of a flight risk assessment
2.	Resilience-building strategies, managing startle and surprise
3.	The limitations and type-specific characteristics of the aeroplane used for training
4.	The importance of adhering to the scenarios that have been validated by the training programme developer
5.	Instructor techniques to induce and manage startle and surprise
6.	Upset recognition and recovery strategies
7.	Disorientation
8.	Distraction
9.	Immediate recognition of student pilot errors

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10.	Intervention strategies
11.	Delivery of the theoretical knowledge instruction of the advanced UPRT course

**TABLE 2: PRACTICAL TRAINING EXERCISES**

<b>SECTION 1 — PRE-FLIGHT PREPARATION</b>	
1.1	Correct completion of a flight risk assessment (such as weather, terrain, traffic density, student's experience level and capabilities)
1.2	Safety briefing
<b>SECTION 2 — FLIGHT</b>	
2.1	Selection of suitable airspace for the conduct of recovery exercises
2.2	Accurate execution of all of the manoeuvres required for the advanced UPRT course
2.3.	Recovery from upsets that could result from the student or instructor mishandling the aeroplane including: <ul style="list-style-type: none"><li>– timely and appropriate intervention;</li><li>– accelerated stall;</li><li>– secondary stall;</li><li>– incipient spin;</li><li>– fully developed spin; and</li><li>– Spiral dive.</li></ul>
2.4	Delivery of all of the training exercises in the advanced UPRT course
2.5	Anticipating and immediately recognising incorrect student inputs which might exceed aeroplane limitations and acting swiftly and appropriately to maintain the necessary margins of safety
2.6	Exercises to surprise the student
2.7	Adapt the training programme to take account of the physiological and psychological state of the student
2.8	Ensure the safety of the operation during training by maintaining awareness of the operating environment
2.9	Assess the competence of the student
<b>SECTION 3 — POST-FLIGHT</b>	
3.1	Provide effective instructor feedback to the student and plan subsequent training details
3.2	Avoid negative transfer of training

**GM1 FCL.915(e) General prerequisites and requirements for instructors**

**TRAINING ON SPIN AVOIDANCE AND SPIN RECOVERY**

- (a) While the purpose of advanced UPRT course is to expose students to psychological and physiological effects, students' responses and actions on controls may take any conceivable variations, including some which can initiate spin entry or, most importantly, can highly aggravate the upset or loss-of-control they are supposed to recover from.
- (b) The advanced UPRT course in accordance with point FCL.745.A is not aerobatic training and only requires training for the incipient spin as well as uncoordinated side slipped stalls which are prone to initiating spins. Full spin training or the development of spin recovery proficiency is reserved for the training course in accordance with point FCL.915(e).
- (c) Even though most flights will go exactly as planned without an unanticipated departure from controlled flight, the instructor is responsible for the safety of flight despite anomalies or unexpected student inputs.
- (d) Even in a case where an aeroplane is not certified for intentional flat or aggravated or inverted spins, it does not mean that mishandled student recovery avoids placing the aeroplane in such a situation. Some student inputs will take the aeroplane uncontrolled far beyond the normal scope of the aerobatic rating as defined in point FCL.800. Those situations might also have the potential to draw the aeroplane outside its certified flight envelope (e.g. overloads, snap-roll departures above limit speed, spin or inverted spin when not certified for, flat spins, etc.). Most importantly, those resulting situations could startle the instructor.
- (e) For the reasons specified in point (d), instructors should:
  - (1) be trained to the extent of proficiency on the specific type of aircraft they use to deliver the course;
  - (2) have academic understanding of the factors assisting or deterring spin recoveries (upright and inverted spins), altitude requirements for safe recovery margins, and other operational considerations;
  - (3) demonstrate that they have the ability to early recognise abnormal situations, timely take action, and safely recover from all the conditions that they may encounter in the delivery of training; and
  - (4) demonstrate their ability to recover from all spin types, not only from spins entered intentionally, but from spins of unannounced direction of autorotation, and from all potential spin variations, including:
    - (i) normal (non-aggravated) spins;
    - (ii) flat spins;



- (iii) accelerated spins; and
  - (iv) transition spins (incorrect recovery resulting in reversal of rotation).
- (f) In the context of points (d) and (e), it is recommended that candidates either hold an aerobatic rating for aeroplanes or have equivalent experience.

### **AMC1 FCL.915(e)(2) General prerequisites and requirements for instructors**

#### **CONTENT OF THE REFRESHER TRAINING FOR UPRT INSTRUCTIONAL PRIVILEGES**

- (a) The objective of the refresher training is for the instructor to maintain or to re-obtain, as applicable, the level of competence required for instructing on a training course as per point FCL.745.A.
- (b) The content of the refresher training should:
  - (1) consist of elements from the initial UPRT instructor training course as per point FCL.915(e)(1)(ii); and
  - (2) be determined by the ATO on a case-by-case basis, considering the needs of the individual instructor and taking into account the following factors:
    - (i) the experience of the instructor;
    - (ii) the amount of time elapsed since the instructor provided instruction on a training course as per point FCL.745.A for the last time; and
    - (iii) the performance of the instructor during a simulated UPRT training session comprising exercises from the advanced UPRT course as per point FCL.745.A. During this simulated training session, another instructor qualified in accordance with point FCL.915(e) should play the role of the student on the advanced UPRT course.
- (c) Taking into account the factors listed in (b)(2) above, the ATO may also count the simulated training session as per point (b)(2)(iii) as refresher training without the need for further refresher training sessions, provided that the instructor demonstrates that he or she already possesses the required level of competence.
- (d) The completion of the refresher training should be entered in the logbook of the instructor and should be signed by the head of training of the ATO.

### **FCL.920 Instructor competencies and assessment**

All instructors shall be trained to achieve the following competences:

- Prepare resources,
- Create a climate conducive to learning,
- Present knowledge,
- Integrate Threat and Error Management (TEM) and crew resource management,
- Manage time to achieve training objectives,
- Facilitate learning,
- Assess trainee performance,
- Monitor and review progress,
- Evaluate training sessions,
- Report outcome.

### **AMC1 FCL.920 Instructor competencies and assessment**

- (a) Training should be both theoretical and practical. Practical elements should include the development of specific instructor skills, particularly in the area of teaching and assessing threat and error management and CRM.
- (b) The training and assessment of instructors should be made against the following performance standards:

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Competence	Performance	Knowledge
Prepare resources	(a) ensures adequate facilities; (b) prepares briefing material; (c) manages available tools; (d) plans training within the training envelope of the training platform, as determined by the ATO (Note: See GM1 ORA.ATO.125 point (f)).	(a) understand objectives; (b) available tools; (c) competency-based training methods; (d) understands the training envelope of the training platform, as determined by the ATO (Note: See GM1 ORA.ATO.125 point (f)) and avoids training beyond the boundaries of this envelope.
Create a climate conducive to learning	(a) establishes credentials, role models appropriate behaviour; (b) clarifies roles; (c) states objectives; (d) ascertains and supports student pilot's needs.	(a) barriers to learning; (b) learning styles.
Present knowledge	(a) communicates clearly; (b) creates and sustains realism; (c) looks for training opportunities.	teaching methods
Integrate TEM and CRM	(a) makes TEM and CRM links with technical training; (b) for aeroplanes: makes upset prevention links with technical training.	(a) TEM and CRM; (b) Causes and countermeasures against undesired aircraft states
Manage time to achieve training objectives	Allocates the appropriate time to achieve competency objective.	syllabus time allocation
Facilitate learning	(a) encourages trainee participation; (b) shows motivating, patient, confident and assertive manner; (c) conducts one-to-one coaching; (d) encourages mutual support.	(a) facilitation; (b) how to give constructive feedback; (c) how to encourage trainees to ask questions and seek advice.
Assesses trainee performance	(a) assesses and encourages trainee self-assessment of performance against competency standards; (b) makes assessment decision and provides clear feedback; (c) observes CRM behaviour.	(a) observation techniques; (b) methods for recording observations.
Monitor and review progress	(a) compares individual outcomes to defined objectives; (b) identifies individual differences in learning rates;	(a) learning styles; (b) strategies for training adaptation to meet individual needs.

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Competence	Performance	Knowledge
	(c) applies appropriate corrective action.	
Evaluate training sessions	(a) elicits feedback from student pilots; (b) tracks training session processes against competence criteria; (c) keeps appropriate records.	(a) competency unit and associated elements; (b) performance criteria.
Report outcome	Reports accurately using only observed actions and events.	(a) phase training objectives; (b) individual versus systemic weaknesses.

**FCL.925 Additional requirements for instructors for the MPL**

- (a) Instructors conducting training for the MPL shall:
- (1) have successfully completed an MPL instructor training course at an ATO; and
  - (2) additionally, for the basic, intermediate and advanced phases of the MPL integrated training course:
    - (i) be experienced in multi-pilot operations; and
    - (ii) have completed initial crew resource management training with a commercial air transport operator approved in accordance with the applicable air operations requirements.
- (b) MPL instructors training course
- (1) The MPL instructor training course shall comprise at least 14 hours of training.

Upon completion of the training course, the applicant shall undertake an assessment of instructor competencies and of knowledge of the competency-based approach to training.
  - (2) The assessment shall consist of a practical demonstration of flight instruction in the appropriate phase of the MPL training course. This assessment shall be conducted by an examiner qualified in accordance with Subpart K.

- (3) Upon successful completion of the MPL training course, the ATO shall issue an MPL instructor qualification certificate to the applicant.
- (c) In order to maintain the privileges, the instructor shall have, within the preceding 12 months, conducted within an MPL training course:
  - (1) 1 simulator session of at least 3 hours; or
  - (2) 1 air exercise of at least 1 hour comprising at least 2 take-offs and landings.
- (d) If the instructor has not fulfilled the requirements of (c), before exercising the privileges to conduct flight instruction for the MPL he/she shall:
  - (1) receive refresher training at an ATO to reach the level of competence necessary to pass the assessment of instructor competencies; and
  - (2) pass the assessment of instructor competencies as set out in (b)(2).

### **AMC1 FCL.925 Additional requirements for instructors for the MPL**

#### **MPL INSTRUCTOR COURSE**

- (a) The objectives of the MPL instructors training course are to train applicants to deliver training in accordance with the features of a competency-based approach to training and assessment.
- (b) Training should be both theoretical and practical. Practical elements should include the development of specific instructor skills, particularly in the area of teaching and assessing threat and error management and CRM in the multicrew environment.
- (c) The course is intended to adapt instructors to conduct competency-based MPL training. It should cover the items specified below:

#### **THEORETICAL KNOWLEDGE**

- (d) Integration of operators and organisations providing MPL training:
  - (1) reasons for development of the MPL;
  - (2) MPL training course objective;
  - (3) adoption of harmonised training and procedures;
  - (4) feedback process.

- (e) The philosophy of a competency-based approach to training: principles of competency-based training.
- (f) Regulatory framework, instructor qualifications and competencies:
  - (1) source documentation;
  - (2) instructor qualifications;
  - (3) syllabus structure.
- (g) Introduction to Instructional systems design methodologies (see ICAO PANSTRG Doc):
  - (1) analysis;
  - (2) design and production;
  - (3) evaluation and revision.
- (h) Introduction to the MPL training scheme:
  - (1) training phases and content;
  - (2) training media;
  - (3) competency units, elements and performance criteria.
- (i) Introduction to human performance limitations, including the principles of threat and error management and appropriate countermeasures developed in CRM:
  - (1) definitions;
  - (2) appropriate behaviours categories;
  - (3) assessment system.
- (j) Application of the principles of threat and error management and CRM principles to training:
  - (1) application and practical uses;
  - (2) assessment methods;
  - (3) individual corrective actions;

- (4) debriefing techniques.
- (k) The purpose and conduct of assessments and evaluations:
  - (1) basis for continuous assessment against a defined competency standard;
  - (2) individual assessment;
  - (3) collection and analysis of data;
  - (4) training system evaluation.

### **PRACTICAL TRAINING**

- (l) Practical training may be conducted by interactive group classroom modules, or by the use of training devices. The objective is to enable instructors to:
  - (1) identify behaviours based on observable actions in the following areas:
    - (i) communications;
    - (ii) team working;
    - (iii) situation awareness;
    - (iv) workload management;
    - (v) problem solving and decision making.
  - (2) analyse the root causes of undesirable behaviours;
  - (3) debrief students using appropriate techniques, in particular:
    - (i) use of facilitative techniques;
    - (ii) encouragement of student self-analysis.
  - (4) agree corrective actions with the students;
  - (5) determine achievement of the required competency.

### **AMC2 FCL.925(d)(1) Additional requirements for instructors for the MPL**

### **RENEWAL OF PRIVILEGES: REFRESHER TRAINING**

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- (a) Paragraph (d) of FCL.925 determines that if the applicant has not complied with the requirements to maintain his/her privileges to conduct competency-based approach training, he or she shall receive refresher training at an ATO to reach the level of competence necessary to pass the assessment of instructor competencies. The amount of refresher training needed should be determined on a case-by-case basis by the ATO, taking into account the following factors:
- (1) the experience of the applicant;
  - (2) the amount of time lapsed since the last time the applicant has conducted training in an MPL course. The amount of training needed to reach the desired level of competence should increase with the time lapsed. In some cases, after evaluating the instructor, and when the time lapsed is very limited, the ATO may even determine that no further refresher training is necessary.
- (b) Once the ATO has determined the needs of the applicant, it should develop an individual training programme, which should be based on the MPL instructor course and focus on the aspects where the applicant has shown the greatest needs.

### **GM1 FCL.925 Additional requirements for instructors for the MPL**

#### **MPL INSTRUCTORS**

The following table summarises the instructor qualifications for each phase of MPL integrated training course:

Phase of training	Qualification
Line flying under supervision according to operational requirements	Line training captain or TRI(A)
Phase 4: Advanced base training	TRI(A)
Phase 4: Advanced skill test	TRE(A)
Phase 4: Advanced	SFI(A) or TRI(A)
Phase 3: Intermediate	SFI(A) or TRI(A)
Phase 2: Basic	(a) FI(A) or IRI(A) and IR(A)/ME/MCC and 1500 hours multi-crew environment and IR(A) instructional privileges, or (b) FI(A) and MCCI(A), or (c) FI(A) and SFI(A), or (d) FI(A) and TRI(A)



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Phase 1: Core flying skills

FI(A) and 500 hours, including 200 hours of instruction

Instructor qualifications and privileges should be in accordance with the training items within the phase.

STI for appropriate exercises conducted in an FNPT or BITD.

### **FCL.930 Training course**

- (a) An applicant for an instructor certificate shall have completed a course of theoretical knowledge and flight instruction at an ATO.
- (b) In addition to the specific elements set out in this MCAR-Part-FCL for each category of instructor, the training course shall contain the elements required in point FCL.920.

### **FCL.935 Assessment of competence**

- (a) Except for the multi-crew cooperation instructor (MCCI), the synthetic training instructor (STI), the mountain rating instructor (MI) and the flight test instructor (FTI), an applicant for an instructor certificate shall pass an assessment of competence in the appropriate aircraft category to demonstrate to an examiner qualified in accordance with Subpart K the ability to instruct a student pilot to the level required for the issue of the relevant licence, rating or certificate.
- (b) This assessment shall include:
  - (1) the demonstration of the competencies described in FCL.920, during pre-flight, post-flight and theoretical knowledge instruction;
  - (2) oral theoretical examinations on the ground, pre-flight and post-flight briefings and in-flight demonstrations in the appropriate aircraft class, type or FSTD;
  - (3) exercises adequate to evaluate the instructor's competencies.
- (c) The assessment shall be performed on the same class or type of aircraft or FSTD used for the flight instruction.
- (d) When an assessment of competence is required for revalidation of an instructor certificate, an applicant who fails to achieve a pass in the assessment before the expiry date of an instructor certificate shall not exercise the privileges of that certificate until the assessment has successfully been completed.

## **AMC1 FCL.935 Assessment of competence**

### **GENERAL**

- (a) The format and application form for the assessment of competence are determined by the Authority.
- (b) When an aircraft is used for the assessment, it should meet the requirements for training aircraft.
- (c) If an aircraft is used for the test or check, the examiner acts as the PIC, except in circumstances agreed upon by the examiner when another instructor is designated as PIC for the flight.
- (d) During the assessment of competence the applicant occupies the seat normally occupied by the instructor (instructor's seat if in an FSTD, or pilot seat if in an aircraft), except in the case of balloons. The examiner, another instructor or, for MPA in an FFS, a real crew member under instruction, functions as the 'student'. The applicant is required to explain the relevant exercises and to demonstrate their conduct to the 'student', where appropriate. Thereafter, the 'student' executes the same manoeuvres (if the 'student' is the examiner or another instructor, this can include typical mistakes of inexperienced students). The applicant is expected to correct mistakes orally or, if necessary, by intervening physically.
- (e) The assessment of competence should also include additional demonstration exercises, as decided by the examiner and agreed upon with the applicant before the assessment. These additional exercises should be related to the training requirements for the applicable instructor certificate.
- (f) All relevant exercises should be completed within a period of 6 months. However, all exercises should, where possible, be completed on the same day. In principle, failure in any exercise requires a retest covering all exercises, with the exception of those that may be retaken separately. The examiner may terminate the assessment at any stage if they consider that a retest is required.

## **AMC2 FCL.935 Assessment of competence**

### **MCCI, STI AND MI**

In the case of the MCCI, STI and MI, the instructor competencies are assessed continuously during the training course.

## **AMC3 FCL.935 Assessment of competence**

### **CONTENT OF THE ASSESSMENT FOR THE FI**

- (a) In the case of the FI, the content of the assessment of competence should be the following:

<b>SECTION 1 THEORETICAL KNOWLEDGE ORAL</b>	
1.1	Air law
1.2	Aircraft general knowledge
1.3	Flight performance and planning
1.4	Human performance and limitations
1.5	Meteorology
1.6	Navigation
1.7	Operational procedures
1.8	Principles of flight
1.9	Training administration

Sections 2 and 3 selected main exercises:

<b>SECTION 2 PRE-FLIGHT BRIEFING</b>	
2.1	Visual presentation
2.3	Technical accuracy
2.4	Clarity of explanation
2.5	Clarity of speech
2.6	Instructional technique
2.7	Use of models and aids
2.8	Student participation

<b>SECTION 3 FLIGHT</b>	
3.1	Arrangement of demo
3.2	Synchronisation of speech with demo
3.3	Correction of faults
3.4	Aircraft handling
3.5	Instructional technique
3.6	General airmanship and safety
3.7	Positioning and use of airspace

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SECTION 4 ME EXERCISES	
4.1	Actions following an engine failure shortly after take-off <sup>2</sup>
4.2	SE approach and go-around <sup>2</sup>
4.3	SE approach and landing <sup>2</sup>

SECTION 5 POST-FLIGHT DE-BRIEFING	
5.1	Visual presentation
5.2	Technical accuracy
5.3	Clarity of explanation
5.4	Clarity of speech
5.5	Instructional technique
5.6	Use of models and aids
5.7	Student participation

- (b) Section 1, the oral theoretical knowledge examination part of the assessment of competence, is for all FI and is subdivided into two parts:
- (1) The applicant is required to give a lecture under test conditions to other 'student(s)', one of whom will be the examiner. The test lecture is to be selected from items of section 1. The amount of time for preparation of the test lecture is agreed upon beforehand with the examiner. Appropriate literature may be used by the applicant. The test lecture should not exceed 45 minutes;
  - (2) The applicant is tested orally by an examiner for knowledge of items of section 1 and the 'core instructor competencies: teaching and learning' content given in the instructor courses.
- (c) Sections 2, 3 and 5 are for all FIs. These sections comprise exercises to demonstrate the ability to be an FI (for example instructor demonstration exercises) chosen by the examiner from the flight syllabus of the FI training courses. The applicant is required to demonstrate FI abilities, including briefing, flight instruction and de-briefing.
- (d) Section 4 comprises additional instructor demonstration exercises for an FI for ME aircraft. This section, if applicable, is done in an ME aircraft, or an FFS or FNPT II simulating an ME aircraft. This section is completed in addition to sections 2, 3 and 5.

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<sup>2</sup> These exercises are to be demonstrated at the assessment of competence for FI for ME aircraft.

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**AMC4 FCL.935 Assessment of competence**

**CONTENT OF THE ASSESSMENT FOR THE SFI**

The assessment should consist of at least 3 hours of flight instruction related to the duties of an SFI on the applicable FFS or FTD 2/3.

**AMC5 FCL.935 Assessment of competence**

**REPORT FORMS FOR THE INSTRUCTOR CERTIFICATES**

(a) Assessment of competence form for the FI, IRI and CRI certificates:

<b>APPLICATION AND REPORT FORM FOR THE INSTRUCTOR ASSESSMENT OF COMPETENCE</b>				
<b>1   Applicants personal particulars:</b>				
Applicant's last name(s):		First name(s):		
Date of birth:		Tel (home):	Tel (work):	
Address:		Country:		
<b>2   Licence details</b>				
Licence type:		Number:		
Class ratings included in the licence:		Exp. Date:		
Type ratings included in the licence:	1.			
	2.			
	3.			
	4.			
	5.			
Other ratings included in the licence:	1.			
	2.			
	3.			
	4.			
	5.			
<b>3   Pre-course flying experience</b>				
Total flying hours	PIC SEP or TMG hours	SEP preceding 6 months	Instrument flight instruction	Cross-country hours

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<b>4   Pre-entry flight test</b>				
<i>I recommend .....for the FI course.</i>				

(b) Report form for the FI for sailplanes

<b>APPLICATION AND REPORT FORM FOR THE FI(S) ASSESSMENT OF COMPETENCE</b>				
<b>1   Applicants personal particulars:</b>				
Applicant's last name(s):		First name(s):		
Date of birth:		Tel (home):	Tel (work):	
Address:		Country:		
<b>2   Licence details</b>				
Licence type:		Number:		
TMG extension:				
<b>3   Pre-course flying experience</b>				
Total flying hours	PIC hours	Sailplane (PIC hours and take-offs)	TMG (PIC hours and take-offs)	
<b>4   Pre-entry flight test</b>				
<i>I recommend .....for the FI course.</i>				
Name of ATO:		Date of flight test:		
Name(s) of FI conducting the test (capital letters):				
Licence number:				
Signature:				
<b>5   Declaration by the applicant</b>				
<i>I have received a course of training in accordance with the syllabus for the:</i>				
FI certificate FI(S)				
Applicant's name(s): (capital letters)		Signature:		

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<b>6 Declaration by the chief flight instructor</b>			
<i>I certify that ..... has satisfactorily completed an approved course of training for the</i>			
FI certificate FI(S)			
<i>in accordance with the relevant syllabus.</i>			
Flying hours during the course:		Take-offs during the course:	
Sailplanes, powered sailplanes or TMGs used :			
Name(s) of CFI:			
Signature:			
Name of DTO or ATO:			
<b>7 Flight instructor examiner's certificate</b>			
<i>I have tested the applicant according to Part-FCL</i>			
<b>A. FLIGHT INSTRUCTOR EXAMINER'S ASSESSMENT (in case of partial pass):</b>			
Theoretical oral examination:		Skill test:	
<b>Passed</b>	<b>Failed</b>	<b>Passed</b>	<b>Failed</b>
<i>I recommend further flight or ground training with an instructor before re-test</i>			
<i>I do not consider further flight or theoretical instruction necessary before re-test (tick as applicable)</i>			
<b>B. FLIGHT INSTRUCTOR EXAMINER'S ASSESSMENT:</b>			
FI certificate			
Date:			
Name(s) of FIE (capital letters):			
Signature:			
Licence number:		Date:	

(c) Report form for the FI for balloons:

<b>APPLICATION AND REPORT FORM FOR THE FI(B) ASSESSMENT OF COMPETENCE</b>			
<b>1 Applicants personal particulars:</b>			
Applicant's last name(s):		First name(s):	
Date of birth:		Tel (home):	Tel (work):
Address:		Country:	

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<b>2   Licence details</b>				
Licence type:		Number:		
Class extension:	1.	Groups:		
	2.	Groups:		
	3.	Groups:		
<b>3   Pre-course flying experience</b>				
Total flying hours in different groups	PIC hours	Hot-air balloon	Gas balloon	Hot-air airship
<b>4   Pre-entry flight test</b>				
<i>I recommend .....for the FI course.</i>				
Name of ATO:		Date of flight test:		
Name(s) of FI conducting the test (capital letters):				
Licence number:				
Signature:				
<b>5   Declaration by the applicant</b>				
<i>I have received a course of training in accordance with the syllabus for the:</i>				
FI certificate FI(B)				
Applicant's name(s): (capital letters)		Signature:		
<b>6   Declaration by the chief flight instructor</b>				
<i>I certify that ..... has satisfactorily completed an approved course of training for the</i>				
FI certificate FI(B)				
<i>in accordance with the relevant syllabus.</i>				
Flying hours during the course:		Take-offs during the course:		
Balloons, hot-air airships used:				
Name(s) of CFI:				
Signature:				
Name of DTO or ATO:				
<b>7   Flight instructor examiner's certificate</b>				
<i>I have tested the applicant according to Part-FCL</i>				



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<b>A. FLIGHT INSTRUCTOR EXAMINER'S ASSESSMENT (in case of partial pass):</b>			
Theoretical oral examination:		Skill test:	
<b>Passed</b>	<b>Failed</b>	<b>Passed</b>	<b>Failed</b>
<input type="checkbox"/> <i>I recommend further flight or ground training with an FI before re-test</i>			
<input type="checkbox"/> <i>I do not consider further flight or theoretical instruction necessary before re-test (tick as applicable)</i>			
<b>B. FLIGHT INSTRUCTOR EXAMINER'S ASSESSMENT:</b>			
<input type="checkbox"/> FI certificate			
Name(s) of FIE (capital letters):			
Signature:			
Licence number:		Date:	

### **FCL.940 Validity of instructor certificates**

With the exception of the MI, and without prejudice to FCL.900(b)(1) and FCL.915 (e)(2), instructor certificates shall be valid for a period of 3 years.

### **FCL.945 Obligations for instructors**

Upon completion of the training flight for the revalidation of an SEP aeroplane or TMG class rating in accordance with point FCL.740.A(b)(1)(ii)(C) or for the revalidation of a single-engine helicopter type rating in accordance with point FCL.740.H(a)(2)(ii)(B), and only in the event of fulfilment of all the other revalidation criteria required by point FCL.740.A(b)(1)(ii) or point FCL.740.H(a)(2)(ii), as applicable, the instructor shall endorse the applicant's licence with the new expiry date of the rating, if specifically authorised for that purpose by the Authority responsible for the applicant's licence.

## **SECTION 2 – SPECIFIC REQUIREMENTS FOR THE FLIGHT INSTRUCTOR – FI**

### **FCL.905.FI FI – Privileges and conditions**

The privileges of FIs are to conduct flight instruction for the issue, revalidation or renewal of:

- (a) a PPL and LAPL in the appropriate aircraft category;
- (b) class and type ratings for single-pilot aircraft, except for single-pilot high-performance complex aeroplanes;
- (c) class and type ratings for single-pilot aeroplanes, except for single-pilot high-performance complex aeroplanes, in multi-pilot operations, provided that FIs meet any of the following conditions:
  - (1) hold or have held a TRI certificate for multi-pilot aeroplanes;
  - (2) have completed all of the following:
    - (i) at least 500 hours as pilots in multi-pilot operations on aeroplanes;
    - (ii) the training course for an MCCI in accordance with point FCL.930.MCCI;
- (d) type ratings for single or multi-pilot airships;
- (e) a CPL in the appropriate aircraft category, provided that FIs have completed at least 200 hours of flight instruction in that aircraft category;
- (f) the night rating, provided that FIs meet all of the following conditions:
  - (1) are qualified to fly at night in the appropriate aircraft category;
  - (2) have demonstrated the ability to instruct at night to an FI qualified in accordance with point (j);
  - (3) comply with the night experience requirement laid down in point FCL.060(b)(2);

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- (g) a towing or aerobatic rating, provided that such privileges are held and the FI has demonstrated the ability to instruct for that rating to an FI who is qualified in accordance with point (j);
- (h) a BIR or an IR in the appropriate aircraft category, provided that FI meets the following conditions:
  - (1) they have completed as student pilots the IRI training course and have passed an assessment of competence for the IRI certificate;
  - (2) they comply with points FCL.915.CRI(a), FCL.930.CRI and FCL.935 in the case of multi engine aeroplanes and with points FCL.910.TRI(c)(1) and FCL.915.TRI(d)(2) in the case of multi-engine helicopters;

In addition to conditions (1) and (2):

- (3) if during an approved training course at an ATO, the FI is providing training in FSTDs or supervising SPIC training flights that take place under IFR, the FI shall have completed at least 50 hours of flight time under IFR after the issuance of the BIR or the IR, of which a maximum of 10 hours may be instrument ground time in an FFS, an FTD 2/3 or an FNPT II,;
- (4) if the FI is providing training in an aircraft, the FI shall have completed at least 200 hours of flight time under IFR, of which up to 50 hours may be instrument ground time in an FFS, an FTD 2/3 or an FNPT II.'
- (i) single-pilot multi-engine class or type ratings, except for single-pilot high-performance complex aeroplanes, provided that they meet the following conditions:
  - (1) in the case of aeroplanes, comply with points FCL.915.CRI(a), FCL.930.CRI and FCL.935;
  - (2) in the case of helicopters, comply with points FCL.910.TRI(c)(1) and FCL.915.TRI(d)(2);
- (j) an FI, an IRI, a CRI, an STI or an MI certificate provided that they meet all of the following conditions:
  - (1) they have completed at least 500 hours of flight instruction in the appropriate aircraft category;
  - (2) they have passed an assessment of competence in accordance with point FCL.935 in the appropriate aircraft category to demonstrate to a flight instructor examiner (FIE) the ability to instruct for the relevant certificate;

- (k) an MPL, provided that the FIs meet all of the following conditions:
- (1) for the core flying phase of the training, have completed at least 500 hours of flight time as a pilot of aeroplanes, including at least 200 hours of flight instruction;
  - (2) for the basic phase of the training:
    - (i) hold a multi-engine aeroplane IR and the privilege to instruct for an IR;
    - (ii) have completed at least 1 500 hours of flight time in multi-crew operations;
  - (3) in the case of FIs already qualified to instruct on ATP(A) or CPL(A)/IR integrated courses, the requirement in point (2)(ii) may be replaced by the completion of a structured course of training consisting of:
    - (i) MCC qualification;
    - (ii) observation of five sessions of flight instruction in Phase 3 of an MPL course;
    - (iii) observation of five sessions of flight instruction in Phase 4 of an MPL course;
    - (iv) observation of five operator recurrent line-oriented flight training sessions;
    - (v) the content of the MCCI course.

In this case, FIs shall conduct their first five instructor sessions under the supervision of a TRI(A), an MCCI(A) or an SFI(A) qualified for MPL flight instruction.

#### **GM1 FCL.905.FI(h)(2) Privileges and conditions**

FSTDs should not be used to pass an assessment of competence on the class or type of aircraft.

### **FCL.910.FI FI – Restricted privileges**

- (a) An FI shall have his or her privileges limited to conducting flight instruction under the supervision of an FI for the same category of aircraft nominated by the DTO or the ATO for this purpose, in the following cases:
  - (1) for the issue of the PPL and LAPL;
  - (2) in all integrated courses at PPL level, in case of aeroplanes and helicopters;
  - (3) for class and type ratings for single-pilot, single-engine aircraft, except for single-pilot high-performance complex aeroplanes;
  - (4) for the night, towing or aerobatic ratings.
- (b) While conducting training under supervision, in accordance with (a), the FI shall not have the privilege to authorise student pilots to conduct first solo flights and first solo cross-country flights.
- (c) The limitations in (a) and (b) shall be removed from the FI certificate when the FI has completed at least:
  - (1) for the FI(A), 100 hours of flight instruction in aeroplanes or TMGs and, in addition has supervised at least 25 student solo flights;
  - (2) for the FI(H) 100 hours of flight instruction in helicopters and, in addition has supervised at least 25 student solo flight air exercises;
  - (3) for the FI(As), 15 hours or 50 take-offs of flight instruction covering the full training syllabus for the issue of a PPL(As).

### **FCL.915.FI FI – Prerequisites**

An applicant for an FI certificate shall:

- (a) in the case of the FI(A) and FI(H):
  - (1) have received at least 10 hours of instrument flight instruction on the appropriate aircraft category, of which not more than 5 hours may be instrument ground time in an FSTD;
  - (2) have completed 20 hours of VFR cross-country flight on the appropriate aircraft category as PIC; and
- (b) additionally, for the FI(A):

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- (1) hold at least a CPL(A); or
- (2) hold at least a PPL(A), or hold an MPL with additional PPL privileges in accordance with point FCL.405.A(b)(1), and have complied with the following conditions:
  - (i) except for an FI(A) providing training for the LAPL(A) only, passed the CPL theoretical knowledge examination, which may be taken without completing a CPL theoretical knowledge training course and which in that case shall not be valid for any of the following:
    - (A) the issue of a CPL;
    - (B) receiving credits for CPL theoretical knowledge in accordance with point FCL.035 and Appendix 1;
  - (ii) completed at least 200 hours of flight time on aeroplanes or TMGs, of which 150 hours as PIC;
- (3) have completed at least 30 hours in the class or type of aeroplane used for the FI(A) training course, of which at least 5 hours shall have been completed during the 6 months preceding the pre-entry flight assessment set out in point FCL.930.FI(a);
- (4) have completed a VFR cross-country flight as PIC, including a flight of at least 540 km (300 NM) in the course of which full stop landings at 2 different aerodromes shall be made;
- (c) additionally, for the FI(H), have completed 250 hours total flight time as pilot on helicopters of which:
  - (1) at least 100 hours shall be as PIC, if the applicant holds at least a CPL(H); or
  - (2) at least 200 hours as PIC if the applicant holds at least a PPL(H) and has passed the CPL theoretical knowledge examination, which may be taken without completing a CPL theoretical knowledge training course and which shall not be valid for the issue of a CPL;
- (d) for an FI(As), have completed 500 hours of flight time on airships as PIC, of which 400 hours shall be as PIC holding a CPL(As).

### **FCL.930.FI FI – Training course**

- (a) Applicants for the FI certificate shall, at an ATO, have passed a specific pre-entry flight assessment with an FI qualified in accordance with point FCL.905.FI(j) within the 6 months preceding the start of the course, to assess their ability to undertake the course. That pre-entry flight assessment shall be based on the proficiency check for the class and type ratings as set out in Appendix 9.
- (b) The FI training course shall include:
  - (1) 25 hours of teaching and learning;
  - (2) at least 100 hours of theoretical knowledge instruction, including progress tests;
  - (3)
    - (i) in the case of an FI(A) and (H), at least 30 hours of flight instruction, of which 25 hours shall be dual flight instruction, of which 5 hours may be conducted in an FFS, an FNPT I or II or an FTD 2/3;
    - (ii) in the case of an FI(As), at least 20 hours of flight instruction, of which 15 hours shall be dual flight instruction.
  - (4) Applicants for an FI certificate in another category of aircraft who are holding or have held an FI(A), (H) or (As) shall be credited with 55 hours towards the requirement in point (b)(2).
- (c) Applicants for the FI certificate who hold or have held any other instructor certificate issued in accordance with this MCAR shall be deemed to meet the requirements in point (b)(1).

### **AMC1 FCL.930.FI FI Training course**

#### **FI(A), FI(H) AND FI(AS) TRAINING COURSE**

##### **GENERAL**

- (a) The aim of the FI training course is to train aircraft licence holders to the level of competence defined in FCL.920.
- (b) The training course should develop safety awareness throughout by teaching the knowledge, skills and attitudes relevant to the FI task including at least the following:
  - (1) refresh the technical knowledge of the student instructor;

- (2) train the student instructor to teach the ground subjects and air exercises;
- (3) ensure that the student instructor's flying is of a sufficiently high standard;
- (4) teach the student instructor the principles of basic instruction and to apply them at the PPL level.

## **FLIGHT INSTRUCTION**

- (c) The remaining 5 hours in FCL.930.FI(b)(3) may be mutual flying (that is, two applicants flying together to practice flight demonstrations).
- (d) The tassessment of competence is additional to the course training time.

## **CONTENT**

- (e) The training course consists of two parts:
  - (1) Part 1, theoretical knowledge, including the teaching and learning instruction that should comply with AMC1 FCL.920;
  - (2) Part 2, flight instruction.

### **Part 1**

## **TEACHING AND LEARNING**

- (a) The course should include at least 125 hours of theoretical knowledge instruction, including at least 25 hours teaching and learning instruction.

## **CONTENT OF THE TEACHING AND LEARNING INSTRUCTIONS (INSTRUCTIONAL TECHNIQUES):**

- (b) The learning process:
  - (1) motivation;
  - (2) perception and understanding;
  - (3) memory and its application;
  - (4) habits and transfer;
  - (5) obstacles to learning;
  - (6) incentives to learning;



- (7) learning methods;
- (8) rates of learning.
- (c) The teaching process:
  - (1) elements of effective teaching;
  - (2) planning of instructional activity;
  - (3) teaching methods;
  - (4) teaching from the 'known' to the 'unknown';
  - (5) use of 'lesson plans'.
- (d) Training philosophies:
  - (1) value of a structured (approved) course of training;
  - (2) importance of a planned syllabus;
  - (3) integration of theoretical knowledge and flight instruction.
- (e) Techniques of applied instruction:
  - (1) theoretical knowledge: classroom instruction techniques:
    - (i) use of training aids;
    - (ii) group lectures;
    - (iii) individual briefings;
    - (iv) student participation or discussion.
  - (2) flight: airborne instruction techniques:
    - (i) the flight or cockpit environment;
    - (ii) techniques of applied instruction;
    - (iii) post-flight and in-flight judgement and decision making.
- (f) Student evaluation and testing:

- (1) assessment of student performance:
  - (i) the function of progress tests;
  - (ii) recall of knowledge;
  - (iii) translation of knowledge into understanding;
  - (iv) development of understanding into actions;
  - (v) the need to evaluate rate of progress.
- (2) analysis of student errors:
  - (i) establish the reason for errors;
  - (ii) tackle major faults first, minor faults second;
  - (iii) avoidance of over criticism;
  - (iv) the need for clear concise communication.
- (g) Training programme development:
  - (1) lesson planning;
  - (2) preparation;
  - (3) explanation and demonstration;
  - (4) student participation and practice;
  - (5) evaluation.
- (h) Human performance and limitations relevant to flight instruction:
  - (1) physiological factors:
    - (i) psychological factors;
    - (ii) human information processing;
    - (iii) behavioural attitudes;
    - (iv) development of judgement and decision making.

- (2) threat and error management.
- (i) Specific hazards involved in simulating systems failures and malfunctions in the aircraft during flight:
  - (i) importance of 'touch drills';
  - (ii) situational awareness;
  - (iii) adherence to correct procedures.
- (j) Training administration:
  - (1) flight or theoretical knowledge instruction records;
  - (2) pilot's personal flying logbook;
  - (3) the flight or ground curriculum;
  - (4) study material;
  - (5) official forms;
  - (6) flight manual or equivalent document (for example owner's manual or pilot's operating handbook);
  - (7) flight authorisation papers;
  - (8) aircraft documents;
  - (9) the private pilot's licence regulations.

## **A. Aeroplanes**

### **Part 2**

#### **AIR EXERCISES**

- (a) The air exercises are similar to those used for the training of PPL(A) but with additional items designed to cover the needs of an FI.
- (b) The numbering of exercises should be used primarily as an exercise reference list and as a broad instructional sequencing guide: therefore the demonstrations and practices need not necessarily be given in the order listed. The actual order and content will depend upon the following interrelated factors:

- (1) the applicant's progress and ability;
  - (2) the weather conditions affecting the flight;
  - (3) the flight time available;
  - (4) instructional technique considerations;
  - (5) the local operating environment.
- (c) It follows that student instructors will eventually be faced with similar interrelated factors. They should be shown and taught how to construct flight lesson plans, taking these factors into account, so as to make the best use of each flight lesson, combining parts of the set exercises as necessary.

### **GENERAL**

- (d) The briefing normally includes a statement of the aim and a brief allusion to principles of flight only if relevant. An explanation is to be given of exactly what air exercises are to be taught by the instructor and practised by the student during the flight. It should include information on how the flight will be conducted, who is to fly the aeroplane and what airmanship, weather and flight safety aspects currently apply. The nature of the lesson will govern the order in which the constituent parts are to be taught.
- (e) The four basic components of the briefing will be:
- (1) the aim;
  - (2) principles of flight (briefest reference only);
  - (3) the air exercise(s) (what, and how and by whom);
  - (4) airmanship (weather, flight safety etc.).

### **PLANNING OF FLIGHT LESSONS**

- (f) The preparation of lesson plans is an essential prerequisite of good instruction and the student instructor is to be given supervised practice in the planning and practical application of flight lesson plans.

### **GENERAL CONSIDERATIONS**

- (g) The student instructor should complete flight training to practise the principles of basic instruction at the PPL(A) level.

- (h) During this training, except when acting as a student pilot for mutual flights, the student instructor occupies the seat normally occupied by the FI(A).
- (i) It is to be noted that airmanship and look-out is a vital ingredient of all flight operations. Therefore, in the following air exercises the relevant aspects of airmanship are to be stressed at all times.
- (j) If the privileges of the FI(A) certificate are to include instruction for night flying, exercises 19 and 20 of the flight instruction syllabus should be undertaken at night in addition to by day either as part of the course or subsequent to certification issue.
- (k) The student instructor should learn how to identify common errors and how to correct them properly, which should be emphasised at all times.

## **SYLLABUS OF FLIGHT INSTRUCTION CONTENTS**

### **LONG BRIEFINGS AND AIR EXERCISES**

Note: though exercise 11b is not required for the PPL(A) course, it is a requirement for the FI course.

#### **EXERCISE 1: FAMILIARISATION WITH THE AEROPLANE**

- (a) Long briefing objectives:
  - (1) introduction to the aeroplane;
  - (2) explanation of the cockpit layout;
  - (3) aeroplane and engine systems;
  - (4) checklists, drills and controls;
  - (5) propeller safety;
    - (i) precautions general;
    - (ii) precautions before and during hand turning;
    - (iii) hand swinging technique for starting (if applicable to type).
  - (6) differences when occupying the instructor's seat;
  - (7) emergency drills:

- (i) action if fire in the air and on the ground: engine, cock or cabin and electrical fire;
  - (ii) system failure as applicable to type;
  - (iii) escape drills: location and use of emergency equipment and exits.
- (b) Air exercise: all long briefing objectives mentioned above should also be trained on site during the air exercise.

## **EXERCISE 2: PREPARATION FOR AND ACTION AFTER FLIGHT**

- (a) Long briefing objectives:
  - (1) flight authorisation and aeroplane acceptance, including technical log (if applicable) and certificate of maintenance;
  - (2) equipment required for flight (maps, etc.);
  - (3) external checks;
  - (4) internal checks;
  - (5) student comfort, harness, seat or rudder pedal adjustment;
  - (6) starting and warming up checks;
  - (7) power checks;
  - (8) running down, system checks and switching off the engine;
  - (9) leaving the aeroplane, parking, security and picketing;
  - (10) completion of authorisation sheet and aeroplane serviceability documents.
- (b) Air exercise: all long briefing objectives mentioned above should also be trained on site during the air exercise.

## **EXERCISE 3: AIR EXPERIENCE**

- (a) Long briefing objectives:

Note: there is no requirement for a long briefing for this exercise.
- (b) Air exercise:

- (1) air experience;
- (2) cockpit layout, ergonomics and controls;
- (3) cockpit procedures: stability and control.

#### **EXERCISE 4: EFFECTS OF CONTROLS**

- (a) Long briefing objectives:
  - (1) function of primary flying controls: when laterally level and banked;
  - (2) further effect of ailerons and rudder;
  - (3) effect of inertia;
  - (4) effect of air speed;
  - (5) effect of slipstream;
  - (6) effect of power;
  - (7) effect of trimming controls;
  - (8) effect of flaps;
  - (9) operation of mixture control;
  - (10) operation of carburettor heat control;
  - (11) operation of cabin heat or ventilation systems;
- (b) Air exercise:
  - (1) primary effects of flying controls: when laterally level and banked;
  - (2) further effects of ailerons and rudder;
  - (3) effect of air speed;
  - (4) effect of slipstream;
  - (5) effect of power;
  - (6) effect of trimming controls;

- (7) effect of flaps;
- (8) operation of mixture control;
- (9) operation of carburettor heat control;
- (10) operation of cabin heat or ventilation systems;
- (11) effect of other controls as applicable.

**EXERCISE 5: TAXIING**

- (a) Long briefing objectives:
  - (1) pre-taxiing checks;
  - (2) starting, control of speed and stopping;
  - (3) engine handling;
  - (4) control of direction and turning (including manoeuvring in confined spaces);
  - (5) parking area procedures and precautions;
  - (6) effect of wind and use of flying controls;
  - (7) effect of ground surface;
  - (8) freedom of Rudder movement;
  - (9) marshalling signals;
  - (10) instrument checks;
  - (11) ATC procedures;
  - (12) emergencies: steering failure and brake failure.
- (b) Air exercise:
  - (1) pre-taxiing checks;
  - (2) starting, control of speed and stopping;
  - (3) engine handling;



- (4) control of direction and turning;
- (5) turning in confined spaces;
- (6) parking area procedures and precautions;
- (7) effect of wind and use of flying control;
- (8) effect of ground surface;
- (9) freedom of Rudder movement;
- (10) marshalling signals;
- (11) instrument checks;
- (12) ATC procedures;
- (13) emergencies: steering failure and brake failure.

**EXERCISE 6: STRAIGHT AND LEVEL FLIGHT**

- (a) Long briefing objectives:
  - (1) the forces;
  - (2) longitudinal stability and control in pitch;
  - (3) relationship of CG to control in pitch;
  - (4) lateral and directional stability (control of lateral level and balance);
  - (5) attitude and balance control;
  - (6) trimming;
  - (7) power settings and air speeds;
  - (8) drag and power curves;
  - (9) range and endurance.
- (b) Air exercise:
  - (1) at normal cruising power;

- (2) attaining and maintaining straight and level flight;
- (3) demonstration of inherent stability;
- (4) control in pitch, including use of elevator trim control;
- (5) lateral level, direction and balance, use of rudder trim controls as applicable at selected air speeds (use of power):
  - (i) effect of drag and use of power (two air speeds for one power setting);
  - (ii) straight and level in different aeroplane configurations (flaps and landing gear);
  - (iii) use of instruments to achieve precision flight.

#### **EXERCISE 7: CLIMBING**

- (a) Long briefing objectives:
  - (1) the forces;
  - (2) relationship between power or air speed and rate of climb (power curves maximum rate of climb ( $v_y$ ));
  - (3) effect of mass;
  - (4) effect of flaps;
  - (5) engine considerations;
  - (6) effect of density altitude;
  - (7) the cruise climb;
  - (8) maximum angle of climb ( $v_x$ ).
- (b) Air exercise:
  - (1) entry and maintaining the normal maximum rate climb;
  - (2) levelling off;
  - (3) levelling off at selected altitudes;

- (4) climbing with flaps down;
- (5) recovery to normal climb;
- (6) en-route climb (cruise climb);
- (7) maximum angle of climb;
- (8) use of instruments to achieve precision flight.

### **EXERCISE 8: DESCENDING**

- (a) Long briefing objectives:
  - (1) the forces;
  - (2) glide descent: angle, air speed and rate of descent;
  - (3) effect of flaps;
  - (4) effect of wind;
  - (5) effect of mass;
  - (6) engine considerations;
  - (7) power assisted descent: power or air speed and rate of descent;
  - (8) cruise descent;
  - (9) sideslip.
- (b) Air exercise:
  - (1) entry and maintaining the glide;
  - (2) levelling off;
  - (3) levelling off at selected altitudes;
  - (4) descending with flaps down;
  - (5) powered descent: cruise descent (including effect of power and air speed);
  - (6) side-slipping (on suitable types);

- (7) use of instrument to achieve precision flight.

### **EXERCISE 9: TURNING**

- (a) Long briefing objectives:

- (1) the forces;
- (2) use of controls;
- (3) use of power;
- (4) maintenance of attitude and balance;
- (5) medium level turns;
- (6) climbing and descending turns;
- (7) slipping turns;
- (8) turning onto selected headings: use of gyro heading indicator and magnetic compass.

- (b) Air exercise:

- (1) entry and maintaining medium level turns;
- (2) resuming straight flight;
- (3) faults in the turn (incorrect pitch, bank and balance);
- (4) climbing turns;
- (5) descending turns;
- (6) slipping turns (on suitable types);
- (7) turns to selected headings: use of gyro heading indicator and magnetic compass
- (8) use of instruments to achieve precision flight;

Note: stall or spin awareness and avoidance training consists of exercises 10a, 10b and 11a.

### **EXERCISE 10a: SLOW FLIGHT**

- (a) Long briefing objectives:
  - (1) aeroplane handling characteristics during slow flight at:
    - (i)  $v_{s1}$  &  $v_{so} + 10$  knots;
    - (ii)  $v_{s1}$  &  $v_{so} + 5$  knots.
  - (2) slow flight during instructor induced distractions;
  - (3) effect of overshooting in configurations where application of engine power causes a strong 'nose-up' trim change.
- (b) Air exercise:
  - (1) safety checks;
  - (2) introduction to slow flight;
  - (3) controlled slow flight in the clean configuration at:
    - (i)  $v_{s1} + 10$  knots and with flaps down;
    - (ii)  $v_{so} + 10$  knots;
    - (iii) straight and level flight;
    - (iv) level turns;
    - (v) climbing and descending;
    - (vi) climbing and descending turns.
  - (4) controlled slow flight in the clean configuration at:
    - (i)  $v_{s1} + 5$  knots and with flaps down;
    - (ii)  $v_{so} + 5$  knots;
    - (iii) straight and level flight;
    - (iv) level turns;
    - (v) climbing and descending;

- (vi) climbing and descending turns;
  - (vii) descending 'unbalanced' turns at low air speed: the need to maintain balanced flight.
- (5) 'instructor induced distractions' during flight at low air speed: the need to maintain balanced flight and a safe air speed;
- (6) effect of going around in configurations where application of engine power causes a strong 'nose up' trim change.

### **EXERCISE 10b: STALLING**

- (a) Long briefing objectives:
- (1) characteristics of the stall;
  - (2) angle of attack;
  - (3) effectiveness of the controls at the stall;
  - (4) factors affecting the stalling speed:
    - (i) effect of flaps, slats and slots;
    - (ii) effect of power, mass, CG and load factor.
  - (5) effects of unbalance at the stall;
  - (6) symptoms of the stall;
  - (7) stall recognition and recovery;
  - (8) stalling and recovery:
    - (i) without power;
    - (ii) with power on;
    - (iii) with flaps down;
    - (iv) maximum power climb (straight and turning flight to the point of stall with uncompensated yaw);
    - (v) stalling and recovery during manoeuvres involving more than 1 G (accelerated stalls, including secondary stalls and recoveries);

- (vi) recovering from incipient stalls in the landing and other configurations and conditions;
- (vii) recovering at the incipient stage during change of configuration;
- (viii) stalling and recovery at the incipient stage with 'instructor induced' distractions.

Note: consideration is to be given to manoeuvre limitations and references to the flight manual or equivalent document (for example owner's manual or pilot's operating handbook) in relation to mass and balance limitations. The safety checks should take into account the minimum safe altitude for initiating such exercises in order to ensure an adequate margin of safety for the recovery. If specific procedures for stalling or spinning exercises and for the recovery techniques are provided by the flight manual or equivalent document (for example owner's manual or pilot's operating handbook), they have to be taken into consideration. These factors are also covered in the next exercise spinning.

(b) Air exercise:

- (1) safety checks;
- (2) symptoms of the stall;
- (3) stall recognition and recovery:
  - (i) without power;
  - (ii) with power on;
  - (iii) recovery when a wing drops at the stall;
  - (iv) stalling with power 'on' and recovery;
  - (v) stalling with flap 'down' and recovery;
  - (vi) maximum power climb (straight and turning flight) to the point of stall with uncompensated yaw: effect of unbalance at the stall when climbing power is being used;
  - (vii) stalling and recovery during manoeuvres involving more than 1 G (accelerated stalls, including secondary stalls and recoveries);
  - (viii) recoveries from incipient stalls in the landing and other configurations and conditions;

- (ix) recoveries at the incipient stage during change of configuration;
- (x) instructor induced distractions during stalling.

Note: consideration of manoeuvre limitations and the need to refer to the aeroplane manual and weight (mass) and balance calculations. The safety checks should take into account the minimum safe altitude for initiating such exercises in order to ensure an adequate margin of safety for the recovery. If specific procedures for stalling or spinning exercises and for the recovery techniques are provided by the flight manual or equivalent document (for example owner's manual or pilot's operating handbook), they have to be taken into consideration. These factors are to be covered in the next exercise: spinning.

### **EXERCISE 11a: SPIN RECOVERY AT THE INCIPIENT STAGE**

- (a) Long briefing objectives:
  - (1) causes, stages, autorotation and characteristics of the spin;
  - (2) recognition and recovery at the incipient stage: entered from various flight attitudes;
  - (3) aeroplane limitations.
- (b) Air exercise:
  - (1) aeroplane limitations;
  - (2) safety checks;
  - (3) recognition at the incipient stage of a spin;
  - (4) recoveries from incipient spins entered from various attitudes with the aeroplane in the clean configuration, including instructor induced distractions.

### **EXERCISE 11b: SPIN RECOVERY AT THE DEVELOPED STAGE**

- (a) Long briefing objectives:
  - (1) spin entry;
  - (2) recognition and identification of spin direction;
  - (3) spin recovery;



- (4) use of controls;
  - (5) effects of power or flaps (flap restriction applicable to type);
  - (6) effect of the CG upon spinning characteristics;
  - (7) spinning from various flight attitudes;
  - (8) aeroplane limitation;
  - (9) safety checks.
- (b) Air exercise:
- (1) aeroplane limitations;
  - (2) safety checks;
  - (3) spin entry;
  - (4) recognition and identification of the spin direction;
  - (5) spin recovery (reference to flight manual);
  - (6) use of controls;
  - (7) effects of power or flaps (restrictions applicable to aeroplane type);
  - (8) spinning and recovery from various flight attitudes.

## **EXERCISE 12: TAKE-OFF AND CLIMB TO DOWNWIND POSITION**

- (a) Long briefing objectives:
- (1) handling: factors affecting the length of take-off run and initial climb;
  - (2) correct lift off speed, use of elevators (safeguarding the nose wheel), rudder and power;
  - (3) effect of wind (including crosswind component);
  - (4) effect of flaps (including the decision to use and the amount permitted);
  - (5) effect of ground surface and gradient upon the take-off run;
  - (6) effect of mass, altitude and temperature on take-off and climb performance;

- (7) pre take-off checks;
  - (8) ATC procedure before take-off;
  - (9) drills, during and after take-off;
  - (10) noise abatement procedures;
  - (11) tail wheel considerations (as applicable);
  - (12) short or soft field take-off considerations or procedures;
  - (13) emergencies:
    - (i) aborted take-off;
    - (ii) engine failure after take-off.
  - (14) ATC procedures.
- (b) Air exercise:
- (1) take-off and climb to downwind position;
  - (2) pre take-off checks;
  - (3) into wind take-off;
  - (4) safeguarding the nose wheel;
  - (5) crosswind take-off;
  - (6) drills during and after take-off;
  - (7) short take-off and soft field procedure or techniques (including performance calculations);
  - (8) noise abatement procedures.

### **EXERCISE 13: CIRCUIT, APPROACH AND LANDING**

- (a) Long briefing objectives:
- (1) downwind leg, base leg and approach: position and drills;
  - (2) factors affecting the final approach and the landing run;

- (3) effect of mass;
  - (4) effects of altitude and temperature;
  - (5) effect of wind;
  - (6) effect of flap;
  - (7) landing;
  - (8) effect of ground surface and gradient upon the landing run;
  - (9) types of approach and landing:
    - (i) powered;
    - (ii) crosswind;
    - (iii) flapless (at an appropriate stage of the course);
    - (iv) glide;
    - (v) short field;
    - (vi) soft field.
  - (10) tail wheel aeroplane considerations (as applicable);
  - (11) missed approach;
  - (12) engine handling;
  - (13) wake turbulence awareness;
  - (14) windshear awareness;
  - (15) ATC procedures;
  - (16) mislanding and go-around;
  - (17) special emphasis on look-out.
- (b) Air exercise:
- (1) circuit approach and landing;

- (2) circuit procedures: downwind and base leg;
- (3) powered approach and landing;
- (4) safeguarding the nose wheel;
- (5) effect of wind on approach and touchdown speeds and use of flaps;
- (6) crosswind approach and landing;
- (7) glide approach and landing;
- (8) flapless approach and landing (short and soft field);
- (9) short field and soft field procedures;
- (10) wheel landing (tail wheel aircraft);
- (11) missed approach and go-around;
- (12) mislanding and go-around;
- (13) noise abatement procedures.

#### **EXERCISE 14: FIRST SOLO AND CONSOLIDATION**

Note: a summary of points to be covered before sending the student on first solo.

- (a) Long briefing objectives:

During the flights immediately following the solo circuit consolidation period the following should be covered:

- (1) procedures for leaving and rejoining the circuit;
  - (2) local area (restrictions, controlled airspace, etc.);
  - (3) compass turns;
  - (4) QDM meaning and use.
- (b) Air exercise: all long briefing objectives mentioned above should also be trained on site during the air exercise.

## **EXERCISE 15: ADVANCED TURNING**

(a) Long briefing objectives:

- (1) the forces;
- (2) use of power;
- (3) effect of load factor:
  - (i) structural considerations
  - (ii) increased stalling speed.
- (4) physiological effects;
- (5) rate and radius of turn;
- (6) steep, level, descending and climbing turns;
- (7) stalling in the turn and how to avoid it;
- (8) spinning from the turn: recovery at the incipient stage;
- (9) spiral dive;
- (10) unusual attitudes and recoveries.

Note: considerations are to be given to manoeuvre limitations and reference to the flight manual or equivalent document (for example owner's manual or pilot's operating handbook) in relation to mass and balance, and any other restrictions for practice entries to the spin.

(b) Air exercise:

- (1) level, descending and climbing steep turns;
- (2) stalling in the turn;
- (3) spiral dive;
- (4) spinning from the turn;
- (5) recovery from unusual attitudes;
- (6) maximum rate turns.

## **EXERCISE 16: FORCED LANDING WITHOUT POWER**

- (a) Long briefing objectives:
  - (1) selection of forced landing areas;
  - (2) provision for change of plan;
  - (3) gliding distance: consideration;
  - (4) planning the descent;
  - (5) key positions;
  - (6) engine failure checks;
  - (7) use of radio: R/T 'distress' procedure;
  - (8) base leg;
  - (9) final approach;
  - (10) go-around;
  - (11) landing considerations;
  - (12) actions after landing: aeroplane security;
  - (13) causes of engine failure.
- (b) Air exercise:
  - (1) forced landing procedures;
  - (2) selection of landing area:
    - (i) provision for change of plan;
    - (ii) gliding distance considerations.
  - (3) planning the descent;
  - (4) key positions;
  - (5) engine failure checks;

- (6) engine cooling precautions;
- (7) use of radio;
- (8) base leg;
- (9) final approach;
- (10) landing;
- (11) actions after landing: when the exercise is conducted at an aerodrome;
- (12) aeroplane security.

### **EXERCISE 17: PRECAUTIONARY LANDING**

- (a) Long briefing objectives:
  - (1) occasions when necessary (in-flight conditions);
  - (2) landing area selection and communication (R/T procedure);
  - (3) overhead inspection;
  - (4) simulated approach;
  - (5) climb away;
  - (6) landing area selection:
    - (i) normal aerodrome;
    - (ii) disused aerodrome;
    - (iii) ordinary field;
  - (7) circuit and approach;
  - (8) actions after landing; aeroplane security.
- (b) Air exercise:
  - (1) occasions when necessary (in-flight conditions):
  - (2) landing area selection

- (3) overhead inspection
- (4) simulated approach
- (5) climb away
- (6) landing area selection:
  - (i) normal aerodrome;
  - (ii) disused aerodrome;
  - (iii) ordinary field;
- (7) circuit and approach;
- (8) actions after landing; aeroplane security;

#### **EXERCISE 18a: NAVIGATION**

- (a) Long briefing objectives:
  - (1) flight planning;
    - (i) weather forecast and actual(s);
    - (ii) map selection, orientation, preparation and use:
      - (A) choice of route;
      - (B) regulated or controlled airspace;
      - (C) danger, prohibited and restricted areas;
      - (D) safety altitude.
    - (iii) calculations:
      - (A) magnetic heading(s) and time(s) en-route;
      - (B) fuel consumption;
      - (C) mass and balance;
      - (D) mass and performance.



- (iv) flight information:
  - (A) NOTAMs etc.;
  - (B) noting of required radio frequencies;
  - (C) selection of alternate aerodrome(s).
- (v) aeroplane documentation.
- (vi) notification of the flight:
  - (A) pre-flight administration procedures;
  - (B) flight plan form (where appropriate).
- (2) departure;
  - (i) organisation of cockpit workload;
  - (ii) departure procedures:
    - (A) altimeter settings;
    - (B) setting heading procedures;
    - (C) noting of ETA(s).
  - (iii) en-route map reading: identification of ground features;
  - (iv) maintenance of altitudes and headings;
  - (v) revisions to ETA and heading, wind effect, drift angle and groundspeed checks;
  - (vi) log keeping;
  - (vii) use of radio (including VDF if applicable);
  - (viii) minimum weather conditions for continuance of flight;
  - (ix) 'in-flight' decisions;
  - (x) diversion procedures;
  - (xi) operations in regulated or controlled airspace;

- (xii) procedures for entry, transit and departure;
- (xiii) navigation at minimum level;
- (xiv) uncertainty of position procedure, including R/T procedure;
- (xv) lost procedure;
- (xvi) use of radio navaids.
- (3) arrival procedures and aerodrome circuit joining procedures:
  - (i) ATC liaison, R/T procedure, etc.;
  - (ii) altimeter setting,
  - (iii) entering the traffic pattern (controlled or uncontrolled aerodromes);
  - (iv) circuit procedures;
  - (v) parking procedures;
  - (vi) security of aircraft;
  - (vii) refuelling;
  - (viii) booking in.
- (b) Air exercise:
  - (1) flight planning:
    - (i) weather forecast and actual(s);
    - (ii) map selection and preparation:
      - (A) choice of route;
      - (B) regulated or controlled airspace;
      - (C) danger, prohibited and restricted areas;
      - (D) safety altitude.
    - (iii) calculations:

- (A) magnetic heading(s) and time(s) en-route;
  - (B) fuel consumption;
  - (C) mass and balance;
  - (D) mass and performance.
- (iv) flight information:
  - (A) NOTAMs etc.;
  - (B) noting of required radio frequencies;
  - (C) selection of alternate aerodromes.
- (v) aircraft documentation;
- (vi) notification of the flight:
  - (A) flight clearance procedures (as applicable);
  - (B) flight plans.
- (2) aerodrome departure;
  - (i) organisation of cockpit workload;
  - (ii) departure procedures:
    - (A) altimeter settings;
    - (B) en-route;
    - (C) noting of ETA(s).
  - (iii) wind effect, drift angle and ground speed checks;
  - (iv) maintenance of altitudes and headings;
  - (v) revisions to ETA and heading;
  - (vi) log keeping;
  - (vii) use of radio (including VDF if applicable);

- (viii) minimum weather conditions for continuance of flight;
  - (ix) 'in-flight' decisions;
  - (x) diversion procedure;
  - (xi) operations in regulated or controlled airspace;
  - (xii) procedures for entry, transit and departure;
  - (xiii) uncertainty of position procedure;
  - (xiv) lost procedure;
  - (xv) use of radio nav aids.
- (3) arrival procedures and aerodrome joining procedures:
- (i) ATC liaison, R/T procedure etc.;
  - (ii) altimeter setting,
  - (iii) entering the traffic pattern;
  - (iv) circuit procedures;
  - (v) parking procedures
  - (vi) security of aircraft;
  - (vii) refuelling;
  - (viii) booking in.

### **EXERCISE 18b: NAVIGATION AT LOWER LEVELS AND IN REDUCED VISIBILITY**

- (a) Long briefing objectives:
- (1) general considerations:
    - (i) planning requirements before flight in entry or exit lanes;
    - (ii) ATC rules, pilot qualifications and aircraft equipment;
    - (iii) entry or exit lanes and areas where specific local rules apply.

- (2) low level familiarisation:
    - (i) actions before descending;
    - (ii) visual impressions and height keeping at low altitude;
    - (iii) effects of speed and inertia during turns;
    - (iv) effects of wind and turbulence;
  - (3) low level operation:
    - (i) weather considerations;
    - (ii) low cloud and good visibility;
    - (iii) low cloud and poor visibility;
    - (iv) avoidance of moderate to heavy rain showers;
    - (v) effects of precipitation;
    - (vi) joining a circuit;
    - (vii) bad weather circuit, approach and landing.
- (b) Air exercise:
- (1) general considerations: entry or exit lanes and areas where specific local rules apply;
  - (2) low level familiarisation:
    - (i) actions before descending;
    - (ii) visual impressions and height keeping at low altitude;
    - (iii) effects of speed and inertia during turns;
    - (iv) effects of wind and turbulence;
    - (v) hazards of operating at low levels;
  - (3) low level operation:
    - (i) weather considerations;

- (ii) low cloud and good visibility;
- (iii) low cloud and poor visibility;
- (iv) avoidance of moderate to heavy rain showers;
- (v) effects of precipitation (forward visibility);
- (vi) joining a circuit;
- (vii) bad weather circuit, approach and landing.

**EXERCISE 18c: USE OF RADIO NAVIGATION AIDS UNDER VFR**

(a) Long briefing objectives:

(1) use of VOR:

- (i) availability, AIP and frequencies;
- (ii) signal reception range;
- (iii) selection and identification;
- (iv) radials and method of numbering;
- (v) use of OBS;
- (vi) to or from indication and station passage;
- (vii) selection, interception and maintaining a radial;
- (viii) use of two stations to determine position.

(2) use of ADF equipment:

- (i) availability of NDB stations, AIP and frequencies;
- (ii) signal reception range;
- (iii) selection and identification;
- (iv) orientation in relation to NDP;
- (v) homing to an NDP.

- (3) use of VHF/DF:
  - (i) availability. AIP and frequencies;
  - (ii) R/T procedures;
  - (iii) obtaining QDMs and QTEs.
- (4) use of radar facilities:
  - (i) availability and provision of service and AIS;
  - (ii) types of service;
  - (iii) R/T procedures and use of transponder:
    - (A) mode selection;
    - (B) emergency codes.
- (5) use of distance DME:
  - (i) availability and AIP;
  - (ii) operating modes;
  - (iii) slant range.
- (6) use of GNSS (RNAV – SATNAV):
  - (i) availability;
  - (ii) operating modes;
  - (iii) limitations.
- (b) Air exercise:
  - (1) use of VOR:
    - (i) availability, AIP and frequencies;
    - (ii) selection and identification;
    - (iii) use of OBS;

- (iv) to or from indications: orientation;
- (v) use of CDI;
- (vi) determination of radial;
- (vii) intercepting and maintaining a radial;
- (viii) VOR passage;
- (ix) obtaining a fix from two VORs.
- (2) use of ADF equipment;
  - (i) availability of NDB stations, AIP and frequencies;
  - (ii) selection and identification;
  - (iii) orientation relative to the beacon;
  - (iv) homing.
- (3) use of VHF/DF:
  - (i) availability, AIP and frequencies;
  - (ii) R/T procedures and ATC liaison;
  - (iii) obtaining a QDM and homing.
- (4) use of en-route or terminal radar:
  - (i) availability and AIP;
  - (ii) procedures and ATC liaison;
  - (iii) pilot's responsibilities;
  - (iv) secondary surveillance radar;
  - (v) transponders;
  - (vi) code selection;
  - (vii) interrogation and reply.



- (5) use of DME:
  - (i) station selection and identification;
  - (ii) modes of operation.
- (6) use of GNSS (RNAV – SATNAV):
  - (i) setting up;
  - (ii) operation;
  - (iii) interpretation.

### **EXERCISE 19: BASIC INSTRUMENT FLIGHT**

- (a) Long briefing objectives:
  - (1) flight instruments;
    - (i) physiological sensations;
    - (ii) instrument appreciation;
    - (iii) attitude instrument flight;
    - (iv) pitch indications;
    - (v) bank indications;
    - (vi) different dial presentations;
    - (vii) introduction to the use of the attitude indicator;
    - (viii) pitch attitude;
    - (ix) bank attitude;
    - (x) maintenance of heading and balanced flight;
    - (xi) instrument limitations (inclusive system failures).
  - (2) attitude, power and performance;
    - (i) attitude instrument flight:

- (ii) control instruments;
- (iii) performance instruments;
- (iv) effect of changing power and configuration;
- (v) cross-checking the instrument indications;
- (vi) instrument interpretation;
- (vii) direct and indirect indications (performance instruments);
- (viii) instrument lag;
- (ix) selective radial scan;
- (3) basic flight manoeuvres (full panel);
  - (i) straight and level flight at various air speeds and aeroplane configurations;
  - (ii) climbing;
  - (iii) descending;
  - (iv) standard rate turns onto pre-selected headings:
    - (A) level;
    - (B) climbing;
    - (C) Descending.
- (b) Air exercise:
  - (1) Introduction to instrument flying
    - (i) flight instruments;
    - (ii) physiological sensations;
    - (iii) instrument appreciation;
    - (iv) attitude instrument flight;
    - (v) pitch attitude;

- (vi) bank attitude;
- (vii) maintenance of heading and balanced flight;
- (2) attitude, power and performance;
  - (i) attitude instrument flight;
  - (ii) effect of changing power and configuration;
  - (iii) cross-checking the instruments;
  - (iv) selective radial scan;
- (3) basic flight manoeuvres (full panel);
  - (i) straight and level flight at various air speeds and aeroplane configurations;
  - (ii) climbing;
  - (iii) descending;
  - (iv) standard rate turns onto pre-selected headings:
    - (A) level;
    - (B) climbing;
    - (C) Descending

**EXERCISE 20: NIGHT FLYING (if night instructional qualification required)**

- (a) Long briefing objectives:
  - (1) start up procedures;
  - (2) local procedures: including ATC liaison;
  - (3) taxiing:
    - (i) parking area and taxiway lighting;
    - (ii) judgement of speed and distances;
    - (iii) use of taxiway lights;

- (iv) avoidance of hazards: obstruction lighting;
- (v) instrument checks;
- (vi) holding point: lighting procedure;
- (vii) initial familiarisation at night;
- (viii) local area orientation;
- (ix) significance of lights on other aircraft;
- (x) ground obstruction lights;
- (xi) division of piloting effort: external or instrument reference;
- (xii) rejoining procedure;
- (xiii) aerodrome lighting: approach and runway lighting (including VASI and PAPI):
  - (A) threshold lights;
  - (B) approach lighting;
  - (C) visual approach slope indicator systems.
- (4) night circuits;
  - (i) take-off and climb:
    - (A) line up;
    - (B) visual references during the take-off run;
    - (C) transfer to instruments;
    - (D) establishing the initial climb;
    - (E) use of flight instruments;
    - (F) instrument climb and initial turn.
  - (ii) circuit:
    - (A) aeroplane positioning: reference to runway lighting;

- (B) the traffic pattern and look-out;
- (C) initial approach and runway lighting demonstration;
- (D) aeroplane positioning;
- (E) changing aspect of runway lights and VASI (or PAPI);
- (F) intercepting the correct approach path;
- (G) the climb away.
- (iii) approach and landing:
  - (A) positioning, base leg and final approach;
  - (B) diurnal wind effect;
  - (C) use of landing lights;
  - (D) the flare and touchdown;
  - (E) the roll out;
  - (F) turning off the runway: control of speed.
- (iv) missed approach:
  - (A) use of instruments;
  - (B) re-positioning in the circuit pattern;
- (5) night navigation:
  - (i) particular emphasis on flight planning;
  - (ii) selection of ground features visible at night:
    - (A) air light beacons;
    - (B) effect of cockpit lighting on map colours;
    - (C) use of radio aids;
    - (D) effect of moonlight upon visibility at night;

- (iii) emphasis on maintaining a 'minimum safe altitude';
  - (iv) alternate aerodromes: restricted availability;
  - (v) restricted recognition of weather deterioration;
  - (vi) lost procedures;
- (6) night emergencies;
  - (i) radio failure;
  - (ii) failure of runway lighting;
  - (iii) failure of aeroplane landing lights;
  - (iv) failure of aeroplane internal lighting;
  - (v) failure of aeroplane navigation lights;
  - (vi) total electrical failure;
  - (vii) abandoned take-off;
  - (viii) engine failure;
  - (ix) obstructed runway procedure.
- (b) Air exercise: during the air exercise all long briefing objectives mentioned above should also be trained on site and the student instructor should demonstrate the following items:
  - (1) how to plan and to perform a flight at night;
  - (2) how to advise the student pilot to plan and prepare a flight at night;
  - (3) how to advise the student pilot to perform a flight at night;
  - (4) how to analyse and correct errors as necessary.

## **B. Helicopters**

### **GROUND INSTRUCTION**

Note: During ground instruction the student instructor should pay specific attention to the teaching of enhanced ground instruction in weather interpretation, planning and route

assessment, decision making on encountering DVE including reversing course or conduction a precautionary landing.

## **Part 2**

### **AIR EXERCISES**

- (a) The air exercises are similar to those used for the training of PPL(H) but with additional items designed to cover the needs of an FI.
- (b) The numbering of exercises should be used primarily as an exercise reference list and as a broad instructional sequencing guide: therefore the demonstrations and practices need not necessarily be given in the order listed. The actual order and content will depend upon the following interrelated factors:
  - (1) the applicant's progress and ability;
  - (2) the weather conditions affecting the flight;
  - (3) the flight time available;
  - (4) instructional technique considerations;
  - (5) the local operating environment;
  - (6) applicability of the exercises to the helicopter type.
- (c) It follows that student instructors will eventually be faced with similar interrelated factors. They should be shown and taught how to construct flight lesson plans, taking these factors into account, so as to make the best use of each flight lesson, combining parts of the set exercises as necessary.

### **GENERAL**

- (d) The briefing normally includes a statement of the objectives and a brief reference to principles of flight only if relevant. An explanation is to be given of exactly what air exercises are to be taught by the instructor and practised by the student during the flight. It should include how the flight will be conducted about who is to fly the helicopter and what airmanship, weather and flight safety aspects currently apply. The nature of the lesson will govern the order in which the constituent parts are to be taught.
- (e) The four basic components of the briefing will be:
  - (1) the aim;

- (2) principles of flight (briefest reference only);
- (3) the air exercise(s) (what, and how and by whom);
- (4) airmanship (weather, flight safety etc.).

## **PLANNING OF FLIGHT LESSONS**

- (f) The preparation of lesson plans is an essential prerequisite of good instruction and the student instructor is to be given supervised practice in the planning and practical application of flight lesson plans.

## **GENERAL CONSIDERATIONS**

- (g) The student instructor should complete flight training to practise the principles of basic instruction at the PPL(H) level.
- (h) During this training, except when acting as a student pilot for mutual flights, the student instructor occupies the seat normally occupied by the FI(H).
- (i) It is to be noted that airmanship and look-out is a vital ingredient of all flight operations. Therefore, in the following air exercises the relevant aspects of airmanship are to be stressed at all times.
- (j) If the privileges of the FI(H) certificate are to include instruction for night flying, exercise 28 should be undertaken either as part of the course or subsequent to certificate issue.
- (k) The student instructor should learn how to identify common errors and how to correct them properly, which should be emphasised at all times.
- (l) The student instructor should be trained to keep in mind that wherever possible, flight simulation should be used to demonstrate to student pilots the effects of flight into DVE and to enhance their understanding and need for avoidance of this potentially fatal flight regime.

## **SYLLABUS OF FLIGHT INSTRUCTION CONTENTS**

### **LONG BRIEFINGS AND AIR EXERCISES**

#### **EXERCISE 1: FAMILIARISATION WITH THE HELICOPTER**

- (a) Long briefing objectives:
  - (1) introduction to the helicopter;



- (2) explanation of the cockpit layout;
- (3) helicopter and engine systems;
- (4) checklist(s) and procedures;
- (5) familiarisation with the helicopter controls;
- (6) differences when occupying the instructor's seat;
- (7) emergency drills:
  - (i) action if fire in the air and on the ground: engine, cockpit or cabin and electrical fire;
  - (ii) system failure drills as applicable to type;
  - (iii) escape drills: location and use of emergency equipment and exits.
- (b) Air exercise: all long briefing objectives mentioned above should also be trained on site during the air exercise.

## **EXERCISE 2: PREPARATION FOR AND ACTION AFTER FLIGHT**

- (a) Long briefing objectives:
  - (1) flight authorisation and helicopter acceptance, including technical log (if applicable) and certificate of maintenance;
  - (2) equipment required for flight (maps, etc.);
  - (3) external checks;
  - (4) internal checks;
  - (5) student comfort, harness, seat and rudder pedal adjustment;
  - (6) starting and after starting checks;
  - (7) system, power or serviceability checks (as applicable);
  - (8) closing down or shutting down the helicopter (including system checks).
  - (9) parking and leaving the helicopter (including safety or security as applicable);

- (10) completion of authorisation sheet and helicopter serviceability documents.
- (b) Air exercise: all long briefing objectives mentioned above should also be trained on site during the air exercise.

### **EXERCISE 3: AIR EXPERIENCE**

- (a) Long briefing objectives:

Note: there is no requirement for a long briefing for this exercise.

- (b) Air exercise:
  - (1) air experience;
  - (2) cockpit layout, ergonomics and controls;
  - (3) cockpit procedures: stability and control.

### **EXERCISE 4: EFFECTS OF CONTROLS**

- (a) Long briefing objectives:

- (1) function of the flying controls (primary and secondary effect);
- (2) effect of air speed;
- (3) effect of power changes (torque);
- (4) effect of yaw (sideslip);
- (5) effect of disc loading (bank and flare);
- (6) effect on controls of selecting hydraulics on/off;
- (7) effect of control friction;
- (8) use of instruments;
- (9) operation of carburettor heat or anti-icing control.

- (b) Air exercise: all long briefing objectives mentioned above should also be trained on site during the air exercise.

### **EXERCISE 5: POWER AND ATTITUDE CHANGES**

- (a) Long briefing objectives:
  - (1) relationship between cyclic control position, disc attitude, fuselage attitude and air speed flap back;
  - (2) power required diagram in relation to air speed;
  - (3) power and air speed changes in level flight;
  - (4) use of the instruments for precision;
  - (5) engine and air speed limitations;
- (b) Air exercise:
  - (1) relationship between cyclic control position, disc attitude, fuselage attitude and air speed flap back;
  - (2) power and air speed changes in level flight;
  - (3) use of instruments for precision (including instrument scan and lookout).

### **EXERCISE 6: LEVEL FLIGHT, CLIMBING, DESCENDING AND TURNING**

Note: for ease of training this exercise is divided into four separate parts in the PPL(H) syllabus but may be taught complete or in convenient parts.

- (a) Long briefing objectives:
  - (1) basic factors involved in level flight;
  - (2) normal power settings;
  - (3) use of control friction or trim;
  - (4) importance of maintaining direction and balance;
  - (5) power required or power available diagram;
  - (6) optimum climb and descent speeds, angles or rates;
  - (7) importance of balance, attitude and co-ordination in the turn;
  - (8) effects of turning on rate of climb or descent;

- (9) use of the gyro direction or heading indicator and compass;
- (10) use of instruments for precision.
- (b) Air exercises:
  - (1) maintaining straight and level flight at normal cruise power;
  - (2) control in pitch, including use of control friction or trim;
  - (3) use of the ball or yaw string to maintain direction and balance;
  - (4) setting and use of power for selected air speeds and speed changes;
  - (5) entry to climb;
  - (6) normal and maximum rate of climb;
  - (7) levelling off from climb at selected altitudes or heights;
  - (8) entry to descent;
  - (9) effect of power and air speed on rate of descent;
  - (10) levelling off from descent at selected altitudes or heights;
  - (11) entry to medium rate turns;
  - (12) importance of balance, attitude and co-ordination to maintain level turn;
  - (13) resuming straight and level flight;
  - (14) turns onto selected headings, use of direction indicator and compass;
  - (15) turns whilst climbing and descending;
  - (16) effect of turn on rate of climb or descent;
  - (17) use of instruments for precision (including instrument scan and lookout).

#### **EXERCISE 7: AUTOROTATION**

- (a) Long briefing objectives:
  - (1) characteristics of autorotation;

- (2) safety checks (including look-out and verbal warning);
  - (3) entry and development of autorotation;
  - (4) effect of AUM, IAS, disc loading, G forces and density altitude on RRPM and rate of descent;
  - (5) rotor and engine limitations;
  - (6) control of air speed and RRPM;
  - (7) recovery to powered flight;
  - (8) throttle override and control of ERPM or RRPM during re-engagement (as applicable);
  - (9) danger of vortex condition during recovery.
- (b) Air exercise:
- (1) safety checks (including verbal warning and look-out);
  - (2) entry to and establishing in autorotation;
  - (3) effect of IAS and disc loading on RRPM and rate of descent;
  - (4) control of air speed and RRPM;
  - (5) recovery to powered flight;
  - (6) medium turns in autorotation;
  - (7) simulated engine off landing (as appropriate).

#### **EXERCISE 8: HOVERING AND HOVER TAXIING**

- (a) Long briefing objectives:
- (1) ground effect and power required;
  - (2) effect of wind, attitude and surface;
  - (3) stability in hover and effects of over controlling;
  - (4) effect of control in hover;

- (5) control and co-ordination during spot turns;
  - (6) requirement for slow hover speed to maintain ground effect;
  - (7) effect of hydraulic failure in hover;
  - (8) specific hazards, for example snow, dust, etc.
- (b) Air exercise:
- (1) ground effect and power or height relationship;
  - (2) effect of wind, attitude and surface;
  - (3) stability in hover and effects of over controlling;
  - (4) effect of control and hover technique;
  - (5) gentle forward running touchdown;
  - (6) control and co-ordination during spot (90 ° clearing) turns;
  - (7) control and co-ordination during hover taxi;
  - (8) dangers of mishandling and over pitching;
  - (9) (where applicable) effect of hydraulics failure in hover;
  - (10) simulated engine failure in the hover and hover taxi.

### **EXERCISE 9: TAKE-OFF AND LANDING**

- (a) Long briefing objectives:
- (1) pre take-off checks or drills;
  - (2) importance of good look-out;
  - (3) technique for lifting to hover;
  - (4) after take-off checks;
  - (5) danger of horizontal movement near ground;
  - (6) dangers of mishandling and over pitching;

- (7) technique for landing;
  - (8) after landing checks;
  - (9) take-off and landing crosswind and downwind.
- (b) Air exercise:
- (1) pre take-off checks or drills;
  - (2) pre take-off look-out technique;
  - (3) lifting to hover;
  - (4) after take-off checks;
  - (5) landing;
  - (6) after landing checks or drills;
  - (7) take-off and landing crosswind and downwind.

**EXERCISE 10: TRANSITIONS FROM HOVER TO CLIMB AND APPROACH TO HOVER**

- (a) Long briefing objectives:
- (1) revision of ground effect;
  - (2) translational lift and its effects;
  - (3) inflow roll and its effects;
  - (4) revision of flap back and its effects;
  - (5) avoidance of curve diagram and associated dangers;
  - (6) effect or dangers of wind speed and direction during transitions;
  - (7) transition to climb technique;
  - (8) constant angle approach;
  - (9) transition to hover technique.
- (b) Air exercise:

- (1) revision of take-off and landing;
- (2) transition from hover to climb;
- (3) effect of translational lift, inflow roll and flap back;
- (4) constant angle approach;
- (5) technique for transition from descent to hover;
- (6) a variable flare simulated engine off landing.

### **EXERCISE 11: CIRCUIT, APPROACH AND LANDING**

- (a) Long briefing objectives:
- (1) circuit and associated procedures;
  - (2) take-off and climb (including checks or speeds);
  - (3) crosswind leg (including checks, speeds or angles of bank in turns);
  - (4) downwind leg (including pre-landing checks);
  - (5) base leg (including checks, speeds or angles of bank in turns);
  - (6) final approach (including checks or speeds);
  - (7) effect of wind on approach and hover IGE;
  - (8) crosswind approach and landing technique;
  - (9) missed approach and go-around technique (as applicable);
  - (10) steep approach technique (including danger of high sink rate);
  - (11) limited power approach technique (including danger of high speed at touchdown);
  - (12) use of the ground effect;
  - (13) abandoned take-off technique;
  - (14) hydraulic failure drills and hydraulics off landing technique (where applicable);



- (15) drills or technique for tail rotor control or tail rotor drive failure;
- (16) engine failure drills in the circuit to include;
- (17) engine failure
- (18) on take-off:
  - (i) crosswind;
  - (ii) downwind;
  - (iii) base leg;
  - (iv) on final approach.
- (19) noise abatement procedures (as applicable).
- (b) Air exercise:
  - (1) revision of transitions and constant angle approach;
  - (2) basic training circuit, including checks;
  - (3) crosswind approach and landing technique;
  - (4) missed approach and go-around technique (as applicable);
  - (5) steep approach technique;
  - (6) basic limited power approach or run on technique;
  - (7) use of ground effect;
  - (8) hydraulic failure and approach to touchdown with hydraulics off and to recover at safe height (as applicable);
  - (9) simulated engine failure on take-off, crosswind, downwind, base leg and finals;
  - (10) variable flare simulated engine off landing.

## **EXERCISE 12: FIRST SOLO**

- (a) Long briefing objectives:

- (1) warning of change of attitude due to reduced and laterally displaced weight;
  - (2) low tail, low skid or wheel during hover or landing;
  - (3) dangers of loss of RRPM and over pitching;
  - (4) pre take-off checks;
  - (5) into wind take-off;
  - (6) drills during and after take-off;
  - (7) normal circuit, approach and landing;
  - (8) action if an emergency.
- (b) Air exercise: all long briefing objectives mentioned above should also be trained on site during the air exercise.

### **EXERCISE 13: SIDEWAYS AND BACKWARDS HOVER MANOEUVRING**

- (a) Long briefing objectives:
- (1) revision of hovering;
  - (2) directional stability and weather cocking effect;
  - (3) danger of pitching nose down on recovery from backwards manoeuvring;
  - (4) helicopter limitations for sideways and backwards manoeuvring;
  - (5) effect of CG position.
- (b) Air exercise:
- (1) revision of hovering and 90 ° clearing turns;
  - (2) manoeuvring sideways heading into wind;
  - (3) manoeuvring backwards heading into wind;
  - (4) manoeuvring sideways and backwards heading out of wind;
  - (5) manoeuvring backwards too fast and recovery action.

#### **EXERCISE 14: SPOT TURNS**

- (a) Long briefing objectives:
- (1) revision of ground effect and effect of wind;
  - (2) weather cocking and control actions;
  - (3) control of RRPM;
  - (4) torque effect;
  - (5) cyclic limiting stops due to CG position (where applicable);
  - (6) rate of turn limitations;
  - (7) spot turn about pilot position;
  - (8) spot turn about tail rotor position;
  - (9) spot turn about helicopter geometric centre;
  - (10) square (safe visibility) and clearing turn.
- (b) Air exercise:
- (1) weather cocking, torque effect and control actions;
  - (2) rate of turn;
  - (3) spot turn about pilot position;
  - (4) spot turn about tail rotor position;
  - (5) spot turn about helicopter geometric centre;
  - (6) square and clearing turn.

#### **EXERCISE 15: HOVER OUT OF GROUND EFFECT AND VORTEX RING**

- (a) Long briefing objectives:
- (1) revision of ground effect and power required diagram;
  - (2) drift, height and power control, look-out or scan;

- (3) vortex ring, (including dangers, recognition and recovery actions);
- (4) loss of tail rotor effectiveness.
- (b) Air exercise:
  - (1) to demonstrate hover OGE;
  - (2) drift, height, power control and look-out, and instrument scan technique;
  - (3) recognition of incipient stage of vortex ring and settling with power;
  - (4) recovery action from incipient stage of vortex ring;
  - (5) recognition of loss of tail rotor effectiveness and recovery actions.

#### **EXERCISE 16: SIMULATED ENGINE OFF LANDINGS**

- (a) Long briefing objectives:
  - (1) revision of basic autorotation;
  - (2) effect of AUM, disc loading, density altitude and RRPM decay;
  - (3) use of cyclic and collective to control speed or RRPM;
  - (4) torque effect;
  - (5) use of flare or turn to restore RRPM;
  - (6) technique for variable flare simulated EOL;
  - (7) technique for constant attitude simulated EOL;
  - (8) revision of technique for hover or hover taxi simulated EOL;
  - (9) emergency technique for engine failure during transition;
  - (10) technique for low level simulated EOL.
- (b) Air exercise
  - (1) revision of entry to and control in autorotation;
  - (2) variable flare simulated EOL

- (3) constant attitude simulated EOL;
- (4) hover simulated EOL;
- (5) hover taxi simulated EOL;
- (6) low level simulated EOL.

### **EXERCISE 17: ADVANCED AUTOROTATIONS**

(a) Long briefing objectives:

- (1) effect of air speed or AUM on angles or rates of descent
- (2) effect of RRPM setting on angle or rate of descent;
- (3) reason and technique for range autorotation;
- (4) reason and technique for constant attitude autorotation;
- (5) reason and technique for low speed and 'S' turns in autorotation;
- (6) speed or bank limitations in turns in autorotation;
- (7) revision of re-engagement or go-around procedures.

(b) Air exercise:

- (1) selection of ground marker and standard datum height to determine distance covered during various autorotation techniques;
- (2) revision of basic autorotation;
- (3) technique for range autorotation;
- (4) technique for constant attitude autorotation;
- (5) technique for low speed autorotation, including need for timely speed recovery;
- (6) technique for 'S' turn in autorotation;
- (7) 180 and 360 ° turns in autorotation;
- (8) revision of re-engagement and go-around technique.

### **EXERCISE 18: PRACTICE FORCED LANDINGS**

- (a) Long briefing objectives:
  - (1) types of terrain or surface options for choice of best landing area;
  - (2) practice forced landing procedure;
  - (3) forced landing checks and crash actions;
  - (4) rules or height for recovery and go-around.
- (b) Air exercise:
  - (1) recognition of types of terrain from normal cruise height or altitude;
  - (2) practice forced landing technique;
  - (3) revision of recovery or go-around technique.

### **EXERCISE 19: STEEP TURNS**

- (a) Long briefing objectives:
  - (1) air speed or angle of bank limitations;
  - (2) technique for co-ordination to hold bank or attitude;
  - (3) revision of speed or bank limitations in autorotation including RRPM control;
  - (4) significance of disc loading, vibration and control feedback;
  - (5) effect of wind in turns at low level.
- (b) Air exercise:
  - (1) technique for turning at 30 ° of bank;
  - (2) technique for turning at 45 ° of bank (where possible);
  - (3) steep autorotative turns;
  - (4) explanation of faults in the turn: balance, attitude, bank and coordination;
  - (5) effect of wind at low level.

## **EXERCISE 20: TRANSITIONS**

- (a) Long briefing objectives:
  - (1) revision of effect of ground cushion, translational lift and flap back;
  - (2) training requirement for precision exercise;
  - (3) technique for transition to forward flight and back to hover as precision exercise;
  - (4) effect of wind.
- (b) Air exercise:
  - (1) transition from hover to minimum 50 knots IAS and back to hover;  
Note: select constant height (20 - 30 ft) and maintain.
  - (2) effect of wind.

## **EXERCISE 21: QUICK STOPS**

- (a) Long briefing objectives:
  - (1) power control co-ordination;
  - (2) revision of effect of wind;
  - (3) technique for quick stop into wind;
  - (4) technique for quick stop from crosswind;
  - (5) revision of air speed and angles of bank limitations;
  - (6) technique for emergency turn from downwind;
  - (7) technique for quick stop from downwind from high speed: flare and turn;
  - (8) technique for quick stop from downwind from low speed: turn and flare;  
Note: use reasonable datum speed for example high speed, low speed.
  - (9) danger of holding flare when downwind, (vortex ring) - (minimum speed 70 knots);

- (10) to revise danger of high disc loading.
- (b) Air exercise:
  - (1) technique for quick stop into wind;
  - (2) technique for quick stop from crosswind;
  - (3) danger of vortex ring and disc loading;
  - (4) technique for quick stop from downwind with low speed;
  - (5) technique for quick stop from downwind with high speed;
  - (6) emergency turns from downwind.

## **EXERCISE 22: NAVIGATION**

- (a) Long briefing objectives:

Note: to be broken down into manageable parts at discretion of instructor.

- (1) flight planning:
  - (i) weather forecasts and actuals;
  - (ii) map selection, orientation, preparation and use:
    - (A) choice of route;
    - (B) regulated or controlled airspace;
    - (C) danger, prohibited and restricted areas;
    - (D) safety altitude.
  - (iii) calculations:
    - (A) magnetic heading(s), time(s) en route;
    - (B) fuel consumption;
    - (C) mass and balance.
  - (iv) flight information:



- (A) NOTAMs etc;
  - (B) noting of required radio frequencies;
  - (C) selection of alternate landing sites.
- (v) helicopter documentation;
- (vi) notification of the flight:
  - (A) pre-flight administration procedures;
  - (B) flight plan form (where appropriate).
- (2) departure:
  - (i) organisation of cockpit workload;
  - (ii) departure procedures:
    - (A) altimeter settings;
    - (B) ATC liaison in controlled or regulated airspace;
    - (C) setting heading procedure;
    - (D) noting of ETA(s);
    - (E) maintenance of height or altitude and heading.
  - (iii) procedure for revisions of ETA and headings to include:
    - (A) 10° line, double track, track error and closing angle;
    - (B) 1 in 60 rule;
  - (iv) amending an ETA;
  - (v) log keeping;
  - (vi) use of radio;
  - (vii) use of nav aids;
  - (viii) weather monitoring and minimum weather conditions for continuation of flight;

- (ix) significance of in-flight decision making;
  - (x) technique for transiting controlled or regulated airspace;
  - (xi) uncertainty of position procedure;
  - (xii) lost procedure.
- (3) arrival:
- (i) aerodrome joining procedure, in particular ATC liaison in controlled or regulated airspace:
    - (A) altimeter setting;
    - (B) entering traffic pattern;
    - (C) circuit procedures.
  - (ii) parking procedures, in particular:
    - (A) security of helicopter;
    - (B) refuelling;
    - (C) closing of flight plan, (if appropriate);
    - (D) post flight administrative procedures.
- (4) navigation problems at low heights and reduced visibility:
- (i) actions before descending;
  - (ii) significance of hazards, (for example obstacles and other traffic);
  - (iii) difficulties of map reading;
  - (iv) effects of wind and turbulence;
  - (v) significance of avoiding noise sensitive areas;
  - (vi) procedures for joining a circuit from low level;
  - (vii) procedures for a bad weather circuit and landing;
  - (viii) actions in the event of encountering DVE;

- (ix) appropriate procedures and choice of landing area for precautionary landings;
  - (x) decision to divert or conduct precautionary landing;
  - (xi) precautionary landing.
- (5) radio navigation:
- (i) use of VOR:
    - (A) availability, AIP and frequencies;
    - (B) selection and identification;
    - (C) use of OBS;
    - (D) to or from indications: orientation;
    - (E) use of CDI;
    - (F) determination of radial;
    - (G) intercepting and maintaining a radial;
    - (H) VOR passage;
    - (I) obtaining a fix from two VORs.
  - (ii) use of ADF equipment:
    - (A) availability of NDB stations, AIP and frequencies;
    - (B) selection and identification;
    - (C) orientation relative to beacon;
    - (D) homing.
  - (iii) use of VHF/DF
    - (A) availability, AIP and frequencies;
    - (B) R/T procedures and ATC liaison;
    - (C) obtaining a QDM and homing.

- (iv) use of en-route or terminal radar:
  - (A) availability and AIP;
  - (B) procedures and ATC liaison;
  - (C) pilots responsibilities;
  - (D) secondary surveillance radar:
    - (a) transponders;
    - (b) code selection;
  - (E) interrogation and reply.
- (v) use of DME:
  - (A) station selection and identification;
  - (B) modes of operation: distance, groundspeed and time to run.
- (vi) use of GNSS:
  - (A) selection of waypoints;
  - (B) to or from indications and orientation;
  - (C) error messages;
  - (D) hazards of over-reliance in the continuation of flight in DVE.
- (b) Air exercise:
  - (1) navigation procedures as necessary;
  - (2) to advise student and correct errors as necessary;
  - (3) map reading techniques;
  - (4) the significance of calculations;
  - (5) revision of headings and ETA's;
  - (6) use of radio;

- (7) use of nav aids: ADF/NDB, VOR, VHF/DF, DME and transponder;
- (8) cross-country flying by using visual reference, DR, GNNS and, where available, radio navigation aids; simulation of deteriorating weather conditions and actions to divert or conduct precautionary landing;
- (8) log keeping;
- (9) importance of decision making;
- (10) procedure to deal with uncertainty of position;
- (11) lost procedure;
- (12) appropriate procedures and choice of landing area for precautionary landings;
- (13) aerodrome joining procedure;
- (14) parking and shut-down procedures;
- (15) post-flight administration procedures.

### **EXERCISE 23: ADVANCED TAKE-OFF, LANDINGS AND TRANSITIONS**

- (a) Long briefing objectives:
  - (1) revision of landing and take-off out of wind (performance reduction);
  - (2) revision of wind limitations;
  - (3) revision of directional stability variation when out of wind;
  - (4) revision of power required diagram;
  - (5) technique for downwind transitions;
  - (6) technique for vertical take-off over obstacles;
  - (7) reconnaissance technique for landing site;
  - (8) power checks;
  - (9) technique for running landing;
  - (10) technique for zero speed landing;

- (11) technique for crosswind and downwind landings;
  - (12) steep approach, including dangers;
  - (13) revision of go-around procedures.
- (b) Air exercise
- (1) technique for downwind transition;
  - (2) technique for vertical take-off over obstacles;
  - (3) reconnaissance technique for landing site;
  - (4) power check and assessment;
  - (5) technique for running landing;
  - (6) technique for zero speed landing;
  - (7) technique for crosswind and downwind landings;
  - (8) technique for steep approach;
  - (9) go-around procedures.

#### **EXERCISE 24: SLOPING GROUND**

- (a) Long briefing objectives:
- (1) limitations;
  - (2) wind and slope relationship, including blade and control stops;
  - (3) effect of CG when on slope;
  - (4) ground effect and power required when on slope;
  - (5) landing technique when on slope, left, right and nose-up;
  - (6) avoidance of dynamic rollover, dangers of soft ground and sideways movement;
  - (7) dangers of over controlling near ground on slope;
  - (8) danger of striking main or tail rotor on up slope.

- (b) Air exercise
  - (1) technique for assessing slope angle;
  - (2) technique for landing and take-off left skid up slope;
  - (3) technique for landing and take-off right skid up slope;
  - (4) technique for landing nose up slope;
  - (5) dangers of over controlling near ground.

#### **EXERCISE 25: LIMITED POWER**

- (a) Long briefing objectives:
  - (1) use of appropriate helicopter performance graphs;
  - (2) selection of technique according to available power;
  - (3) effect of wind on available power.
- (b) Air exercise: to revise and refine techniques demonstrated in exercise 23.

#### **EXERCISE 26: CONFINED AREAS**

- (a) Long briefing objectives:
  - (1) revision of use of helicopter performance graphs;
  - (2) procedure for locating landing site and selecting site marker;
  - (3) procedures for assessing wind speed and direction;
  - (4) landing site reconnaissance techniques;
  - (5) reason for selecting landing markers;
  - (6) procedure for selecting direction and type of approach;
  - (7) dangers of out of wind approach;
  - (8) circuit procedures;
  - (9) reason for approach to committal point and go-around, (practice approach);

- (10) approach technique;
  - (11) revision of clearing turn and landing (sloping ground technique);
  - (12) hover power check or performance assessment IGE and OGE (if necessary);
  - (13) take-off procedures.
- (b) Air exercise
- (1) procedures for locating landing site and selecting site marker;
  - (2) procedures for assessing wind speed and direction;
  - (3) landing site reconnaissance techniques;
  - (4) selecting landing markers, direction and type of approach;
  - (5) circuit procedure;
  - (6) practice approach, go-around and approach technique;
  - (7) revision of clearing turn and landing (sloping ground technique);
  - (8) hover power check or performance assessment IGE and OGE (if necessary);
  - (9) take-off procedures.

## **EXERCISE 27: BASIC INSTRUMENT FLIGHT**

- (a) Long briefing objectives:
- (1) physiological sensations;
  - (2) instrument appreciation;
  - (3) attitude instrument flight;
  - (4) instrument scan;
  - (5) instrument limitations;
  - (6) basic manoeuvres by sole reference to instruments:



- (i) straight and level flight at various air speeds and configurations;
  - (ii) climbing and descending;
  - (iii) standard rate turns, climbing and descending, onto selected headings;
  - (iv) recoveries from climbing and descending turns (unusual attitudes).
- (b) Air exercise:
  - (1) attitude instrument flight and instrument scan;
  - (2) basic manoeuvres by sole reference to instruments:
    - (i) straight and level flight at various air speeds and configurations;
    - (ii) climbing and descending;
    - (iii) standard rate turns, climbing and descending, onto selected headings;
    - (iv) recoveries from climbing and descending turns (unusual attitudes).

**EXERCISE 28: NIGHT FLYING (if night instructional qualification required)**

- (a) Long briefing objectives:
  - (1) medical or physiological aspects of night vision;
  - (2) requirement for torch to be carried (pre-flight inspection, etc.);
  - (3) use of the landing light;
  - (4) take-off and hover taxi procedures at night;
  - (5) night take-off procedure;
  - (6) cockpit procedures at night;
  - (7) approach techniques;
  - (8) night landing techniques;
  - (9) night autorotation techniques (power recovery at safe height);

- (10) technique for practice forced landing at night (using appropriate illumination);
  - (11) emergency procedures at night;
  - (12) navigation principles at night;
  - (13) map marking for night use (highlighting built up or lit areas with thicker lines, etc.).
- (b) Air exercise:
- (1) use of torch for pre-flight inspection;
  - (2) use of landing light;
  - (3) night take-off to hover (no sideways or backwards movement);
  - (4) night hover taxi (higher and slower than by day);
  - (5) night transition procedure;
  - (6) night circuit;
  - (7) night approach and landing (including use of landing light);
  - (8) night autorotation (power recovery at safe height);
  - (9) practice forced landing at night (using appropriate illumination);
  - (10) night emergency procedures;
  - (11) night cross country techniques, as appropriate.

## **C. Airships**

### **Part 2**

#### **AIR EXERCISES**

- (a) The air exercises are similar to those used for the training of PPL(As) but with additional items designed to cover the needs of an FI.
- (b) The numbering of exercises should be used primarily as an exercise reference list and as a broad instructional sequencing guide: therefore the demonstrations and

practices need not necessarily be given in the order listed. The actual order and content will depend upon the following interrelated factors:

- (1) the applicant's progress and ability;
  - (2) the weather conditions affecting the flight;
  - (3) the flight time available;
  - (4) instructional technique considerations;
  - (5) the local operating environment.
- (c) It follows that student instructors will eventually be faced with similar interrelated factors. They should be shown and taught how to construct flight lesson plans, taking these factors into account, so as to make the best use of each flight lesson, combining parts of the set exercises as necessary.

## **GENERAL**

- (d) The briefing normally includes a statement of the aim and a brief allusion to principles of flight only if relevant. An explanation is to be given of exactly what air exercises are to be taught by the instructor and practised by the student during the flight. It should include how the flight will be conducted about who is to fly the airship and what airmanship, weather and flight safety aspects currently apply. The nature of the lesson will govern the order in which the constituent parts are to be taught.
- (e) The four basic components of the briefing will be:
- (1) the aim;
  - (2) principles of flight (briefest reference only);
  - (3) the air exercise(s) (what, and how and by whom);
  - (4) airmanship (weather, flight safety etc.).

## **PLANNING OF FLIGHT LESSONS**

- (f) The preparation of lesson plans is an essential prerequisite of good instruction and the student instructor is to be given supervised practice in the planning and practical application of flight lesson plans.

## **GENERAL CONSIDERATIONS**

- (g) The student instructor should complete flight training to practise the principles of basic instruction at the PPL(As) level.
- (h) During this training, except when acting as a student pilot for mutual flights, the student instructor occupies the seat normally occupied by the FI(As).
- (i) It is to be noted that airmanship and look-out is a vital ingredient of all flight operations. Therefore, in the following air exercises the relevant aspects of airmanship are to be stressed at all times.
- (j) The exercises 15 and 16 of the flight instruction syllabus should be undertaken at night in addition to by day as part of the course.
- (k) The student instructor should learn how to identify common errors and how to correct them properly, which should be emphasised at all times.

## **SYLLABUS OF FLIGHT INSTRUCTION CONTENTS**

### **LONG BRIEFINGS AND AIR EXERCISES**

Note: although exercise 16 is not required for the PPL(As) course it is a requirement for the FI(As) course.

#### **EXERCISE 1: FAMILIARISATION WITH THE AIRSHIP**

- (a) Long briefing objectives:
  - (1) introduction to the airship;
  - (2) characteristics of the airship;
  - (3) cockpit layout;
  - (4) airship and engine systems;
  - (5) use of the checklist(s) and procedures;
  - (6) to familiarise the student with the airship controls;
  - (7) differences when occupying the instructor's seat;
  - (8) emergency drills:
    - (i) action if fire in the air or on the ground: engine, cockpit or cabin and electrical fire;

- (ii) system failure drills as applicable to type;
  - (iii) escape drills: location and use of emergency equipment and exits.
- (b) Air exercise: all long briefing objectives mentioned above should also be trained on site during the air exercise.

## **EXERCISE 2: PREPARATION FOR AND ACTION AFTER FLIGHT**

- (a) Long briefing objectives:
  - (1) flight authorisation and airship acceptance including tech log (if applicable) and certificate of maintenance;
  - (2) equipment required for flight (maps, etc.);
  - (3) external checks;
  - (4) internal checks;
  - (5) student comfort, harness, seat and rudder pedal adjustment;
  - (6) starting and after starting checks;
  - (7) system, power or serviceability checks (as applicable);
  - (8) closing down or shutting down the airship (including system checks);
  - (9) parking, masting and unmasting, leaving the airship (including safety or security as applicable);
  - (10) completion of the authorisation sheet and airship serviceability documents;
- (b) Air exercise: all long briefing objectives mentioned above should also be trained on site during the air exercise.

## **EXERCISE 3: AIR EXPERIENCE**

- (a) Long briefing objectives:

Note: there is no requirement for a long briefing for this exercise.
- (b) Air exercise:
  - (1) air experience;

- (2) cockpit layout, ergonomics and controls;
- (3) cockpit procedures: stability and control.

#### **EXERCISE 4: EFFECTS OF CONTROLS**

- (a) Long briefing objectives:
  - (1) function of the flying controls (primary and secondary effect);
  - (2) effect of air speed;
  - (3) effect of power changes;
  - (4) effect of trimming and other controls;
  - (5) use of instruments;
  - (6) use of carburettor heat.
- (b) Air exercise:
  - (1) function of the flying controls;
  - (2) effect of air speed;
  - (3) effect of power changes;
  - (4) effect of trimming and other controls;
  - (5) use of instruments (including instrument scan);
  - (6) use of carburettor heat.

#### **EXERCISE 5: GROUND MANOEUVERING**

- (a) Long briefing objectives:
  - (1) pre-taxi checks;
  - (2) starting, control of speed and stopping;
  - (3) engine handling;
  - (4) mastering procedures;

- (5) control of direction and turning;
  - (6) effects of wind;
  - (7) effects of ground surface;
  - (8) marshalling signals;
  - (9) instrument checks;
  - (10) ATC procedures;
  - (11) emergencies.
- (b) Air exercise:
- (1) starting, control of speed and stopping;
  - (2) engine handling;
  - (3) masting procedures;
  - (4) control of direction and turning;
  - (5) effect of wind.

#### **EXERCISE 6: TAKE-OFF PROCEDURES**

- (a) Long briefing objectives:
- (1) pre take-off checks;
  - (2) take-off with different static heaviness;
  - (3) drills during and after take-off;
  - (4) noise abatement procedures.
- (b) Air exercise:
- (1) take-off with different static heaviness;
  - (2) drills during and after take-off.

**EXERCISE 6e: EMERGENCIES**

- (a) Long briefing objectives:
  - (1) abandoned take-off;
  - (2) engine failures and actions after take-off;
  - (3) malfunctions of thrust vector control;
  - (4) aerodynamic control failures;
  - (5) electrical and system failures.
- (b) Air exercise:
  - (1) how to abandon a take-off;
  - (2) engine failure and suitable action;
  - (3) malfunctions of thrust vector control;
  - (4) aerodynamic control failures.

**EXERCISE 7: CLIMBING**

- (a) Long briefing objectives:
  - (1) entry and how to maintain the normal and max rate of climb;
  - (2) levelling off procedure;
  - (3) how to level off at selected altitudes;
  - (4) maximum angle of climb;
  - (5) maximum rate of climb.
- (b) Air exercise:
  - (1) how to level off at selected altitudes;
  - (2) maximum angle of climb.



### **EXERCISE 8: STRAIGHT AND LEVEL FLIGHT**

- (a) Long briefing objectives:
  - (1) how to attain and maintain straight and level flight;
  - (2) flight at or close to pressure height;
  - (3) control in pitch, including use of trim;
  - (4) at selected air speeds (use of power);
  - (5) during speed changes;
  - (6) use of instruments for precision.
- (b) Air exercise:
  - (1) how to attain and maintain straight and level flight;
  - (2) flight at or close to pressure height;
  - (3) control in pitch, including use of trim;
  - (4) at selected air speeds (use of power);
  - (5) during speed changes.

### **EXERCISE 9: DESCENDING**

- (a) Long briefing objectives:
  - (1) entry, maintaining and levelling off techniques;
  - (2) levelling off at selected altitudes;
  - (3) maximum rate of descent;
  - (4) maximum angle of descent;
  - (5) use of instruments for precision flight.
- (b) Air exercise:
  - (1) levelling off at selected altitudes;

- (2) maximum rate of descent;
- (3) maximum angle of descent.

### **EXERCISE 10: TURNING**

- (a) Long briefing objectives:
  - (1) entry and maintaining level turns;
  - (2) resuming straight flight;
  - (3) faults in the turn;
  - (4) climbing turns;
  - (5) descending turns;
  - (6) turns to selected headings: use of gyro heading indicator and compass;
  - (7) use of instruments for precision.
- (b) Air exercise
  - (1) faults in the turn and correction techniques;
  - (2) climbing turns;
  - (3) descending turns.

### **EXERCISE 11: HOVERING**

- (a) Long briefing objectives: hovering manoeuvres (as applicable).
- (b) Air exercise: hovering manoeuvres (as applicable).

### **EXERCISE 12: APPROACH AND LANDING**

- (a) Long briefing objectives:
  - (1) effect of wind on approach and touchdown speeds;
  - (2) landing with different static heaviness;
  - (3) missed approach and go-around procedures;

- (4) noise abatement procedures.
- (b) Air exercise
  - (1) a landing with different static heaviness;
  - (2) missed approach and go-around procedures.

#### **EXERCISE 12e: EMERGENCIES**

- (a) Long briefing objectives:
  - (1) aborted approach or go-around;
  - (2) malfunction of thrust vector control;
  - (3) envelope emergencies;
  - (4) fire emergencies;
  - (5) aerodynamic control failures;
  - (6) electrical and system failures.
- (b) Air exercise: emergency drills and actions.

#### **EXERCISE 13: PRECAUTIONARY LANDING**

- (a) Long briefing objectives:
  - (1) occasions necessitating a precautionary landing;
  - (2) in-flight conditions;
  - (3) landing area selection;
  - (4) circuit and approach.
- (b) Air exercise:
  - (1) how to perform the landing area selection;
  - (2) circuit and approach.

**EXERCISE 14a: NAVIGATION**

- (a) Long briefing objectives:
  - (1) how to do the flight planning;
  - (2) departure for a navigation flight;
  - (3) in-flight navigational techniques;
  - (4) arrival and aerodrome joining procedures;
- (b) Air exercise:
  - (1) complete flight planning of a navigation flight;
  - (2) departure for a navigation flight;
  - (3) in-flight navigational techniques;
  - (4) arrival and aerodrome joining procedures.

**EXERCISE 14b: NAVIGATION AT LOWER LEVELS AND IN REDUCED VISIBILITY**

- (a) Long briefing objectives:
  - (1) actions before descending;
  - (2) possible hazards (for example obstacles and terrain) and actions;
  - (3) student difficulties of map reading;
  - (4) effects of winds, turbulence and precipitation;
  - (5) vertical situational awareness;
  - (6) avoidance of noise sensitive areas;
  - (7) joining the circuit;
  - (8) bad weather circuit and landing.
- (b) Air exercise:
  - (1) actions before descending;

- (2) map reading techniques;
- (3) vertical situational awareness;
- (4) avoidance of noise sensitive areas;
- (5) joining the circuit;
- (6) bad weather circuit and landing.

#### **EXERCISE 14c: RADIO NAVIGATION**

- (a) Long briefing objectives:
  - (1) use of VOR;
  - (2) use of ADF equipment;
  - (3) use of NDB stations;
  - (4) use of VHF/DF;
  - (5) use of en-route or terminal radar;
  - (6) use of DME equipment.
- (b) Air exercise
  - (1) use of nav aids;
  - (2) procedure to deal with uncertainty of position.

#### **EXERCISE 15: BASIC INSTRUMENT FLIGHT**

- (a) Long briefing objectives:
  - (1) physiological sensations;
  - (2) instrument appreciation;
  - (3) attitude instrument flight;
  - (4) instrument scan;
  - (5) instrument limitations;

- (6) basic manoeuvres by sole reference to the instruments:
  - (i) straight and level;
  - (ii) climbing and descending;
  - (iii) turns, climbing and descending, onto selected headings;
  - (iv) recoveries from climbing and descending turns.
- (b) Air exercise:
  - (1) attitude instrument flight and instrument scan;
  - (2) the basic manoeuvres:
    - (i) straight and level;
    - (ii) climbing and descending;
    - (iii) turns, climbing and descending, onto selected headings;
    - (iv) recoveries from climbing and descending turns.

**EXERCISE 16: NIGHT FLYING (if night instructional qualification required)**

- (a) Long briefing objectives:
  - (1) medical and physiological aspects of night vision;
  - (2) requirement for torch to be carried (pre-flight inspection, etc.);
  - (3) use of the landing light;
  - (4) ground manoeuvring procedures at night;
  - (5) night take-off procedure;
  - (6) cockpit procedures at night;
  - (7) approach techniques;
  - (8) night landing techniques
  - (9) emergency procedures at night;

- (10) navigation principles at night.
- (b) Air exercise:
  - (1) use of landing light;
  - (2) night ground manoeuvring;
  - (3) night take-off, circuit or approach and landing (including use of landing light).

### **AMC2 FCL.930.FI FI – Training course**

#### **FI(S) AND FI(B) TRAINING COURSE**

##### **GENERAL**

- (a) The aim of the FI(S) and FI(B) training course at a DTO or an ATO is to train SPL and BPL holders to the level of competence defined in FCL.920 as instructor competencies.
- (b) The training course should develop safety awareness throughout by teaching the knowledge, skills and attitudes relevant to the FI task including at least the following:
  - (1) refresh the technical knowledge of the student instructor;
  - (2) train the student instructor to teach the ground subjects and air exercises;
  - (3) ensure that the student instructor's flying is of a sufficiently high standard; and
  - (4) teach the student instructor the principles of basic instruction and to apply them at all training levels.
- (c) With the exception of the section on teaching and learning, all the subject detail contained in the ground and flight training syllabus is complementary to the SPL and BPL course syllabus.
- (d) The FI training course should give particular stress to the role of the individual in relation to the importance of human factors in the man-machine and theoretical knowledge environment interaction. Special attention should be paid to the applicant's maturity and judgement including an understanding of adults, their behavioural attitudes and variable levels of education.

- (e) During the training course, the applicants should be made aware of their own attitudes to the importance of flight safety. Improving safety awareness should be a fundamental objective throughout the training course. It will be of major importance for the training course to aim at giving applicants the knowledge, skills and attitudes relevant to a flight instructor's task.
- (f) On successful completion of the training course and final test the applicant may be issued with an FI certificate.

## **CONTENT**

- (g) The training course consists of two parts:
  - (1) Part 1, theoretical knowledge including the teaching and learning instruction that should comply with AMC1 FCL.920;
  - (2) Part 2, flight instruction.

### **Part 1**

The content of the teaching and learning part of the FI course, as established in AMC1 FCL.930.FI, should be used as guidance to develop the course syllabus.

The course should include at least 55 hours of theoretical knowledge including at least 25 hours teaching and learning instructions for the FI (S) and FI(B) certificate.

### **Part 2**

## **FLIGHT INSTRUCTION SYLLABUS**

An approved FI training course should comprise at least the minimum hours of flight instruction as defined in FCL.930.FI.

## **AIR EXERCISES**

- (a) The air exercises are similar to those used for the training of SPL or BPL but with additional items designed to cover the needs of a flight instructor.
- (b) The numbering of exercises should be used primarily as an exercise reference list and as a broad instructional sequencing guide: therefore the demonstrations and practices need not necessarily be given in the order listed. The actual order and content will depend upon the following interrelated factors:
  - (1) the applicant's progress and ability;



- (2) the weather conditions affecting the flight;
  - (3) the flight time available;
  - (4) instructional technique considerations;
  - (5) the local operating environment;
  - (6) Applicability of the exercises to the aircraft type.
- (c) At the discretion of the instructors some of the exercises may be combined whereas some other exercises may be done in several flights.
- (d) It follows that student instructors will eventually be faced with similar inter-related factors. They should be shown and taught how to construct flight lesson plans, taking these factors into account, so as to make the best use of each flight lesson, combining parts of the set exercises as necessary.

## **GENERAL**

- (e) The briefing normally includes a statement of the aim and a brief allusion to principles of flight only if relevant. An explanation is to be given of exactly what air exercises are to be taught by the instructor and practised by the student during the flight. It should include how the flight will be conducted with regard to who is to fly the aircraft and what airmanship, weather and flight safety aspects currently apply. The nature of the lesson will govern the order in which the constituent parts are to be taught.
- (f) The five basic components of the briefing will be:
- (1) the aim;
  - (2) the air exercise(s) (what, and how and by whom);
  - (3) flight briefing;
  - (4) check of understanding;
  - (5) airmanship.

## **PLANNING OF FLIGHT LESSONS**

- (g) The preparation of lesson plans is an essential prerequisite of good instruction and the student instructor is to be given supervised practice in the planning and practical application of flight lesson plans.

## **GENERAL CONSIDERATIONS**

- (h) The student instructor should complete flight training in order to practise the principles of basic instruction at the SPL or BPL level. During this training the student instructor occupies the seat normally occupied by the FI.
- (i) The instructor providing this instructor training is normally taking over the role of the student pilot. In the case of the course for the FI(B) an additional person holding a BPL or LAPL(B) licence or a student pilot for these licences may be on board in order to function as a student pilot under the supervision of the instructor.
- (j) It is to be noted that airmanship is a vital ingredient of all flight operations. Therefore, in the following air exercises the relevant aspects of airmanship are to be stressed at the appropriate times during each flight.
- (k) The student instructor should learn how to identify common errors and how to correct them properly, which should be emphasised at all times.

## **SYLLABUS OF FLIGHT INSTRUCTION CONTENTS**

### **A. SAILPLANES**

#### **LONG BRIEFINGS AND AIR EXERCISES**

Note: although the fully developed spin in exercise 10 is not required for the LAPL course, it is a requirement for the FI course.

#### **EXERCISE 1: FAMILIARISATION WITH THE SAILPLANE**

- (a) Objective:

To advise the student instructor on how to familiarise the student with the sailplane which will be used for the training and to test his/her position in the sailplane for comfort, visibility, and ability to use all controls and equipment.

- (b) Briefing and exercise:

The student Instructor has to:

- (1) present the type of sailplane which will be used;
- (2) explain the cockpit layout: instruments and equipment;
- (3) explain the flight controls: stick, pedals, airbrakes, flaps, cable release, undercarriage;

- (4) check the position of the student on the seat for comfort, visibility, ability to use all controls;
- (5) explain the use of the harness;
- (6) demonstrate how to adjust the rudder pedal;
- (7) explain the differences when occupying the instructor's position;
- (8) explain all checklists, drills, controls.

## **EXERCISE 2: PROCEDURE IN THE EVENT OF EMERGENCIES**

- (a) Objective:

To advise the student instructor on how to familiarise the student with the use of the parachute and how to explain the bail out procedure in case of emergency.

- (b) Briefing and exercise:

The student instructor has to:

- (1) explain how to handle the parachute with care (transport, storage and drying after use);
- (2) demonstrate the adjustment of the parachute harness;
- (3) explain the bail out procedure (especially from a sailplane in unusual attitude);
- (4) explain the procedure for landing with a parachute in normal conditions and with a strong wind.

## **EXERCISE 3: PREPARATION FOR FLIGHT**

- (a) Objective:

To advise the student instructor on how to explain all the operations to be completed prior to flight. Furthermore, the student instructor should learn how to identify student errors and how to correct them properly.

- (b) Briefing:

The student instructor has to explain:

- (1) the need for a pre-flight briefing;

- (2) the structure and the content of this briefing;
  - (3) which documents are required on board;
  - (4) which equipment are required for a flight;
  - (5) how to handle the sailplane on the ground, how to move it, how to tow it out and how to park it;
  - (6) how to do the pre-flight external and internal checks;
  - (7) the procedure for verifying in-limits mass and balance;
  - (8) the pre-launch checks (checklist).
- (c) Air exercise:
- The student instructor has to demonstrate:
- (1) the need for a pre-flight briefing;
  - (2) that the required documents are on board;
  - (3) that the equipment required for the intended flight is on board;
  - (4) how to handle the sailplane on the ground, move it to the start position, tow it out and park it;
  - (5) how to perform a pre-flight external and internal check;
  - (6) how to verify in-limits mass and balance;
  - (7) how to adjust harness as well as seat or rudder pedals;
  - (8) the pre-launch checks;
  - (9) how to advise the student pilot in performing the pre-flight preparation;
  - (10) how to analyse and correct pre-flight preparation errors as necessary.

#### **EXERCISE 4: INITIAL AIR EXPERIENCE**

- (a) Objective:

To advise the student instructor on how to familiarise the student with being in the air, with the area around the airfield, to note his/her reactions in this situation, and to draw his/her attention to safety and look-out procedures.

(b) Briefing:

The student instructor has to explain:

- (1) the area around the airfield;
- (2) the need for looking out;
- (3) the change of aircraft control.

(c) Air exercise:

The student instructor has to:

- (1) show the noteworthy references on the ground;
- (2) analyse the reactions of the student;
- (3) check that the student looks out (safety).

**EXERCISE 5: PRIMARY EFFECTS OF CONTROLS**

(a) Objective:

To advise the student instructor on how to:

- (1) demonstrate the primary effects of each control with the help of visual references;
- (2) train the student pilot to recognise when the sailplane is no longer in a normal attitude along one of the axes and to return to the normal attitude;
- (3) train continuous and efficient look-out during these exercises;
- (4) analyse and correct errors and student pilot mistakes as necessary.

(b) Briefing:

The student instructor has to explain:

- (1) define the axes of a sailplane;

- (2) the look-out procedures;
  - (3) the visual references along each axis;
  - (4) the primary effects of controls when laterally level;
  - (5) the relationship between attitude and speed;
  - (6) the use of flaps;
  - (7) the use of airbrakes.
- (c) Air exercise:
- The student instructor has to demonstrate:
- (1) the visual references in flight;
  - (2) the primary effect of the elevator;
  - (3) the relationship between attitude and speed (inertia);
  - (4) the primary effect of rudder on the rotation of the sailplane around the vertical axis;
  - (5) the primary effect of ailerons on banking;
  - (6) the effect of airbrakes (including changes in pitch when airbrakes are extended or retracted);
  - (7) the effects of flaps (provided the sailplane has flaps);
  - (8) the look-out procedures during all the exercises;
  - (9) how to advise the student pilot to recognise the primary effects of each control;
  - (10) how to analyse and correct errors as necessary.

#### **EXERCISE 6: CO-ORDINATED ROLLING TO AND FROM MODERATE ANGLES OF BANK**

- (a) Objective:

To advise the student instructor on secondary effects of controls and on how to teach the student to coordinate ailerons and rudder in order to compensate for the

adverse yaw effect. Furthermore the student instructor should learn how to identify student errors and how to correct them properly.

(b) Briefing:

The student instructor has to explain:

- (1) the secondary effects of controls;
- (2) the adverse yaw effect;
- (3) how to compensate for the adverse yaw;
- (4) the further effect of the rudder (roll).

(c) Air exercise:

The student instructor has to demonstrate:

- (1) the adverse yaw effect with a reference on ground;
- (2) the further effect of the rudder (roll);
- (3) the coordination of ruder and aileron controls to compensate for the adverse yaw effects;
- (4) rolling to and from moderate angles of bank (20 to 30 °) and returning to the straight flight;
- (5) how to advise the student pilot to coordinate ailerons and rudder;
- (6) how to analyse and correct errors as necessary.

## **EXERCISE 7: STRAIGHT FLYING**

(a) Objective:

To advise the student instructor on how to train the student to maintain straight flight with a constant heading without slipping and skidding. Furthermore, the student instructor should learn how to identify student errors and how to correct them properly.

(b) Briefing:

The student instructor has to:

- (1) explain how to maintain straight flight;
  - (2) explain different air speed limitations;
  - (3) explain the pitch stability of the sailplane;
  - (4) explain the effect of trimming.
- (c) Air exercise:
- The instructor student has to demonstrate:
- (1) maintaining straight flight;
  - (2) inherent pitch stability;
  - (3) the control of the sailplane in pitch, including use of trim with visual references and speed;
  - (4) how to perform the instrument monitoring;
  - (5) the control of level attitude with visual references;
  - (6) the control of the heading with a visual reference on the ground;
  - (7) the look-out procedures during all the exercises;
  - (8) how to advise the student pilot to maintain straight flight;
  - (9) how to analyse and correct errors as necessary.

### **EXERCISE 8: TURNING**

- (a) Objective:
- To advise the student instructor on how to teach students to fly turns and circles with a moderate constant bank of about 30 ° with constant attitude (speed) and coordinated flight. Furthermore, the student instructor should learn how to identify student errors and how to correct them properly.
- (b) Briefing:
- The student instructor has to explain:
- (1) the forces on the sailplane during a turn;



- (2) the need to look out before turning;
  - (3) the sequences of a turn (entry, stabilizing and exiting);
  - (4) the common faults during a turn;
  - (5) how to turn on to selected headings, use of compass;
  - (6) the use of instruments (ball indicator or slip string) for precision.
- (c) Air exercise:
- The student instructor has to demonstrate:
- (1) the look-out procedure before turning;
  - (2) entering a turn (correction of adverse yaw);
  - (3) the stabilisation of a turn (keeping the attitude and compensating the induced roll);
  - (4) the exit from a turn;
  - (5) the most common faults in a turn;
  - (6) turns on to selected headings (use landmarks as reference);
  - (7) use of instruments (ball indicator or slip string) for precision;
  - (8) how to advise the student pilot to fly a turn or circle with a moderate bank;
  - (9) how to analyse and correct errors as necessary.

### **EXERCISE 9a: SLOW FLIGHT**

- (a) Objective:

To advise the student instructor on how to improve the student's ability to recognise inadvertent flight at critically low speeds (high angle of attack) and to provide practice in maintaining the sailplane in balance while returning to normal attitude (speed). Furthermore the student instructor should learn how to identify student errors and how to correct them properly.

- (b) Briefing:

The student instructor has to explain:

- (1) the characteristics of slow flight;
- (2) the risks of stalling.

(c) Air Exercise:

The student instructor has to check that the airspace below the sailplane is free of other aircraft before starting the exercise.

The student instructor has to demonstrate:

- (1) a controlled flight down to critically high angle of attack (slow air speed), and draw the attention of the student to the nose up attitude, reduction of noise, reduction of speed;
- (2) a return to the normal attitude (speed);
- (3) how to advise the student pilot to recognise inadvertent flight at critically low speeds;
- (4) how to provide practice in maintaining the sailplane in balance while returning to normal attitude;
- (5) how to analyse and correct errors as necessary.

**EXERCISE 9b: STALLING**

(a) Objective:

To advise the student Instructor on how to improve the student's ability to recognize a stall and to recover from it. This includes stall from a level flight and stalls when a wing drops. Furthermore the student instructor should learn how to identify student errors and how to correct them properly.

(b) Briefing:

The student instructor has to explain:

- (1) the mechanism of a stall;
- (2) the effectiveness of the controls at the stall;
- (3) pre-stall symptoms, recognition and recovery;
- (4) factors affecting the stall (importance of the angle of attack and high speed stall);

- (5) effect of flaps if any on the sailplane;
- (6) the effects of unbalance at the stall safety checks;
- (7) stall symptoms, recognition and recovery;
- (8) recovery when a wing drops; approach to stall in the approach and in the landing configurations: recognition and recovery from accelerated stalls.

(c) Air Exercise:

The student instructor has to check that the airspace below the sailplane is free of other aircraft or traffic before starting the exercise.

The student instructor has to demonstrate:

- (1) stall from a level flight;
- (2) pre-stall symptoms, recognition and recovery;
- (3) stall symptoms, recognition and recovery;
- (4) recovery when a wing drops;
- (5) approach to stall in the approach and in the landing configurations;
- (6) recognition and recovery from accelerated stalls;
- (7) stalling and recovery at the incipient stage with 'instructor induced' distractions;
- (8) how to improve the student pilot's ability to recognise a stall and to recover from it;
- (9) how to analyse and correct errors as necessary.

Note: consideration is to be given to manoeuvre limitations and references to the flight manual or equivalent document (for example owner's manual or pilot's operating handbook) in relation to mass and balance limitations. The safety checks should take into account the minimum safe altitude for initiating such exercises in order to ensure an adequate margin of safety for the recovery. If specific procedures for stalling or spinning exercises and for the recovery techniques are provided by the flight manual or equivalent document (for example owner's manual or pilot's operating handbook), they have to be taken into consideration. These factors are also covered in the next exercise.

### **EXERCISE 10a: SPIN RECOGNITION AND AVOIDANCE**

(a) Objective:

To advise the student Instructor on how to improve the student's ability to recognize a spin at the incipient stage and to recover from it. Furthermore, the student instructor should learn how to identify student errors and how to correct them properly.

(b) Briefing:

The student instructor has to explain:

- (1) why a sailplane spins;
- (2) how to recognise the symptoms of a spin (not to be confused with spiral dive);
- (3) what are the parameters influencing the spin;
- (4) how to recover from a spin.

(c) Air exercise:

The student instructor has to check that the airspace below the sailplane is free of other aircraft or traffic before starting the exercise.

The student instructor has to:

- (1) demonstrate stalling and recovery at the incipient spin stage (stall with excessive wing drop, about 45 °);
- (2) make sure that the student recognises the spin entry;
- (3) make sure that the student pilot is able to recover from the spin;
- (4) check if the student still reacts properly if the instructor induces distractions during the spin entry;
- (5) demonstrate how to analyse and correct errors as necessary.

Note: consideration of manoeuvre limitations and the need to refer to the sailplane manual and mass and balance calculations.

**EXERCISE 10b: DEVELOPED SPINS: ENTRY AND RECOVERY**

(a) Objective:

To advise the student instructor on how to recognize a developed spin and to recover from it. Furthermore, the student instructor should learn how to identify student errors and how to correct them properly.

(b) Briefing:

The student instructor has to explain:

- (1) the spin entry;
- (2) the symptoms of a real spin and the recognition and identification of spin direction;
- (3) the spin recovery;
- (4) use of controls;
- (5) effects of flaps (flap restriction applicable to type);
- (6) the effect of the CG upon spinning characteristics;
- (7) the spinning from various flight attitudes;
- (8) the sailplane limitations;
- (9) safety checks;
- (10) common errors during recovery.

(c) Air exercise:

The student instructor has to check that the airspace below the sailplane is free of other aircraft or traffic before starting the exercise.

The student instructor has to demonstrate:

- (1) safety checks;
- (2) the spin entry;
- (3) the recognition and identification of the spin direction;

- (4) the spin recovery (reference to flight manual);
- (5) the use of controls;
- (6) the effects of flaps (restrictions applicable to sailplane type);
- (7) spinning and recovery from various flight attitudes;
- (8) how to improve the student pilot's ability to recognise a spin and how to recover from it;
- (9) how to analyse and correct errors as necessary.

### **EXERCISE 11: TAKE OFF OR LAUNCH METHODS**

Note: the student instructor has to teach at least one of the following launch methods: winch launch, aero tow, self-launch. At least three launch failure exercises should be completed. Furthermore, the student instructor should learn how to identify student errors and how to correct them properly.

#### **EXERCISE 11a: WINCH LAUNCH**

- (a) Objective:

To advise the student instructor on how to teach winch launches and on how to make sure that their student will manage an aborted launch. Furthermore, the student instructor should learn how to identify student errors and how to correct them properly.

- (b) Briefing:

The student instructor has to explain:

- (1) the signals or communication before and during launch;
- (2) the use of the launching equipment;
- (3) the pre-take-off checks;
- (4) the procedure for into wind take-off;
- (5) the procedure for crosswind take-off;
- (6) the optimum profile of winch launch and limitations;
- (7) the launch failure procedures.

(c) Air exercise:

The student instructor has to demonstrate:

- (1) the use of the launching equipment;
- (2) the pre-take-off checks;
- (3) the into wind take-off;
- (4) the crosswind take-off;
- (5) the optimum profile of winch launch and limitations;
- (6) the procedure in case of cable break or aborted launch, launch failure procedures;
- (7) how to teach the student pilot to perform safe winch launches;
- (8) how to teach the student pilot to manage an aborted launch (different altitudes);
- (9) how to analyse and correct errors as necessary.

**EXERCISE 11b: AERO TOW**

(a) Objective:

To advise the student instructor on how to teach aero towing and on how to make sure that their student will manage an aborted launch. Furthermore, the student instructor should learn how to identify student errors and how to correct them properly.

(b) Briefing:

The student instructor has to explain:

- (1) the signals or communication before and during launch;
- (2) the use of the launch equipment;
- (3) the pre-take-off checks;
- (4) the procedure for into wind take-off;
- (5) the procedure for crosswind take-off;

- (6) the procedure on tow: straight flight, turning and slip stream;
- (7) the recovery from out-of-position on tow;
- (8) the procedures in case of launch failure and abandonment;
- (9) the descending procedure on tow (towing aircraft and sailplane);
- (10) the reasons for launch failures and abandonment or procedures.

(c) Air exercise:

The student instructor has to demonstrate:

- (1) the signals before and during launch;
- (2) the use of the launch equipment;
- (3) the pre-take-off checks;
- (4) the procedure for into wind take-off;
- (5) the procedure for a crosswind take-off;
- (6) the procedures on tow: straight flight, turning and slip stream;
- (7) the recovery from out-of-position on tow;
- (8) the procedure in case of launch failure and abandonment;
- (9) the descending procedure on tow;
- (10) how to teach the student pilot to perform safe aero tow launches;
- (11) how to teach the student pilot to manage an aborted launch;
- (12) how to analyse and correct errors as necessary.

**EXERCISE 11c: SELF LAUNCH**

(a) Objective:

To advise the student instructor on how to teach launching with a self launching sailplane and on how to make sure that his/her student will manage an aborted launch. Furthermore, the student instructor should learn how to identify student errors and how to correct them properly.



(b) Briefing:

The student instructor has to explain:

- (1) the engine extending and retraction procedures;
- (2) the engine starting and safety precautions;
- (3) the pre-take-off checks;
- (4) the noise abatement procedures;
- (5) the checks during and after take-off;
- (6) the into wind take-off;
- (7) the crosswind take-off;
- (8) the procedure in case of power failure;
- (9) the procedure in case of abandoned take-off;
- (10) the maximum performance (short field and obstacle clearance) take-off;
- (11) the short take-off and soft field procedure or techniques and performance calculations.

(c) Air exercise:

The student instructor has to demonstrate:

- (1) the engine extending and retraction procedures;
- (2) the engine starting and safety precautions;
- (3) the pre-take-off checks;
- (4) the noise abatement procedures;
- (5) the checks during and after take off;
- (6) the into wind take-off;
- (7) the crosswind take-off;
- (8) the power failures and procedures;

- (9) the procedure in case of abandoned take-off;
- (10) the maximum performance (short field and obstacle clearance) take-off;
- (11) the short take-off and soft field procedure or techniques and performance calculations;
- (12) how to teach the student pilot to perform safe self launches;
- (13) how to teach the student pilot to manage an aborted launch (different altitudes);
- (14) how to analyse and correct errors as necessary.

## **EXERCISE 12: CIRCUIT APPROACH AND LANDING**

(a) Objective:

To advise the student instructor on how to teach their students to fly a safe circuit approach and to land the sailplane. Furthermore, the student instructor should learn how to identify student errors and how to correct them properly.

(b) Briefing:

The student instructor has to explain:

- (1) the procedures for rejoining the circuit;
- (2) the procedures for collision avoidance and the lookout techniques;
- (3) the pre-landing check;
- (4) the normal circuit procedures, downwind, base leg;
- (5) the effect of wind on approach and touchdown speeds ;
- (6) the visualisation of a reference point;
- (7) the approach control and use of airbrakes;
- (8) the use of flaps (if applicable);
- (9) the procedures for normal and crosswind approach and landing.

(c) Air exercise:

The student instructor has to demonstrate:

- (1) the procedures for rejoining the circuit;
- (2) the procedures for collision avoidance and the look-out techniques;
- (3) the pre-landing check;
- (4) the standard circuit and contingency planning (for example running out of height);
- (5) the effect of wind on approach and touchdown speeds;
- (6) the visualisation of an aiming point;
- (7) the approach control and use of airbrakes;
- (8) the use of flaps (if applicable);
- (9) the procedures for normal and crosswind approaches and landings;
- (10) how to teach the student pilot to fly a safe circuit approach;
- (11) how to improve the student pilot's ability to perform a safe landing;
- (12) how to analyse and correct errors as necessary.

### **EXERCISE 13: FIRST SOLO**

- (a) Objective:

To advise the student instructor on how to prepare their students for the first solo flight.

- (b) Briefing:

The student instructor has to explain:

- (1) the limitations of the flight (awareness of local area and restrictions);
- (2) the use of required equipment.

- (c) Air exercise:

The student instructor has to;

- (1) check with another or more senior instructor if the student can fly solo;
- (2) monitor the flight;
- (3) debrief the flight with the student.

#### **EXERCISE 14 : ADVANCED TURNING**

(a) Objective:

To advise the student instructor on how to fly steep turns or circles (45 ° banking) at constant attitude (speed) and with the yaw string centred. Furthermore, the student instructor should learn how to identify student errors and how to correct them properly.

(b) Briefing:

The student instructor has to explain;

- (1) the relationship between banking and speed;
- (2) how to master steep turns or circles;
- (3) the unusual attitudes which can occur (stalling or spinning and spiral dive);
- (4) how to recover from these unusual attitudes.

(c) Air exercise:

The student has to demonstrate:

- (1) steep turns (45 °) at constant speed and with the yaw string centred;
- (2) common errors (slipping and skidding);
- (3) unusual attitudes and how to recover from them;
- (4) how to teach the student pilot to fly steep turns or circles;
- (5) how to analyse and correct errors as necessary.

#### **EXERCISE 15: SOARING TECHNIQUES**

Note: if the weather conditions during the instructor training do not allow the practical training of soaring techniques, all items of the air exercises have to be discussed and explained during a long briefing exercise only.

### **EXERCISE 15a: THERMALLING**

(a) Objective:

To advise the student instructor on how to teach their students to recognise and detect thermals, on how to join a thermal and on how to look out, in order to avoid mid-air collisions. Furthermore, the student instructor should learn how to identify student errors and how to correct them properly.

(b) Briefing:

The student instructor has to explain;

- (1) the look-out procedures;
- (2) the detection and recognition of thermals;
- (3) the use of audio soaring instruments;
- (4) the procedure for joining a thermal and giving way;
- (5) how to fly in close proximity to other sailplanes;
- (6) how to centre in thermals;
- (7) how to leave thermals.

(c) Air exercise:

The student instructor has to demonstrate;

- (1) the look-out procedures;
- (2) the detection and recognition of thermals;
- (3) the use of audio soaring instruments;
- (4) the procedure for joining a thermal and giving way;
- (5) the procedure for flying in close proximity to other sailplanes;
- (6) the centering in thermals;
- (7) the procedure for leaving thermals;
- (8) how to improve the student pilot's ability to recognise and detect thermals;

- (9) how to improve the student pilot's ability to join a thermal and how to look out;
- (10) how to analyse and correct errors as necessary.

### **EXERCISE 15b: RIDGE FLYING**

- (a) Objective:

To advise the student instructor on how to teach his/her students to fly safely on ridges, to control their speed, and to apply the rules in order to avoid midair collisions. Furthermore, the student instructor should learn how to identify student errors and how to correct them properly.

- (b) Briefing:

The student instructor has to explain:

- (1) the look-out procedures;
- (2) the ridge flying rules;
- (3) the recognition of optimum flight path;
- (4) speed control.

- (c) Air exercise: (if applicable during training and, if possible, at training site)

The student instructor has to demonstrate:

- (1) the look-out procedures;
- (2) the practical application of ridge flying rules;
- (3) the recognition of optimum flight path;
- (4) speed control;
- (5) how to teach the student pilot to fly safely on ridges;
- (6) how to analyse and correct errors as necessary.

### **EXERCISE 15c: WAVE FLYING**

- (a) Objective:

To advise the student instructor on how to introduce students to wave flying and to teach them to fly safely at high altitude. Furthermore, the student instructor should learn how to identify student errors and how to correct them properly.

(b) Briefing:

The student instructor has to explain:

- (1) the look-out procedures;
- (2) the techniques to be used to accede to a wave;
- (3) the speed limitations with increasing height;
- (4) the risks of hypoxia and the use of oxygen.

(c) Air exercise: (if applicable during training and if possible at training site) The student instructor has to demonstrate:

- (1) the look-out procedures;
- (2) the wave access techniques;
- (3) the speed limitations with increasing height;
- (4) the use of oxygen (if available);
- (5) how to improve the student pilot's ability to recognise and detect waves;
- (6) how to teach the student pilot to fly safely in a wave;
- (7) how to analyse and correct errors as necessary.

## **EXERCISE 16: OUT-LANDINGS**

Note: if the weather conditions during the instructor training do not allow the practical training of out-landing procedures (a touring motor glider may be used) all items of the air exercise have to be discussed and explained during a long briefing exercise only. Instructors may only teach the safe out-landing exercise after they have demonstrated the practical ability to do so.

(a) Objective:

To advise the student instructor on how to teach students to select an outlanding field, to fly the circuit and how to master the unusual landing situation. Furthermore,

the student instructor should learn how to identify student errors and how to correct them properly.

(b) Briefing:

The student instructor has to explain:

- (1) the gliding range at max L/D;
- (2) the engine re-start procedures (only for self-launching and selfsustaining sailplanes);
- (3) the selection of a landing area;
- (4) the circuit judgement and key positions;
- (5) the circuit and approach procedures;
- (6) the actions to be done after landing.

(c) Air exercise:

The student instructor has to demonstrate:

- (1) precision landings on the airfield;
- (2) the gliding range;
- (3) the procedures for joining, arrival and circuit at a remote aerodrome;
- (4) the selection of an out-landing area;
- (5) the procedures for circuit and approach on an out-landing field;
- (6) the actions to be done after landing;

The student instructor also has to be trained:

- (7) how to advise the student pilot to do perform a safe out-landing;
- (8) how to master an unusual landing situation;
- (9) how to analyse and correct errors as necessary.



## **EXERCISE 17: CROSS COUNTRY FLYING**

Note: if the weather conditions during the instructor training do not allow a cross country training flight the items of the air exercise have to be discussed and explained during a long briefing exercise only.

### **EXERCISE 17a: FLIGHT PLANNING**

(a) Objective:

To advise the student instructor on how plan and prepare a cross-country flight.

(b) Briefing:

The student instructor has to explain:

- (1) the weather forecast and current situation;
- (2) the selection of the amount of water to be carried as a function of the weather forecast;
- (3) the method for selecting a task, taking into account the average speed to be expected;
- (4) the map selection and preparation;
- (5) the NOTAMs and airspace considerations;
- (6) the radio frequencies (if applicable);
- (7) the pre-flight administrative procedures;
- (8) the procedure for filing a flight plan where required;
- (9) alternate aerodromes and landing areas.

### **EXERCISE 17b: IN-FLIGHT NAVIGATION**

(a) Objective:

To advise the student instructor on how to teach performing a cross-country flight.

(b) Briefing:

The student instructor has to explain:

- (1) how to maintain track and re-route if necessary;
  - (2) the altimeter settings;
  - (3) the use of radio and phraseology;
  - (4) the in-flight planning;
  - (5) the procedures for transiting regulated airspace or ATC liaison where required;
  - (6) the procedure in case of uncertainty of position;
  - (7) the procedure in case of becoming lost;
- (c) Air exercise:
- The student instructor has to demonstrate:
- (1) maintaining track and re-routing if necessary;
  - (2) altimeter settings;
  - (3) the use of radio and phraseology;
  - (4) in-flight planning;
  - (5) procedures for transiting regulated airspace or ATC liaison where required;
  - (6) uncertainty of position procedure;
  - (7) lost procedure;
  - (8) use of additional equipment where required;
  - (9) joining, arrival and circuit procedures at remote aerodrome;
  - (10) how to teach the student pilot to perform a cross-country flight;
  - (11) how to analyse and correct errors as necessary.

#### **EXERCISE 17c: CROSS-COUNTRY SOARING TECHNIQUES**

- (a) Objective:

To advise the student instructor on the techniques for an efficient cross country flight.

(b) Briefing:

The student instructor has to explain:

- (1) the speed to fly at maximal L/D ratio;
- (2) the speed to fly to maximise the cruise speed (Mc Cready theory);
- (3) how to select the optimal track (efficient use of cloud streets etc.);
- (4) how to calculate the final glide;
- (5) how to perform a safe out-landing.

(c) Air exercise:

The student instructor has to demonstrate:

- (1) a cross-country flight;
- (2) the selection of the optimal track (efficient use of cloud streets, etc) ;
- (3) the use of the Mc Cready ring;
- (4) use of final glide computers;
- (5) how to reduce risk and to react to potential dangers;
- (6) how to plan and perform an out-landing;
- (7) how to teach the student pilot techniques for an efficient crosscountry flight;
- (8) how to analyse and correct errors as necessary.

## **B. BALLOONS**

### **LONG BRIEFINGS AND AIR EXERCISES**

#### **EXERCISE 1: FAMILIARISATION WITH THE BALLOON**

(a) Objective:

To advise the student Instructor on how to familiarise the student with the balloon which will be used for the training and to test his position in the basket for comfort, visibility, and ability to use all controls and equipment. Furthermore, the student instructor should learn how to identify student errors and how to correct them properly.

(b) Briefing and exercise:

The student instructor has to:

- (1) present the type of balloon which will be used;
- (2) explain the characteristics of the balloon;
- (3) explain the components, instruments and equipment;
- (4) explain the re-fuelling procedures (in the case of hot air balloons);
- (5) to familiarise the student with the balloon controls;
- (6) explain the differences when occupying the instructor's position;
- (7) explain all checklists, drills and controls.

**EXERCISE 2: PREPARATION FOR FLIGHT**

(a) Objective:

To advise the student instructor on how to explain all the operations and necessary preparation to be completed before the flight. Furthermore, the student instructor should learn how to identify student errors and how to correct them properly.

(b) Briefing

The student instructor has to explain:

- (1) the need for a pre-flight briefing;
- (2) the structure and the content of this briefing;
- (3) which documents are required on board;
- (4) which equipment are required for a flight;
- (5) the use of weather forecasts or actuals;

- (6) the flight planning with particular regard to NOTAMs, airspace structure, sensitive areas, expected track and distance, pre-flight picture and possible landing fields;
  - (7) the use of load calculation chart;
  - (8) the selection of launch field with particular regard to permission, behaviour and adjacent fields.
- (c) Air exercise:
- The student instructor has to prepare and give a pre-flight briefing.
- The student instructor has to demonstrate:
- (1) that the required documents are on board;
  - (2) that the equipment required for the intended flight is on board;
  - (3) how to advise the student to do the pre-planning procedures for each flight;
  - (4) how to perform a pre-launch check;
  - (5) how to select a launch field with particular regard to permission, behaviour and adjacent fields;
  - (6) how to teach the student pilot to perform the preparation to be completed prior to flight;
  - (7) how to analyse and correct errors of the student pilot as necessary.

### **EXERCISE 3: CREW AND PASSENGER BRIEFING**

- (a) Objective:
- To advise the student instructor on how to explain all the importance of correct clothing for pilot, passengers and crew and how to perform the briefing of ground- and retrieve crew and the briefing of passengers. Furthermore, the student instructor should learn how to identify student errors and how to correct them properly.
- (b) Briefing:
- The student instructor has to explain:
- (1) the correct clothing for passengers and crew;

(2) the briefings for ground- and retrieve crew and passengers.

(c) Air exercise:

The student instructor has to demonstrate:

- (1) how to advise the passengers and crew about the correct clothing;
- (2) the briefing of ground- and retrieve crew;
- (3) the briefing of passengers;
- (4) how to familiarise the student pilot with the different type of briefings;
- (5) how to analyse and correct errors of the student pilot.

#### **EXERCISE 4: ASSEMBLY AND LAYOUT**

(a) Objective:

To advise the student instructor on how to familiarise the student pilot with the control of the crowd and how to perform the securing of launch site. Furthermore the student instructor has to demonstrate how to familiarise the student pilot with the correct rigging of envelope and basket, the burner test procedure (hot air balloons) and the pre-inflation checks. Furthermore, the student instructor should learn how to identify student errors and how to correct them properly.

(b) Briefing:

The student instructor has to explain:

- (1) the control of the crowd;
- (2) the securing of the launch site;
- (3) the correct rigging procedure;
- (4) the use of the restraint line;
- (5) the pre-inflation checks.

(c) Air exercise:

The student instructor has to demonstrate:

- (1) how to control the crowd and securing of launch site;

- (2) the correct rigging of envelope and basket;
- (3) the correct use of the restraint line;
- (4) the burner test procedure (hot air balloons);
- (5) the pre-inflation checks;
- (6) how to teach the student pilot to perform the correct rigging;
- (7) how to analyse and correct assembly errors of the student pilot as necessary.

### **EXERCISE 5: INFLATION**

(a) Objective:

To advise the student instructor on how to familiarise the student pilot with the different phases of the inflation procedure, the use of restraint line and inflation fan (hot air balloons) and the avoidance of electrostatic discharge (gas balloons). Furthermore, the student instructor should learn how to identify student errors and how to correct them properly.

(b) Briefing:

The student instructor has to explain:

- (1) the different phases of the inflation procedure;
- (2) the crowd control and securing procedures during inflation;
- (3) the use of the inflation fan (hot air balloons);
- (4) how to avoid electronic discharge (gas balloons).

(c) Air exercise:

The student instructor has to demonstrate:

- (1) how to control of crowd and securing of launch site during inflation procedure; the cold inflation procedure and use of restraint line and inflation fan (hot air balloons);
- (2) the hot inflation procedure (hot air balloons);
- (3) the avoidance of electrostatic discharge (gas balloons);

- (4) the inflation procedure (gas balloons);
- (5) how to teach the student pilot to perform the inflation procedures;
- (6) how to analyse and correct errors of the student pilot during the inflation procedure as necessary.

### **EXERCISE 6: TAKE OFF IN DIFFERENT WIND CONDITIONS**

(a) Objective:

To advise the student instructor how to explain the pre take-off checks and briefings, the preparation for controlled climb and the use of restraint equipment. Furthermore the student instructor should be able to demonstrate the assessment of wind and obstacles, the preparation for false lift and the take off techniques in different wind conditions. In addition to this the student instructor should learn how to identify student errors and how to correct them properly.

(b) Briefing:

The student instructor has to explain:

- (1) the pre take-off checks and briefings;
- (2) the preparation for controlled climb;
- (3) the 'hands off and hands on' procedure for ground crew;
- (4) the assessment of lift;
- (5) the use of the restraint equipment ;
- (6) the assessment of wind and obstacles;
- (7) the preparation for false lift;
- (8) the take off techniques from sheltered and non sheltered launch fields.

(c) Air exercise:

The student instructor has to demonstrate:

- (1) how to perform the pre take-off checks and briefings;
- (2) how to prepare for controlled climb;



- (3) how to perform the 'hands off and hands on' procedure for ground crew;
- (4) how to perform the assessment of lift without endangering the ground crew;
- (5) how to use the restraint equipment;
- (6) how to perform the assessment of wind and obstacles;
- (7) how to prepare for false lift;
- (8) how to teach the student pilot the correct take off techniques from sheltered and non sheltered launch fields;
- (9) how to analyse and correct errors of the student pilot as necessary.

### **EXERCISE 7: CLIMB TO LEVEL FLIGHT**

(a) Objective:

To advise the student instructor on how to explain and demonstrate the climb to flight level. Furthermore the student instructor should learn how to identify student errors and how to correct them properly.

(b) Briefing:

The student instructor has to explain:

- (1) the climbing with a predetermined rate of climb;
- (2) the effect on envelope temperature (hot air balloons);
- (3) the maximum rate of climb according to manufacturer's flight manual;
- (4) how to level off at selected altitude.

(c) Air exercise:

The student instructor has to demonstrate:

- (1) how to climb with a predetermined rate of climb;
- (2) how to perform look out techniques;
- (3) the effect on envelope temperature (hot air balloons);
- (4) the maximum rate of climb according to manufacturer's flight manual;

- (5) the levelling off techniques at selected altitude;
- (6) how to advise the student pilot to perform the climb to level flight;
- (7) how to analyse and correct faults or errors of the student pilot during the climb.

### **EXERCISE 8: LEVEL FLIGHT**

(a) Objective:

To advise the student instructor on how to explain and demonstrate level flight. Furthermore the student instructor should learn how to identify student errors and how to correct them properly.

(b) Briefing:

The student instructor has to explain:

- (1) how to maintain level flight by use of instruments;
- (2) how to maintain level flight by use of visual references;
- (3) how to maintain level flight by use of all available means;
- (4) the use of parachute;
- (5) the use of turning vents if installed (hot air balloons).

(c) Air exercise:

The student instructor has to demonstrate:

- (1) how to maintain level flight by use of instruments;
- (2) how to maintain level flight by use of visual references;
- (3) how to maintain level flight by use of all available means;
- (4) the use of parachute;
- (5) the use of turning vents if installed (hot air balloons);
- (6) how to advise the student pilot to perform the level flight;

- (7) how to analyse and correct faults or errors of the student pilot during the level flight.

### **EXERCISE 9: DESCENT TO LEVEL FLIGHT**

- (a) Objective:

To advise the student instructor on how to explain and demonstrate the descent to a certain flight level. Furthermore the student instructor should learn how to identify student errors and how to correct them properly.

- (b) Briefing:

The student instructor has to explain:

- (1) how to descent with a predetermined rate of descent;
- (2) a fast descent;
- (3) the maximum rate of descent according to manufacturer's flight manual;
- (4) the use of parachute;
- (5) a parachute stall and cold descent (hot air balloons);
- (6) the levelling off technique at selected altitude.

- (c) Air exercise:

The student instructor has to demonstrate:

- (1) a descent with a predetermined rate of descent;
- (2) how to perform look out techniques;
- (3) a fast descent;
- (4) the maximum rate of descent according to manufacturer's flight manual;
- (5) the use of parachute;
- (6) how to level off at selected altitudes;
- (7) how to advise the student pilot to perform a descent to a certain flight level;

- (8) how to analyse and correct faults or errors of the student pilot during the descent.

## **EXERCISE 10: EMERGENCIES**

- (a) Objective:

To advise the student instructor on how to explain and demonstrate the different emergency situations and how to react. Furthermore the student instructor should learn how to identify student errors during the simulated emergency exercises and how to correct them properly.

- (b) Briefing:

The student instructor has to explain:

- (1) the pilot light failure (hot air balloons);
- (2) burner failures, valve leaks, flame out and re-light (hot air balloons);
- (3) gas leaks;
- (4) closed appendix during take-off and climb (gas balloons);
- (5) the envelope over temperature (hot air balloons);
- (6) envelope damage in flight;
- (7) the parachute or rapid deflation system failure;
- (8) fire on ground and in the air;
- (9) how to avoid an obstacle contact including contact with electrical power lines;
- (10) escape drills, location and use of emergency equipment.

- (c) Air exercise:

The student instructor has to demonstrate:

- (1) a pilot light failure (hot air balloons);
- (2) a burner failure, valve leaks, flame out and re-light (hot air balloons);
- (3) gas leaks;

- (4) a closed appendix during take-off and climb (gas balloons);
- (5) envelope over temperature (hot air balloons);
- (6) envelope damage in flight;
- (7) parachute or rapid deflation system failure;
- (8) a fire on ground and in the air;
- (9) the escape drills, location and use of emergency equipment;
- (10) how to advise the student pilot in performing the different emergency drills;
- (11) how to analyse and correct faults or errors of the student pilot.

### **EXERCISE 11: NAVIGATION**

(a) Objective:

To advise the student instructor on how to explain and demonstrate the advanced navigational flight preparation. Furthermore the student instructor should learn how to identify student errors and how to correct them properly.

(b) Briefing:

The student instructor has to explain:

- (1) the maps selection;
- (2) the plotting of the expected track;
- (3) the marking of positions and time;
- (4) the calculation of distance and speed;
- (5) the calculation of fuel consumption (hot air balloons);
- (6) the calculation of ballast consumption (gas balloons);
- (7) the ceiling limitations (ATC or weather);
- (8) how to plan ahead;
- (9) the monitoring of weather development;

- (10) the monitoring of fuel or ballast consumption;
  - (11) ATC liaison (if applicable);
  - (12) the communication with retrieve crew;
  - (13) the use of GNSS.
- (c) Air exercise:
- The student instructor has to demonstrate:
- (1) the use of selected maps;
  - (2) the plotting of the expected track;
  - (3) the marking of positions and time;
  - (4) how to monitor of distance and speed;
  - (5) how to monitor the fuel or ballast consumption;
  - (6) the observance of ceiling limitations (ATC or weather);
  - (7) the planning ahead;
  - (8) the monitoring of weather development;
  - (9) the monitoring of envelope temperature (hot air balloons);
  - (10) ATC liaison (if applicable);
  - (11) communication with retrieve crew;
  - (12) use of GNSS;
  - (13) how to advise the student pilot in performing the navigational preparation;
  - (14) how to advise the student pilot in performing the different navigational in-flight tasks;
  - (15) how to analyse and correct faults or errors of the student pilot.

### **EXERCISE 12a: FUEL MANAGEMENT HOT AIR BALLOONS**

- (a) Objective:

To advise the student instructor on how to explain and demonstrate the fuel management techniques. Furthermore, the student instructor should learn how to identify student errors and how to correct them properly.

(b) Briefing:

The student instructor has to explain:

- (1) the cylinder arrangement and the burner systems;
- (2) the function of the pilot light supply (vapour or liquid);
- (3) the use of master cylinders (if applicable);
- (4) the fuel requirement and expected fuel consumption;
- (5) the fuel state and pressure;
- (6) the minimum fuel reserves;
- (7) cylinder contents gauge and change procedure;
- (8) the use of cylinder manifolds.

(c) Air exercise:

The student instructor has to demonstrate:

- (1) the cylinder arrangement and burner systems;
- (2) the pilot light supply (vapour or liquid);
- (3) the use of master cylinders (if applicable);
- (4) how to monitor of fuel requirement and expected fuel consumption;
- (5) the monitoring of fuel state and pressure;
- (6) the monitoring of fuel reserves;
- (7) the use of cylinder contents gauge and change procedure;
- (8) the use of cylinder manifolds;
- (9) how to advise the student pilot to perform the fuel management;

- (10) how to analyse and correct faults or errors of the student pilot.

### **EXERCISE 12b: BALLAST MANAGEMENT GAS BALLOONS**

- (a) Objective:

To advise the student instructor on how to explain and demonstrate the ballast management. Furthermore, the student instructor should learn how to identify student errors and how to correct them properly.

- (b) Briefing:

The student instructor has to explain:

- (1) the minimum ballast;
- (2) the arrangement and securing of ballast;
- (3) the ballast requirement and expected ballast consumption;
- (4) the ballast reserves.

- (c) Air exercise:

The student instructor also has to demonstrate:

- (1) the arrangement of minimum ballast;
- (2) the arrangement and securing of ballast;
- (3) the ballast requirement calculation and expected ballast consumption;
- (4) how to secure ballast reserves;
- (5) how to advise the student pilot to perform the ballast management;
- (6) how to analyse and correct faults or errors of the student pilot.

### **EXERCISE 13: APPROACH FROM LOW LEVEL**

- (a) Objective:

To advise the student instructor on how to explain and demonstrate the approach from level. Furthermore, the student instructor should learn how to identify student errors and how to correct them properly.



(b) Briefing:

The student instructor has to explain:

- (1) the pre landing checks;
- (2) passenger pre-landing briefing;
- (3) the selection of field;
- (4) the use of burner and parachute (hot air balloons);
- (5) the use of ballast or parachute and valve (gas balloons);
- (6) the use of trail rope (if applicable) (gas balloons);
- (7) the look-out;
- (8) missed approach and fly on procedures.

(c) Air exercise:

The student instructor has to demonstrate:

- (1) the use of the pre landing checks;
- (2) the selection of fields;
- (3) the use of burner and parachute (hot air balloons);
- (4) the use of ballast or parachute and valve (gas balloons);
- (5) the use of trail rope (if applicable) (gas balloons);
- (6) the look out procedures and how to avoid possible distractions;
- (7) the missed approach and fly on techniques;
- (8) how to advise the student pilot to perform an approach from low level;
- (9) how to analyse and correct faults or errors of the student pilot.

**EXERCISE 14: APPROACH FROM HIGH LEVEL**

(a) Objective:

To advise the student instructor on how to explain and demonstrate the approach from high level. Furthermore, the student instructor should learn how to identify student errors and how to correct them properly.

(b) Briefing:

The student instructor has to explain:

- (1) the pre-landing checks;
- (2) passenger pre-landing briefing;
- (3) the selection of field;
- (4) the rate of descent;
- (5) the use of burner and parachute (hot air balloons);
- (6) the use of ballast and parachute (gas balloons);
- (7) the use of trail rope (if applicable) (gas balloons);
- (8) the look-out;
- (9) the missed approach and fly on procedures.

(c) Air exercise:

The student instructor has to demonstrate:

- (1) the pre-landing checks;
- (2) the selection of field;
- (3) the rate of descent;
- (4) the use of burner and parachute (hot air balloons);
- (5) the use of ballast and parachute (gas balloons);
- (6) the use of trail rope (if applicable) (gas balloons);
- (7) the look out procedures and how to avoid potential distraction;
- (8) the missed approach and fly on techniques;

- (9) how to advise the student pilot to perform an approach from a higher level;
- (10) how to analyse and correct faults or errors of the student pilot.

### **EXERCISE 15: OPERATING AT LOW LEVEL**

(a) Objective:

To advise the student instructor on how to explain and demonstrate the operation at a low height. Furthermore, the student instructor should learn how to identify student errors and how to correct them properly.

(b) Briefing:

The student instructor has to explain:

- (1) the use of burner and parachute (hot air balloons);
- (2) the use of ballast and parachute (gas balloons);
- (3) the look out;
- (4) how to avoid a contact with low level obstacles;
- (5) how to avoid sensitive areas (for example nature protection areas);
- (6) landowner relations.

(c) Air exercise:

The student instructor has to demonstrate:

- (1) the use of burner and parachute (hot air balloons);
- (2) the use of ballast and parachute (gas balloons);
- (3) the look out procedures and how to avoid potential distraction;
- (4) how to avoid low level obstacles;
- (5) good landowner relations;
- (6) how to advise the student pilot to operate the balloon at a low level;
- (7) how to analyse and correct faults or errors of the student pilot.

## **EXERCISE 16: LANDING IN DIFFERENT WIND CONDITIONS**

(a) Objective:

To advise the student instructor on how to explain and demonstrate landings in different wind conditions. Furthermore, the student instructor should learn how to identify student errors and how to correct them properly.

(b) Briefing:

The student instructor has to explain:

- (1) the correct actions for turbulences during the approach or landing;
- (2) the passenger pre-landing briefing;
- (3) the use of burner and pilot lights (hot air balloons);
- (4) the use of ballast, parachute, valve and rip panel (gas balloons);
- (5) the use of parachute and turning vents (if applicable);
- (6) the look out;
- (7) the landing, dragging and deflation;
- (8) landowner relations.

(c) Air exercise:

The student instructor has to demonstrate:

- (1) the pre-landing checks;
- (2) the passenger briefing;
- (3) the selection of field;
- (4) the effect of turbulence;
- (5) the use of burner and pilot lights (hot air balloons);
- (6) the use of ballast, parachute, valve and rip panel (gas balloons);
- (7) the use of parachute and turning vents (if applicable);

- (8) the look out procedures and how to avoid potential distraction;
- (9) the landing, dragging and deflation procedures;
- (11) how to advise the student pilot to perform a safe landing in different wind conditions;
- (12) how to analyse and correct faults or errors of the student pilot.

### **EXERCISE 17: FIRST SOLO**

- (a) Objective:

To advise the student instructor on how to prepare their students for the first solo flight.

- (b) Briefing:

The student instructor has to explain:

- (1) the limitations of the flight;
- (2) the use of required equipment.

- (c) Air exercise:

The student instructor has to:

- (1) check with another or more senior instructor if the student can fly solo;
- (2) monitor the pre-flight preparation;
- (3) brief the student (expected flight time or emergency actions);
- (4) monitor the flight as far as possible;
- (5) debrief the flight with the student.

### **EXERCISE 18: TETHERED FLIGHT HOT AIR BALLOONS (if tethered flight instructional qualification is required)**

- (a) Objective:

To advise the student instructor on how to explain and demonstrate the tethering techniques. Furthermore, the student instructor should learn how to identify student errors and how to correct them properly.

(b) Briefing:

The student instructor has to explain:

- (1) the ground preparations;
- (2) the weather suitability;
- (3) the tethering techniques and equipment;
- (4) the maximum all-up-weight limitation;
- (5) the crowd control;
- (6) the pre take-off checks and briefings;
- (7) the heating for controlled lift off;
- (8) the 'hands off and hands on' procedure for ground crew;
- (9) the assessment of wind and obstacles;
- (10) the controlled climb to a pre-defined altitude (at least 60 ft).

(c) Air exercise:

The student instructor has to demonstrate:

- (1) the ground preparations;
- (2) the tethering techniques;
- (3) the reason for maximum all-up-weight limitation;
- (4) how to perform the crowd control;
- (5) the pre take-off checks and briefings;
- (6) the heating for controlled lift off;
- (7) the 'hands off and hands on' procedure for ground crew;
- (8) the assessment of wind and obstacles;
- (9) the controlled climb;

- (10) the landing techniques;
- (11) how to advise the student pilot to perform a tethered flight;
- (12) how to analyse and correct faults or errors of the student pilot.

**EXERCISE 19: NIGHT FLYING (if night instructional qualification required)**

(a) Objective:

To advise the student instructor on how to explain and demonstrate the night flying techniques. Furthermore, the student instructor should learn how to identify student errors and how to correct them properly.

(b) Briefing:

The student instructor has to explain:

- (1) the medical or physiological aspects of night vision;
- (2) the use of lights for assembly, layout and inflation;
- (3) the requirement for torch to be carried, (pre-flight inspection, etc.);
- (4) the use of the external- and instrument lights;
- (5) the night take-off procedure;
- (6) the checklist procedures at night;
- (7) the emergency procedures at night;
- (8) the navigation principles at night;
- (9) map marking for night use (highlighting built up or lit areas with thicker lines, etc.).

(c) Air exercise:

The student instructor has to demonstrate:

- (1) the use of lights for assembly, layout and inflation;
- (2) the use of torch for pre-flight inspection;
- (3) the use of external- and instrument lights;

- (4) the night take-off procedure;
- (5) how to perform the checklist procedures at night;
- (6) simulated night emergency procedures;
- (7) night cross country techniques, as appropriate;
- (8) how to advise the student pilot to perform a flight at night;
- (9) how to analyse and correct faults or errors of the student pilot.

### **FCL.940.FI FI – Revalidation and renewal**

**(a) Revalidation**

- (1) To revalidate an FI certificate, holders shall fulfil at least two out of the three following requirements before the expiry date of the FI certificate:
  - (i) they have completed
    - (A) in the case of an FI(A) and an FI(H), at least 50 hours of flight instruction in the appropriate aircraft category as FIs, TRIs, CRIs, IRIs, MIs or examiners. If the privileges to instruct for the BIR and the IR are to be revalidated, 10 of those 50 hours shall be flight instruction for a BIR or an IR and shall have been completed within the last 12 months immediately preceding the expiry date of the FI certificate;
    - (B) in the case of an FI(As), at least 20 hours of flight instruction in airships as FIs, IRIs or as examiners. If the privileges to instruct for the IR are to be revalidated, 10 of those hours shall be flight instruction for an IR and shall have been completed in the period of 12 months immediately preceding the expiry date of the FI certificate;
  - (ii) they have completed instructor refresher training as an FI at an ATO or at the Authority;
  - (iii) they have passed an assessment of competence in accordance with point FCL.935 in the period of 12 months immediately preceding the expiry date of the FI certificate.



- (2) For at least each alternate revalidation, in the case of FI(A) or FI(H), or each third revalidation, in the case of FI (As), holders of the relevant FI certificate shall pass an assessment of competence in accordance with point FCL.935.

(b) **Renewal.**

If the FI certificate has expired, applicants shall, within a period of 12 months before the application date for the renewal, complete instructor refresher training as an FI at an ATO or at the Authority and complete an assessment of competence in accordance with point FCL.935.

**AMC1 FCL.940.FI; FCL.940.IRI Revalidation and renewal**

(a) The instructor refresher training for the revalidation of the FI and IRI certificates should be provided as a seminar by either an ATO, DTO, or Authority.

- (1) FI or IRI refresher seminars made available in the State should have due regard to geographical location, numbers attending, and periodicity throughout the territory of the State.
- (2) Such seminars should run for at least 2 days (1 day = 6 hours), and attendance from participants will be required for the whole duration of the seminar including breakout groups and workshops. Different aspects, such as inclusion of participants holding certificates in other categories of aircraft, should be considered.
- (3) Appropriately experienced FIs or IRIs currently involved with flying training and with a practical understanding of the revalidation requirements and current instructional techniques should be included as speakers at these seminars.
- (4) The attendance form will be completed and signed by the organiser of the seminar as approved by the Authority, following attendance and satisfactory participation by the FI or IRI.
- (5) The content of the FI or IRI refresher seminar should be selected from the following:
  - (i) new or current rules or regulations, with emphasis on knowledge of MCAR-Part-FCL and operational requirements;
  - (ii) teaching and learning;
  - (iii) instructional techniques;

- (iv) the role of the instructor;
  - (v) national regulations (as applicable);
  - (vi) human factors;
  - (vii) flight safety, incident and accident prevention;
  - (viii) airmanship;
  - (ix) legal aspects and enforcement procedures;
  - (x) navigational skills including new or current radio navigation aids;
  - (xi) teaching instrument flying;
  - (xii) weather-related topics including methods of distribution;
  - (xiii) any additional topic selected by the Authority.
- (6) Formal sessions should allow time for presentations and related questions. The use of visual aids is recommended, with interactive videos and other teaching aids (where available) for breakout groups and workshops.
- (b) If the instructor certificate lapsed, the ATO, DTO, or Authority, whichever is appropriate to the category of aircraft, should consider all the above as well as the following, when assessing the refresher training programme:
- (1) the ATO, DTO, or Authority should determine on a case-by-case basis the amount of refresher training needed, following an assessment of the candidate taking into account the following factors:
    - (i) the experience of the applicant;
    - (ii) the amount of time elapsed since the expiry of the FI or IRI certificate; and
    - (iii) the technical elements of the FI or IRI training course, as determined by the assessment of the candidate by the ATO, DTO, or Authority; and
  - (2) the individual training programme should be based on the content of the FI or IRI training course and focus on the aspects where the applicant showed the greatest needs.

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- (c) After successful completion of the seminar or refresher training, as applicable, the ATO, DTO, or Authority should:
- (1) in case of a seminar, in accordance with point (a), issue the applicant with a seminar completion certificate or another document specified by the Authority, which describes the content of the seminar as in point (a), as well as a statement that the seminar was successfully completed; and
  - (2) in case of refresher training, in accordance with point (b), issue the applicant with a training completion certificate or another document specified by the Authority, which describes the evaluation of the factors listed in point (b)(1) and the training received, as well as a statement that the training was successfully completed; the training completion certificate should be presented to the examiner prior to the assessment of competence.
- Upon successful completion of the refresher seminar or refresher training, as applicable, the ATO or DTO should submit the seminar or training completion certificate, or the other document specified by the Authority, to the Authority.
- (d) Taking into account the factors listed in point (b)(1), the ATO, DTO, or Authority, as applicable, may also decide that it is sufficient for the candidate to complete a seminar in accordance with point (a). In such a case, the completion certificate or the other document that is referred to in point (c) should contain a related statement with sufficient reasoning.

FI — Revalidation and renewal

**FI CERTIFICATE: REVALIDATION AND RENEWAL FORM**

**A. AEROPLANES**

INSTRUCTIONAL FLYING EXPERIENCE				
Instructors applying for revalidation of the FI certificate should enter the instructional hours flown during the preceding 36 months.				
SINGLE-ENGINE		MULTI-ENGINE		INSTRUMENT
DAY	NIGHT	DAY	NIGHT	
Total instructional hours (preceding 36 months):				
Total instructional hours (preceding 12 months):				
FI REFRESHER SEMINAR				
1	This is to certify that the undersigned attended an FI seminar			

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2	Attendee's personal particulars:	
Name(s):		Address:
Licence number:		Expiration date of FI(A) certificate
3	Seminar particulars:	
Date(s) of seminar:		Place:
4	Declaration by the responsible organiser:	
I certify that the above data are correct and that the FI seminar was carried out.		
Date of approval:		Name(s) of organiser: (capital letters)
Date and place:		Signature:
5	Declaration by the attendee:	
I confirm the data under 1 through 3		
Attendee's signature:		
<b>PROFICIENCY CHECK</b>		
(Name(s) of applicant) has given proof of flying instructional ability during a proficiency check flight. This was done to the required standard.		
Flying time:		Aeroplane or FFS used:
Main exercise:		
Name(s) of FIE:		Licence number:
Date and place:		Signature:

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**B. HELICOPTERS**

<b>INSTRUCTIONAL FLYING EXPERIENCE</b>			
Instructors applying for revalidation of the FI certificate should enter the instructional hours flown during the preceding 36 months.			
Instrument:			
Total instructional hours (preceding 36 months):			
Total instructional hours (preceding 12 months):			
<b>FI REFRESHER SEMINAR</b>			
1	This is to certify that the undersigned attended an FI seminar		
2	Attendees personal particulars:		
Name(s):		Address:	
Licence number:		Expiration date of FI(H) certificate:	
3	Seminar particulars:		
Date(s) of seminar:		Place:	
4	Declaration by the responsible organiser:		
I certify that the above data are correct and that the FI seminar was carried out.			
Date of approval:		Name(s) of organiser: (capital letters)	
Date and place:		Signature:	
5	Declaration by the attendee:		
I confirm the data under 1 through 3			
Attendee's signature:			
<b>PROFICIENCY CHECK</b>			

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(Name(s) of applicant) has given proof of flying instructional ability during a proficiency check flight. This was done to the required standard.	
Flying time:	Helicopter or FFS used:
Main exercise:	
Name(s) of FIE:	Licence number:
Date and place: <div style="border-bottom: 1px solid black; height: 1.2em; width: 100%; margin-top: 5px;"></div>	
Signature:	

**C. AIRSHIPS**

<b>INSTRUCTIONAL FLYING EXPERIENCE</b>				
Instructors applying for revalidation of the FI certificate should enter the instructional hours flown during the preceding 36 months.				
SINGLE-ENGINE		MULTI-ENGINE		INSTRUMENT
DAY	NIGHT	DAY	NIGHT	
Total instructional hours (preceding 36 months):				
Total instructional hours (preceding 12 months):				
<b>FLIGHT INSTRUCTOR REFRESHER SEMINAR</b>				
1	This is to certify that the undersigned attended an FI seminar			
2	Attendee's personal particulars:			
Name(s):			Address:	
Licence number:			Expiration date of FI(As) certificate:	
3	Seminar particulars:			
Date(s) of seminar:			Place:	
4	Declaration by the responsible organiser:			
I certify that the above data are correct and that the FI seminar was carried out.				
Date of approval:			Name(s) of organiser: (capital letters)	

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Date and place:	Signature:
5   Declaration by the attendee:	
I confirm the data under 1 through 3	
Attendee's signature:	
<b>PROFICIENCY CHECK</b>	
(Name(s) of applicant) has given proof of flying instructional ability during a proficiency check flight. This was done to the required standard.	
Flying time:	Airship or FFS used:
Main exercise:	
Name(s) of FIE:	Licence number:
Date and place:	Signature:

**D. SAILPLANES INSTRUCTIONAL FLYING EXPERIENCE**

<b>INSTRUCTIONAL FLYING EXPERIENCE</b>			
Instructors applying for revalidation of the FI certificate should enter the instructional hours and take-offs flown during the preceding 36 months.			
SAILPLANE (hours and take-offs)		TMG (hours and take-offs)	
DAY	NIGHT	DAY	NIGHT
Total instructional hours (preceding 36 months):			
Total instructional hours (preceding 12 months):			
Total amount of take-offs (preceding 36 months):			
Total amount of take-offs (preceding 12 months):			
<b>FI REFRESHER SEMINAR</b>			
1	This is to certify that the undersigned attended an FI seminar		
2	Attendee's personal particulars:		

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Name(s):		Address:	
Licence number:		Expiration date of FI(S) certificate:	
3	Seminar particulars:		
Date(s) of seminar:		Place:	
4	Declaration by the responsible organiser:		
I certify that the above data are correct and that the FI seminar was carried out.			
Date of approval:		Name(s) of organiser: (capital letters)	
Date and place:		Signature:	
5	Declaration by the attendee:		
I confirm the data under 1 through 3			
Attendee's signature:			
PROFICIENCY CHECK			
(Name(s) of applicant) has given proof of flying instructional ability during a proficiency check flight. This was done to the required standard.			
Flying time:		Sailplane or TMG used:	
Main exercise:			
Name(s) of FIE:		Licence number:	
Date and place:		Signature:	



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**E. BALLOONS**

<b>INSTRUCTIONAL FLYING EXPERIENCE</b>					
Instructors applying for revalidation of the FI certificate should enter the instructional hours flown during the preceding 36 months.					
<b>Balloons (gas)</b>		<b>Balloons (hot-air)</b>		<b>Hot-air airships</b>	
<b>DAY</b>	<b>NIGHT</b>	<b>DAY</b>	<b>NIGHT</b>	<b>DAY</b>	<b>NIGHT</b>
Total instructional hours (preceding 36 months):					
Total instructional hours (preceding 12 months):					
<b>FI REFRESHER SEMINAR</b>					
1	This is to certify that the undersigned attended an FI seminar				
2	Attendee's personal particulars:				
Name(s):			Address:		
Licence number:			Expiration date of FI(B) certificate:		
3	Seminar particulars:				
Date(s) of seminar:			Place:		
4	Declaration by the responsible organiser:				
I certify that the above data are correct and that the FI seminar was carried out.					
Date of approval:			Name(s) of organiser: (capital letters)		
Date and place:			Signature:		
5	Declaration by the attendee:				
I confirm the data under 1 through 3					
Attendee's signature:					
<b>PROFICIENCY CHECK</b>					
(Name(s) of applicant) has given proof of flying instructional ability during a proficiency check flight. This was done to the required standard.					
Flying time:			Balloon or hot-air airship used:		
Main exercise:					

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Name(s) of FIE:	Licence number:
Date and place:	Signature:

## **SECTION 4 – SPECIFIC REQUIREMENTS FOR THE TYPE RATING IN- STRUCTOR – TRI**

### **FCL.905.TRI TRI – Privileges and conditions**

- (a) The privileges of a TRI are to instruct for:
- (1) the revalidation and renewal of an IR, provided the TRI holds a valid IR;
  - (2) the issue of a TRI or SFI certificate, provided that the holder meets all of the following conditions:
    - (i) has at least 50 hours of instructional experience as a TRI or SFI in accordance with this MCAR or the Civil Aviation Regulations;
    - (ii) has conducted the flight instruction syllabus of the relevant part of the TRI training course in accordance with point FCL.930.TRI(ab)(3) to the satisfaction of the head of training of an ATO;
  - (3) in the case of the TRI for single-pilot aeroplanes:
    - (i) the issue, revalidation and renewal of type ratings for single-pilot high performance complex aeroplanes provided that the applicant seeks privileges to operate in single-pilot operations.

The privileges of the TRI(SPA) may be extended to flight instruction for single-pilot high-performance complex aeroplane type ratings in multi-pilot operations, provided that the TRI meets any of the following conditions:

      - (A) holds or has held a TRI certificate for multi-pilot aeroplanes;
      - (B) has at least 500 hours on aeroplanes in multi-pilot operations and completed an MCCI training course in accordance with point FCL.930.MCCI;
    - (ii) the MPL course on the basic phase, provided that he or she has the privileges extended to multi-pilot operations and holds or has held an FI(A) or an IRI(A) certificate;
  - (4) in the case of the TRI for multi-pilot aeroplanes:
    - (i) the issue, revalidation and renewal of type ratings for:

- (A) multi-pilot aeroplanes;
  - (B) single-pilot high-performance complex aeroplanes when the applicant seeks privileges to operate in multi-pilot operations;
- (ii) MCC training;
- (iii) the MPL course on the basic, intermediate and advanced phases, provided that, for the basic phase, he or she holds or has held an FI(A) or IRI(A) certificate;
- (5) in the case of the TRI for helicopters:
  - (i) the issue, revalidation and renewal of helicopter type ratings;
  - (ii) MCC training, provided that he or she has completed 350 hours of flight time as a pilot in multi-pilot operations in any aircraft category.
- (6) in the case of the TRI for powered-lift aircraft:
  - (i) the issue, revalidation and renewal of powered-lift type ratings;
  - (ii) MCC training.
- (b) The privileges of a TRI include privileges to conduct EBT practical assessment at an EBT operator, provided that the instructor complies with the requirements of MCAR-Part-ORO for EBT instructor standardisation at that EBT operator.

### **GM1 FCL.905.TRI(b) Privileges and conditions**

#### **INSTRUCTORS INSTRUCTING FOR THE ISSUE OF A TRI OR SFI CERTIFICATE**

Training in an aeroplane is not a requirement for the issue of an SFI or a TRI certificate. In order to deliver effective UPRT, it is beneficial for the instructor to have first-hand experience of the critical psychological and physiological human factors, which might be present during recoveries from developed upsets. These human factors (effects of unusual acceleration, such as variations from normal 1G flight, the difficulty to perform counter-intuitive actions, and the management of the associated stress response) can only be experienced during training in an aeroplane because FFSs are not capable of reproducing sustained accelerations. Completion of the advanced UPRT course in accordance with FCL.745.A would provide such experience and is therefore useful for instructors providing instruction for the issue of a TRI or an SFI certificate.

### **FCL.910.TRI TRI – Restricted privileges**

- (a) General. If the TRI training is carried out in FSTDs only, the privileges of TRIs shall be restricted to training in FSTDs. This restriction shall however include the following privileges for conducting, in the aircraft:
- (1) LIFUS, provided that the TRI training course has included the relevant training specified in point FCL.930.TRI(ab)(4)
  - (2) landing training, provided that the TRI training course has included the relevant training specified in point FCL.930.TRI(ab)(4); or
  - (3) the training flight specified in point FCL.060(c)(2), provided that the TRI training course has included the training referred to in points (a)(1) or (a)(2).

The restriction to FSTD shall be removed if TRIs have completed an assessment of competence in the aircraft.

- (b) TRIs for aeroplanes and for powered-lift aircraft — TRI(A) and TRI(PL). The privileges of TRIs are restricted to the type of aeroplane or powered-lift aircraft in which the training and the assessment of competence were conducted. Unless otherwise determined in the OSD, to extend the privileges of TRIs to further types, TRIs shall have:
- (1) completed within the 12 months preceding the application, at least 15 route sectors, including take-offs and landings on the applicable aircraft type, of which of maximum of 7 sectors may be completed in an FSTD;
  - (2) completed the relevant parts of the technical training and the flight instruction parts of the applicable TRI course;
  - (3) passed the relevant sections of the assessment of competence in accordance with point FCL.935 in order to demonstrate to an FIE or a TRE qualified in accordance with Subpart K to this MCAR their ability to instruct a pilot to the level required for the issue of a type rating, including pre-flight, post-flight and theoretical knowledge instruction.

The privileges of TRIs shall be extended to further variants, provided that they comply with point FCL.710 in those other variants and, where applicable, the elements set out in the operational suitability data established in accordance with MCAR-Part-21 for those variants

- (c) TRIs for helicopters — TRI(H).

- (1) The privileges of TRIs(H) are restricted to the type of helicopter in which the assessment of competence for the issue of the TRI certificate was taken. Unless otherwise determined in the OSD, the privileges of the TRIs shall be extended to further types if TRIs have:
- (i) completed the relevant parts of the technical training and flight instruction parts of the TRI course;
  - (ii) completed within the 12 months preceding the date of application, at least 10 hours on the applicable helicopter type, of which a maximum of 5 hours may be completed in an FFS or FTD 2/3; and
  - (iii) passed the relevant sections of the assessment of competence in accordance with point FCL.935 in order to demonstrate to an FIE or a TRE qualified in accordance with Subpart K of this MCAR their ability to instruct a pilot to the level required for the issue of a type rating, including pre-flight, post-flight and theoretical knowledge instruction.

The privileges of TRIs shall be extended to further variants, provided that they comply with point FCL.710 in those other variants and, where applicable, the elements set out in the operational suitability data established in accordance with MCAR-Part-21 for those variants.

- (2) In order to extend the privileges of a TRI(H) to multi-pilot operations in the same type of single-pilot helicopters, the holder shall have at least 350 hours of flight time as a pilot in multi-pilot operations in any aircraft category or have at least 100 hours of flight time as a pilot in multi-pilot operations on the specific type within the last 2 years.
- (3) Before the privileges of a TRI(H) are extended from single-pilot helicopters to multi-pilot helicopters, the holder shall comply with point FCL.915.TRI(d)(3).
- (d) Notwithstanding the points above, holders of a TRI certificate who received a type rating in accordance with point FCL.725(e) shall be entitled to have their TRI privileges extended to that new type of aircraft.

### **GM1 FCL.910.TRI TRI Restricted privileges**

- (a) The restrictions of the TRI privileges are annotated on the license under 'Remarks and Restrictions' against the appropriate TRI certificate, along with the following endorsements:

- (1) if the training is carried out in an FSTD: 'TRI/r' (r=restricted);
  - (2) if the TRI training, as specified in point FCL.910.TRI(a)(1), includes the LIFUS training: endorsement as per point (a) and 'LIFUS'; and
  - (3) if the landing training, as specified in point FCL.910.TRI(a)(2), is included in the TRI training course: endorsement as per point (a) and 'LT' (LT = landing training).
- (b) For example a TRI restricted with LIFUS and landing training privileges will have on their license the following endorsement: 'TRI/r LIFUS LT'.

### **GM1 FCL.910.TRI(b)(2) TRI training for type extension**

'Relevant parts of the technical training and the flight instruction parts of the applicable TRI training course' means that the training should be relevant to its purpose, taking into consideration the experience of the individual TRI on other aircraft types that are similar to the one for which the extension of TRI privileges is applied for.

### **FCL.915.TRI TRI – Prerequisites**

An applicant for a TRI certificate shall:

- (a) hold a CPL, MPL or ATPL pilot licence on the applicable aircraft category;
- (b) for a TRI(MPA) certificate:
  - (1) have completed 1 500 hours flight time as a pilot on multi-pilot aeroplanes; and
  - (2) have completed, within the 12 months preceding the date of application, 30 route sectors, including take-offs and landings, as PIC or co-pilot on the applicable aeroplane type, of which 15 sectors may be completed in an FFS representing that type;
- (c) for a TRI(SPA) certificate:
  - (1) have completed, within the 12 months preceding the date of the application, at least 30 route sectors, including take-offs and landings, as PIC on the applicable aeroplane type, of which a maximum of 15 sectors may be completed in an FSTD representing that type; and
  - (2) (i) have competed at least 500 hours flight time as pilot on aeroplanes, including 30 hours as PIC on the applicable type of aeroplane; or

- (ii) hold or have held an FI certificate for multi-engine aeroplanes with IR(A) privileges;
- (d) for TRI(H):
  - (1) for a TRI(H) certificate for single-pilot single-engine helicopters, either:
    - (i) have completed 250 hours as a pilot on helicopters; or
    - (ii) hold an FI(H) certificate.
  - (2) for a TRI(H) certificate for single-pilot multi-engine helicopters, either:
    - (i) have completed 500 hours as pilot of helicopters, including 100 hours as PIC in single pilot multi-engine helicopters; or
    - (ii) hold an FI(H) certificate and have completed 100 hours of flight time as a pilot in multi engine helicopters.
  - (3) for a TRI(H) certificate for multi-pilot helicopters, have completed 1 000 hours of flight time as a pilot on helicopters, and have either 350 hours in multi-pilot operations on any aircraft category or 100 hours of flight time as a pilot in multi-pilot operations on the type for which the TRI(H) certificate is sought;
- (e) for TRI(PL):
  - (1) have completed 1 500 hours flight time as a pilot on multi-pilot aeroplanes, powered-lift, or multi-pilot helicopters; and
  - (2) have completed, within the 12 months preceding the application, 30 route sectors, including take-offs and landings, as PIC or co-pilot on the applicable powered-lift type, of which 15 sectors may be completed in an FFS representing that type.

### **FCL.930.TRI TRI – Training course**

- (a) The TRI training course shall be conducted:
  - (1) in the case of MPA, in an FFS or a combination of FSTD(s) and FFS;
  - (2) in the case of type ratings for SPA and helicopters, in either of the following:
    - (i) an available and accessible FFS, or in a combination of such FFS and FSTD(s);



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- (ii) a combination of FSTD(s) and the aircraft if an FFS is not available or accessible;
  - (iii) the aircraft if no FSTD is available or accessible.
- (aa) By way of derogation from point (a), the TRI training course:
  - (1) for non-complex helicopters may be conducted in a combination of FSTD(s) and the aircraft even if an FFS is available and accessible;
  - (2) for aircraft referred to in Section A, point 1e, of Appendix 9 may be conducted in accordance with points FCL.930.TRI(a)(2)(i), (ii) or (iii), irrespective of the availability and accessibility of FFS or FSTD.
- (ab) The TRI training course shall include:
  - (1) 25 hours of teaching and learning;
  - (2) 10 hours of technical training, including revision of technical knowledge, the preparation of lesson plans and the development of classroom or simulator instructional skills;
  - (3) 5 hours of flight instruction on the appropriate aircraft or an FSTD representing that aircraft for single-pilot aircraft and 10 hours for multi-pilot aircraft or an FSTD representing that aircraft;
  - (4) if privileges for conducting LIFUS or take-off and landing training are sought, the following training, as applicable:
    - (i) in an FSTD and related to the relevant privileges, additional specific training which, in the case of privileges for conducting take-off and landing training, shall include training for emergency procedures related to the aircraft;
    - (ii) consolidation of the specific training in accordance with point (4)(i), where the applicant shall, in the aircraft, provide LIFUS or take-off and landing training, as applicable, under the supervision of a TRI that is nominated for that purpose by the ATO.
- (b) Applicants holding or having held an instructor certificate shall be fully credited towards the requirement of (a)(1).
- (c) An applicant for a TRI certificate who holds an SFI certificate for the relevant type shall be fully credited towards the requirements of this paragraph for the issue of a TRI certificate restricted to flight instruction in simulators.

**AMC1 FCL.930.TRI TRI Training course**

**TRI TRAINING COURSE — AEROPLANES**

(a) General

- (1) The training course should develop safety awareness throughout by imparting knowledge, skills, and attitudes relevant to the TRI task, and should be designed to adequately train the candidate instructor in theoretical-knowledge instruction, flight instruction, and FSTD instruction to enable the candidate instructor to instruct others on an aeroplane type rating for which the candidate instructor is qualified.
- (2) The TRI(A) training course should place particular emphasis on the role of the individual, human factors in the man–machine environment, and CRM.
- (3) Special attention should be given to the candidate instructor's maturity and judgment including their understanding of adults, behavioural attitudes, and variable levels of learning ability. During the training course, the candidate instructor should be made aware of their own attitude towards the importance of flight safety.
- (4) For a TRI(A), the amount of time for flight training should vary depending on the complexity of the aeroplane type. A similar number of hours should be allotted to the instruction on, and practice of, both preflight and postflight briefing for each exercise.
- (5) The flight instruction should ensure that the candidate instructor is able to teach the air exercises safely and efficiently and should be related to the type of aeroplane on which the candidate instructor wishes to instruct. The content of the training programme should cover training exercises applicable to the aeroplane type, which are set out in the applicable type rating training courses.
- (6) Airmanship is a vital element of all flight operations. Therefore, in the following exercises, the relevant aspects of airmanship should be stressed at the appropriate times during each flight.
- (7) The candidate instructor should learn how to identify common errors and how to correct them properly, which should be emphasised at all times.

(b) Content

The training course consists of three parts:

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- Part 1: teaching and learning instruction in accordance with AMC1 FCL.920;
  - Part 2: technical theoretical-knowledge instruction (technical training); and
  - Part 3: flight instruction.
- (1) Part 1 — Teaching and learning The content of the teaching and learning part of the FI training course as described in AMC1 FCL.930.FI should be used as guidance to develop the course syllabus.
- (2) Part 2 — Technical theoretical-knowledge instruction syllabus
- (i) If a TRI(A) certificate for MP aeroplanes is sought, particular attention should be given to MCC. If a TRI(A) certificate for SP aeroplanes is sought, particular attention should be given to the duties in SP operations.
  - (ii) The technical theoretical-knowledge instruction should comprise at least 10 hours of training to refresh Part-1 theoretical topics, as necessary, and aircraft technical knowledge. It should include preparation of lesson plans and development of briefing-room instructional skills. A proportion of the allotted 10 hours could be integrated into the practical flight instruction lessons of Part 3, using expanded preflight and postflight briefing sessions. Consequently, for practical purposes, Part 2 and Part 3 could be considered complementary to each other.
  - (iii) The type rating theoretical syllabus should be used to develop the TRI(A)'s teaching skills in relation to the type technical course syllabus. The course instructor should deliver example lectures from the applicable type technical syllabus and the candidate instructor should prepare and deliver lectures on topics that are selected by the course instructor from the type rating course.
- (3) Part 3 — Flight instruction
- (i) General
    - (A) The course should be related to the type of aeroplane on which the applicant wishes to instruct. It should consist of at least 5 hours of flight instruction for SP aeroplanes that are operated in SP operations, and at least 10 hours for MP aeroplanes or SP-certified aeroplanes that are operated in MP operations, per candidate instructor.

- (B) TEM, CRM, and the appropriate use of behavioural markers should be integrated throughout.
  - (C) Training courses should be developed to help the candidate instructor gain experience in the training of a variety of exercises, covering both normal and abnormal operations.
  - (D) The syllabus should be tailored and appropriate to the aeroplane type, and the exercises used should be more demanding for each individual student.
  - (E) The course should cover the whole range of instructor skills to enable the candidate instructor to plan sessions, brief, train and debrief using all relevant training techniques that are appropriate to pilot training.
- (ii) Use of FSTDs
- (A) The applicant for a TRI(A) certificate should be instructed in using the device and made familiar with its limitations, capabilities, and safety features, including emergency evacuation.
  - (B) The applicant for a TRI(A) certificate should be instructed in providing and evaluating training from the instructor station and from all pilot operating positions, including demonstrations of handling exercises.
  - (C) The syllabus should include engine-out handling and engine-out operations in addition to representative exercises from the type rating course.
  - (D) Where no FSTD exists for the type of aeroplane for which the certificate is sought, or if the FSTD is not suitable to complete all the elements of the training programme for the TRI certificate, the entire course or a part of it should be conducted in the applicable aeroplane type, and the synthetic-device elements should be replaced with appropriate exercises in the aeroplane.

The assessment of competence should be performed:

— when no FSTD exists, in the aeroplane; and

- when not all elements of the training are completed in the FSTD, in both the aeroplane and the FSTD; this combined use of aeroplane and FSTD in the assessment of competence should reflect and be similar to the combined use of aeroplane and FSTD during the training course.
- (F) In general, TRI training is designed to develop the competencies of a pilot to become an instructor. From this perspective, the training may be provided in several arrangements:
- the candidate instructor is seating in either pilot seat;
  - the candidate instructor is seating at the IOS; or
  - the candidate instructor is observing (seating as an observer).

The combination of the above-mentioned training arrangements and the allocation of time to each one of them depends on an analysis of several elements, including but not limited to the following:

- previous experience and curriculum of each candidate (e.g. previous instructor experience, experience on aeroplane type, total flight experience, etc.) in isolation and as part of the course group(s);
- specific requirements for aeroplane type and related training exercises;
- overall maturity and experience of the ATO in providing TRI training courses; and
- type, fidelity level, and reliability of the available devices.

Subject to particular training arrangements that are determined by the ATO and approved by the Authority, a TRI may instruct in parallel two TRI candidate instructors under the following scenarios:

- one candidate is sitting at the controls (supported by a suitable pilot), while the second candidate is sitting at

the IOS; this scenario may be used for demonstration of flight manoeuvres or engine out exercises; or

- both candidates receive instruction (general introduction and handling) at the IOS.

In this way, both candidates can independently develop specific competencies.

Additional TRI candidate instructors may be present as observers during such an instruction given in parallel, with no credit of hours for their TRI training.

For an initial TRI training course, such 'in parallel' instruction should be given only for a reasonable part of the overall TRI training course duration. For a TRI type extension, the amount of hours required for such an instruction may be increased.

In any case, the way of instruction largely depends on the experience of the TRI trainer in the various training arrangements and on the general experience of the candidate instructor.

(iii) SP MET aeroplane training for asymmetric power flight

During this part of the training, particular emphasis should be placed on:

- (A) the circumstances under which the actual feathering and unfeathering is practised, e.g. safe altitude, compliance with regulations regarding minimum altitude or height for feathering, weather conditions, distance from the nearest available aerodrome;
- (B) the procedure that should be used for cooperation between instructor and student, e.g. the correct use of touch drills and the prevention of misunderstandings, especially during feathering and unfeathering and when zero thrust is used for asymmetric circuits; this procedure should include a positive agreement on which engine should be shut down or restarted or set at zero thrust, as well as on identifying each control and the engine it will affect;

- (C) avoiding overworking the operating engine and preventing degraded performance when operating the aeroplane in asymmetric flight; and
  - (D) the need to use the specific checklist for the given aeroplane type.
- (iv) Long briefings on SP MET aeroplanes

Long briefings provide an essential link between academic principles and air exercises. They introduce aeronautical theory and the practical application of aeronautical principles to the student.

The instructor should ensure that the candidate instructor is able to teach all the following subjects:

- (A) Asymmetric power flight:
  - (a) introduction to asymmetric flight;
  - (b) feathering the propeller: method of operation;
  - (c) effects on aeroplane handling at cruising speed;
  - (d) introduction to the effects upon aeroplane performance;
  - (e) identification of the foot load to maintain a constant heading (no rudder trim);
  - (f) feathering the propeller: regaining normal flight;
  - (g) finding the zero-thrust setting: comparison of foot load when the propeller is feathered and thrust is set to zero;
  - (h) effects and recognition of engine failure in level flight;
  - (i) forces and effects of yaw;
  - (j) types of failure:
    - (1) sudden or gradual, and
    - (2) complete or partial;
  - (k) yaw direction and further effects of yaw;

- (l) flight instrument indications;
  - (m) identification of failed engine;
  - (n) couples and residual out-of-balance forces: resultant flight attitude;
  - (o) use of rudder to counteract yaw;
  - (p) use of aileron: dangers of misuse;
  - (q) use of elevator to maintain level flight;
  - (r) use of power to maintain safe airspeed and altitude;
  - (s) supplementary recovery to straight and level flight: simultaneous increase in speed and reduction in power;
  - (t) identification of failed engine: idle engine;
  - (u) use of engine instruments for identification:
    - (1) fuel pressure or flow;
    - (2) RPM gauge response effect of constant speed unit (CSU) action at lower and higher airspeed; and
    - (3) engine temperature gauges;
  - (v) confirmation of identification: closing the throttle of the identified failed engine;
  - (w) effects and recognition of engine failure in turns;
  - (x) identification and control; and
  - (y) side forces and effects of yaw.
- (B) Turning flight:
- (a) effect of 'inside' engine failure: sudden and pronounced effect;



- (b) effect of 'outside' engine failure: less sudden and pronounced effect;
  - (c) possible confusion in identification (particularly at low power):
    - (1) correct use of rudder; and
    - (2) possible need to return to lateral level flight to confirm correct identification;
  - (d) visual and flight instrument indications;
  - (e) effect of varying speed and power;
  - (f) speed and thrust relationship;
  - (g) at normal cruising speed and cruising power: engine failure clearly recognised;
  - (h) at low safe speed and climb power: engine failure most likely recognised; and
  - (i) at high-speed descent and low power: asymmetry (engine failure) possibly not recognised.
- (C) Minimum control speeds:
- (a) Air speed indicator (ASI) colour coding: red radial line. Note: this exercise is intended to explore the ultimate boundaries of controllability of the aeroplane aircraft in an asymmetric state in various conditions with a steady power setting. A steady power setting is achieved by using a fixed power setting and adjusting the aircraft attitude to obtain a gradual speed reduction. The failure exercise should not be performed as a sudden and complete failure at the VMCA given in the AFM. The purpose of the exercise is to continue the gradual introduction of a student to the control of an aeroplane in asymmetric power flight in extreme or critical situations, and not to demonstrate VMCA.
  - (b) Techniques for assessing critical speeds at wings level, and recovery from those speeds; dangers involved

when minimum control speed and stalling speed are very close: use of safe single-engine speed ( $V_{sse}$ ).

- (c) Establishing a minimum control speed for each asymmetrically disposed engine: establishing the critical engine (if applicable).
- (d) Effects on minimum control speeds of:
  - (i) bank;
  - (ii) zero-thrust setting; and
  - (iii) take-off configuration:
    - (A) landing gear down and take-off flap set; and
    - (B) landing gear up and take-off flap set.

Note: the use of 5 ° of bank towards the operating engine results in a better climb performance than that obtained with wings level held. Manufacturers may use these conditions when determining the asymmetric climb performance of the aircraft.

Thus, the VMCA quoted in the AFM may be different from the speeds that are determined during this exercise.

- (D) Feathering and unfeathering:
  - (a) minimum heights for practising feathering and unfeathering drills; and
  - (b) engine-handling precautions (overheating, icing conditions, priming, warm-up, method of simulating an engine failure: refer to the aircraft engine manual, service instructions, and bulletins).
- (E) Engine failure procedure:

- (a) once control is maintained, the phase of operation and the aircraft type determine in which order the procedures should be followed; and
- (b) the flight phase should be:
  - (1) in cruising flight; or
  - (2) a critical phase, e.g. immediately after take-off or during approach to landing or during a go-around.

(F) Aircraft type:

Variations in the order of certain drills and checks inevitably occur due to differences between aeroplane types and perhaps between models of the same aeroplane type. The AFM should be consulted to establish the exact order of the related procedures.

For example, one AFM may call for the raising of flaps and landing gear before feathering, whereas another AFM may recommend feathering as a first step. The reason for this latter procedure may be that some engines cannot be feathered if RPM drop below a certain figure.

However, in some aeroplanes, the raising of the landing gear may create more drag during retraction due to the transient position of the landing gear doors, and as a result, retraction should be avoided until feathering is completed and propeller drag reduced.

Therefore, the order in which the drills and checks are presented under immediate and subsequent actions in this syllabus should be considered as general guidance only; the exact order of precedence is determined by reference to the AFM for the specific aeroplane type used in the course.

- (G) In-flight engine failure during cruising or other flight phase not including take-off or landing:
  - (a) immediate actions:
    - (1) control of the aircraft;

- (2) recognition of asymmetric condition;
- (3) identification and confirmation of failed engine:
  - (i) idle leg = idle engine; and
  - (ii) closing of throttle or pulling back of power lever, as appropriate, for confirmation;
- (4) identification of failure cause and fire check:
  - (i) typical reasons for failure; and
  - (ii) methods of rectification; and
- (5) feathering decision and procedure:
  - (i) reduction of other drag;
  - (ii) need for speed but not haste; and
  - (iii) use of rudder trim;
- (b) subsequent actions:
  - (1) operating engine:
    - (i) temperature, pressure, and power;
    - (ii) remaining services;
    - (iii) electrical load: assess and reduce, as necessary;
    - (iv) effect on power source for air-driven instruments;
    - (v) landing gear; and (vi) flaps and other services;
  - (2) replanning of the flight:
    - (i) ATC and weather;
    - (ii) terrain clearance, SE cruising speed; and

- (iii) decision to divert or continue;
  - (3) fuel management: best use of remaining fuel;
  - (4) dangers of restarting damaged engine;
  - (5) action if unable to maintain altitude: effect of altitude on available power;
  - (6) effects on performance;
  - (7) effects on available power and required power;
  - (8) effects on various airframe configurations and propeller settings;
  - (9) use of AFM:
    - (i) cruising;
    - (ii) climbing: ASI colour coding (blue line);
    - (iii) descending; and (iv) turning;
  - (10) limitations and handling of operating engine; and
  - (11) control and performance of take-off and approach.
- (H) Significant factors:
- (a) significance of take-off safety speed:
    - (1) effect on aeroplane performance of landing gear, flap, feathering, take-off, trim setting, and systems for operating landing gear and flaps; and
    - (2) effect on aeroplane performance of mass, altitude, and temperature;
  - (b) significance of best SE climb speed (Vyse):
    - (1) accelerating to Vyse and establishing a positive climb;

- (2) relationship between Vyse and normal climb speed; and
    - (3) action, if unable to climb; and
  - (c) significance of asymmetric committal height and speed: action, if baulked below asymmetric committal height.
- (I) Engine failure during take-off:
  - (a) below VMCA or unstick speed:
    - (1) use AFM data, if available ; and
    - (2) accelerate or stop distance considerations;
  - (b) above VMCA or unstick speed and below safety speed;
  - (c) immediate relanding or use of remaining power for forced landing; and
  - (d) considerations:
    - (1) degree of engine failure;
    - (2) speed at the time;
    - (3) mass, altitude, temperature performance;
    - (4) configuration;
    - (5) length of remaining runway; and
    - (6) position of any obstacles ahead.
- (J) Engine failure after take-off:
  - (a) simulated at a safe height and at or above take-off safety speed;
  - (b) considerations:
    - (1) need to maintain control;

- (2) use of bank technique towards operating engine;
  - (3) use of available power to reach Vyse;
  - (4) mass, altitude, temperature performance; and
  - (5) effect of prevailing conditions and circumstances;
- (c) immediate actions:
  - (1) maintaining control, including airspeed and use of power;
  - (2) recognition of asymmetric condition;
  - (3) identification and confirmation of failed engine;
  - (4) feathering and removal of drag (procedure for specific type); and
  - (5) reaching and maintaining Vyse; and
- (d) subsequent actions, whilst carrying out an asymmetric power climb to the downwind position at Vyse:
  - (1) identification of failure and fire check;
  - (2) handling considerations for operating engine;
  - (3) remaining services;
  - (4) liaison with ATC; and
  - (5) fuel management.

Note: these procedures are dependent upon the aeroplane type concerned and actual flight situation.

**(K) Asymmetric committal height**

- (a) Asymmetric committal height is the minimum height needed to put the aircraft into a positive climb, whilst maintaining an adequate speed to control the aircraft and reduce drag during an approach to landing.

- (b) Due to the significantly reduced performance of many CS-23 aeroplanes when operating with one engine, a minimum height should be considered from which it would be safe to attempt a go-around procedure during an approach when the aeroplane must change from descent to climb in a high-drag configuration.
- (c) Due to the height loss that occurs when the operating engine is turned to full power, with landing gear and flap retracted, and the aeroplane is put into a climb at Vyse, a minimum height (often referred to as 'asymmetric committal height') should be selected below which the pilot should not attempt to fly another circuit. This height should be compatible with the aeroplane type, all-up weight, altitude of the aerodrome used, air temperature, wind, height of obstructions along the climb-out path, and the pilot's competence.
- (d) Circuit approach and landing with asymmetric power:
  - (1) definition and use of asymmetric committal height;
  - (2) use of standard pattern and normal procedures;
  - (3) action, if unable to maintain circuit height;
  - (4) speed and power settings required; and
  - (5) decision to land or execute a go-around at asymmetric committal height: factors to be considered.
- (e) Undershooting: importance of maintaining an appropriate airspeed.
- (L) Speed and heading control:
  - (a) relationship between height, speed, and power: need for minimum possible drag; and
  - (b) reaching a positive climb at Vyse:
    - (1) effect of availability of systems, and power for the flap and landing gear; and



- (2) operation and rapid clean-up.

Note 1: the airspeed at which the decision is made to make a landing or execute a go-around should normally be  $V_{yse}$  and not lower than the safety speed.

Note 2: instrument approach 'decision height' and its associated procedures should not be confused with the selection of minimum height for initiating a go-around in asymmetric power flight.

- (M) Engine failure during an all-engine approach or missed approach:
  - (a) use of asymmetric committal height, and speed considerations; and
  - (b) speed and heading control: decision to attempt a landing, go-around or forced landing depending on circumstances. Note: at least one demonstration and practice of engine failure in this situation should be performed during the course.
- (N) Instrument flying with asymmetric power:
  - (a) considerations relating to aircraft performance during:
    - (1) straight and level flight;
    - (2) climb and descent;
    - (3) standard rate turns; and
    - (4) level, climbing, and descending turns including turns to preselected headings;
  - (b) availability of vacuum-operated instruments; and
  - (c) electrical power source.
- (v) Specific trainings: LIFUS training and landing training

The applicant for a TRI(A) certificate should receive instruction in an FSTD in accordance with FCL.930.TRI(a)(4).

(A) LIFUS training: content

(a) Training in an FSTD:

- (1) familiarisation as PF on both seats, as applicable, which should include at least the following:
  - (i) pre-flight preparation and use of checklists;
  - (ii) taxiing;
  - (iii) take-off;
  - (iv) rejected take-off;
  - (v) engine failure during take-off, after take-off decision speed (V1);
  - (vi) one-engine-inoperative approach and go-around;
  - (vii) one-engine-inoperative (critical, simulated) landing;
  - (viii) other emergency and abnormal operating procedures (as necessary);
  - (ix) emergency evacuations; and
  - (x) task sharing and decision-making; and
- (2) aeroplane training techniques:
  - (i) methods of providing appropriate commentary; and
  - (ii) intervention strategies developed from situations that are role-

played by a TRI training course instructor, taken from but not limited to:

(A) take-off:

- tail strike awareness and avoidance,
- rejected take-off,
- actual engine failure,
- take-off configuration warning, and
- overcontrolling;

(B) approach and landing:

- normal approach,
- high flare, long float, no flare,
- immediate go-around after touchdown,
- baulked landing,
- rejected landing,
- crosswind, and
- overcontrolling; and

(C) flight management:

- task sharing and handover of controls,

- effect of ATC-delaying actions on endurance,
- alternate management and diversion, and
- traffic awareness when flying in pattern.

(b) Training in aeroplane (in flight)

This training should consist of at least one route sector where the candidate instructor:

- (1) either observes a TRI(A) who conducts line flying under supervision, or
- (2) conducts role play line flying under supervision for a TRI(A) who is qualified for line flying under supervision.

Upon completion of the above-mentioned training, the candidate instructor should complete a route sector under the supervision and to the satisfaction of a TRI(A) who is nominated for that purpose by the ATO.

(B) Landing training: content

(a) Training in an FSTD

The training in an FSTD should be tailored and appropriate to the aeroplane type, and the exercises should be more demanding for each candidate instructor. In addition to the LIFUS training items in the FSTD (listed under (a)(1) and (a)(2) above), the landing training should comprise a variety of exercises that cover both normal and abnormal operations including the following:

- (1) consideration of threats during touch-and-go:
    - operating at low altitude;
    - General Aviation (GA) traffic;
    - increased fuel consumption;
    - bird strikes;
    - decision to continue touch-and-go or make a full-stop landing; and
    - aspects of performance and associated risks;
  - (2) incorrect rudder inputs;
  - (3) failure of a critical engine;
  - (4) approach and full-stop landing in simulated engine-out flight; and
  - (5) go-around in simulated engine-out flight. The applicant needs to be additionally trained in other abnormal items during the training course, if required.
- (b) Training in an aeroplane
- (1) Upon completion of the FSTD training, the applicant should perform role-play flying for landing training under the supervision and to the satisfaction of a TRI(A) who is nominated for that purpose by the ATO.
- The training should cover at least the following elements:
- take-off,
  - traffic pattern,

- touch-and-go,
- go-around, and
- full-stop landing with different flap settings.

- (2) In exceptional circumstances, it may be necessary to perform simulated engine-out handling and engine-out operations in an aeroplane in addition to representative exercises from the type rating course.

(vi) UPRT

Instructors should have the specific competence to provide UPRT during the type rating training course, including the ability to demonstrate knowledge and understanding of the type-specific upset recovery procedures and of the recommendations that are developed by the original equipment manufacturers (OEMs). Therefore, during the TRI training course, the student instructor should:

- (A) be able to apply the correct upset recovery techniques for the specific aeroplane type;
- (B) understand the importance of applying type-specific OEM procedures for recovery manoeuvres;
- (C) be able to distinguish between the applicable SOPs and OEM recommendations (if available);
- (D) understand the capabilities and limitations of the FSTDs that are used for UPRT;
- (E) ensure that the training remains within the FSTD training envelope to avoid the risk of negative transfer of training;
- (F) understand and be able to use the IOS of the FSTD in the context of providing effective UPRT;
- (G) understand and be able to use the available FSTD instructor tools to provide accurate feedback on pilot performance;

- (H) understand the importance of adhering to the FSTD UPRT scenarios that are validated by the training programme developer; and
- (I) understand the missing critical human factor aspects due to the limitations of the FSTD, and convey this to the student pilot(s) receiving the training.

## **AMC2 FCL.930.TRI TRI Training course**

### **HELICOPTERS**

#### **GENERAL**

- (a) The aim of the TRI(H) course is to train helicopter licence holders to the level of competence defined in FCL.920 and adequate for a TRI.
- (b) The training course should develop safety awareness throughout by teaching the knowledge, skills and attitudes relevant to the TRI(H) task, and should be designed to give adequate training to the applicant in theoretical knowledge instruction, flight instruction and FSTD instruction to instruct for a helicopter type rating for which the applicant is qualified.
- (c) The TRI(H) training course should give particular emphasis to the role of the individual in relation to the importance of human factors in the man-machine environment and the role of CRM.
- (d) Special attention should be given to the applicant's maturity and judgment including an understanding of adults, their behavioural attitudes and variable levels of learning ability. During the training course the applicants should be made aware of their own attitudes to the importance of flight safety. It will be important during the course of training to aim at giving the applicant the knowledge, skills and attitudes relevant to the role of the TRI.
- (e) For a TRI(H) certificate the amount of flight training will vary depending on the complexity of the helicopter type.
- (f) A similar number of hours should be used for the instruction and practice of pre-flight and post flight briefing for each exercise. The flight instruction should aim to ensure that the applicant is able to teach the air exercises safely and efficiently and should be related to the type of helicopter on which the applicant wishes to instruct. The content of the training program should cover training exercises applicable to the helicopter type as set out in the applicable type rating course syllabus.

- (g) A TRI(H) may instruct in a TRI(H) course once he or she has conducted a minimum of four type rating instruction courses.

## **CONTENT**

- (h) The training course consists of three parts:
- (1) Part 1: teaching and learning, that should comply with AMC1 FCL.920;
  - (2) Part 2: technical theoretical knowledge instruction (technical training);
  - (3) Part 3: flight instruction.

### **Part 1**

The content of the teaching and learning part of the FI training course, as established in AMC1 FCL.930.FI, should be used as guidance to develop the course syllabus.

### **Part 2**

## **TECHNICAL THEORETICAL KNOWLEDGE INSTRUCTION SYLLABUS**

- (a) The technical theoretical knowledge instruction should comprise of not less than 10 hours training to include the revision of technical knowledge, the preparation of lesson plans and the development of classroom instructional skills to enable the TRI(H) to instruct the technical theoretical knowledge syllabus.
- (b) If a TRI(H) certificate for MP helicopters is sought, particular attention should be given to multi-crew cooperation.
- (c) The type rating theoretical syllabus should be used to develop the TRI(H)'s teaching skills in relation to the type technical course syllabus. The course instructor should deliver example lectures from the applicable type technical syllabus and the candidate instructor should prepare and deliver lectures on topics selected by the course instructor from the subject list below:
- (1) helicopter structure, transmissions, rotor and equipment, normal and abnormal operation of systems:
    - (i) dimensions;
    - (ii) engine including aux. power unit, rotors and transmissions;
    - (iii) fuel system;



- (iv) air-conditioning;
- (v) ice protection, windshield wipers and rain repellent;
- (vi) hydraulic system;
- (vii) landing gear;
- (viii) flight controls, stability augmentation and autopilot systems;
- (ix) electrical power supply;
- (x) flight instruments, communication, radar and navigation equipment;
- (xi) cockpit, cabin and cargo compartment;
- (xii) emergency equipment.
- (2) limitations:
  - (i) general limitations, according to the helicopter flight manual;
  - (ii) minimum equipment list.
- (3) performance, flight planning and monitoring:
  - (i) performance;
  - (ii) flight planning.
- (4) load and balance and servicing:
  - (i) load and balance;
  - (ii) servicing on ground;
- (5) emergency procedures;
- (6) special requirements for helicopters with EFIS;
- (7) optional equipment.

### **Part 3**

## **FLIGHT INSTRUCTION SYLLABUS**

- (a) The amount of flight training will vary depending on the complexity of the helicopter type. At least 5 hours flight instruction for a SP helicopter and at least 10 hours for a MP ME helicopter should be counted. A similar number of hours should be used for the instruction and practice of pre-flight and post flight briefing for each exercise. The flight instruction should aim to ensure that the applicant is able to teach the air exercises safely and efficiently and related to the type of helicopter on which the applicant wishes to instruct. The content of the training programme should only cover training exercises applicable to the helicopter type as set out in Appendix 9 to MCAR-Part-FCL.
- (b) If a TRI(H) certificate for MP helicopters is sought, particular attention should be given to MCC.
- (c) If a TRI(H) certificate for revalidation of instrument ratings is sought, then the applicant should hold a valid instrument rating.

#### **FLIGHT OR FSTD TRAINING**

- (d) The training course should be related to the type of helicopter on which the applicant wishes to instruct.
- (e) For MP helicopter type ratings MCC, CRM and the appropriate use of behavioural markers should be integrated throughout.
- (f) The content of the training programme should cover identified and significant exercises applicable to the helicopter type.

#### **FSTD TRAINING**

- (g) The applicant for a TRI(H) certificate should be taught and made familiar with the device, its limitations, capabilities and safety features, and the instructor station.
- (h) The applicant for a TRI(H) certificate should be taught and made familiar with giving instruction from the instructor station seat as well as the pilot's seats, including demonstrations of appropriate handling exercises.
- (i) Training courses should be developed to give the applicant experience in training a variety of exercises, covering both normal and abnormal operations. The syllabus should be tailored appropriate to the helicopter type, using exercises considered more demanding for the student. This should include engine-out handling and engine-out operations in addition to representative exercises from the type transition course.
- (j) The applicant should be required to plan, brief, train and debrief sessions using all relevant training techniques.

## **HELICOPTER TRAINING**

- (k) The applicant for a TRI(H) certificate should receive instruction in an FSTD to a satisfactory level in:
- (1) left hand seat familiarisation, and in addition right hand seat familiarisation where instruction is to be given to co-pilots operating in the left hand seat, which should include at least the following as pilot flying:
    - (i) pre-flight preparation and use of checklists;
    - (ii) taxiing: ground and air;
    - (iii) take-off and landings;
    - (iv) engine failure during take-off, before DPATO;
    - (v) engine failure during take-off, after DPATO;
    - (vi) engine inoperative approach and go-around;
    - (vii) one engine simulated inoperative landing;
    - (viii) autorotation to landing or power recovery;
    - (ix) other emergency and abnormal operating procedures (as necessary);
    - (x) instrument departure, approach and go-around with one engine simulated inoperative should be covered where TRI(H) privileges include giving instrument instruction for the extension of an IR(H) to additional types.
  - (2) helicopter training techniques:
    - (i) methods for giving appropriate commentary;
    - (ii) instructor demonstrations of critical manoeuvres with commentary;
    - (iii) particularities and safety considerations associated with handling the helicopter in critical manoeuvres such as one-engine-inoperative and autorotation exercises;
    - (iv) where relevant, the conduct of instrument training with particular emphasis on weather restrictions, dangers of icing and limitations on

the conduct of critical manoeuvres in instrument meteorological conditions;

- (v) intervention strategies developed from situations role-played by a TRI(H) course instructor, taken from but not limited to:
  - (A) incorrect helicopter configuration;
  - (B) over controlling;
  - (C) incorrect control inputs;
  - (D) excessive flare close to the ground;
  - (E) one-engine-inoperative take-off and landings;
  - (F) incorrect handling of autorotation;
  - (G) static or dynamic rollover on take-off or landing;
  - (H) too high on approach with associated danger of vortex ring or settling with power;
  - (I) incapacitation;
  - (L) abnormal and emergency procedures and appropriate methods and minimum altitudes for simulating failures in the helicopter;
  - (M) failure of the driving engine during OEI manoeuvres.

- (I) Upon successful completion of the training above, the applicant should receive sufficient training in an helicopter in-flight under the supervision of a TRI(H) to a level where the applicant is able to conduct the critical items of the type rating course to a safe standard. Of the minimum course requirements of 5 hours flight training for a SP helicopter or 10 hours for a MP helicopter, up to 3 hours of this may be conducted in an FSTD.

#### **TRAINING WHERE NO FSTD EXISTS**

- (m) Where no FSTD exists for the type for which the TRI(H) certificate is sought, a similar course of training should be conducted in the applicable helicopter type. This includes all elements listed under sub paragraphs (k)(1) and (2) of this AMC, the FSTD elements being replaced with appropriate exercises in a helicopter of the applicable type, subject to any restrictions placed on the conduct of critical

exercises associated with helicopter flight manual limitations and safety considerations.

### **FCL.935.TRI TRI – Assessment of competence**

- (a) The assessment of competence for a TRI for MPA and PL shall be conducted in an FFS. If no FFS is available or accessible, an aircraft shall be used.
- (b) The assessment of competence for a TRI for single-pilot high-performance complex aeroplanes and helicopters shall be conducted in any of the following:
  - (1) an available and accessible FFS;
  - (2) if no FFS is available or accessible, in a combination of FSTD(s) and an aircraft;
  - (3) if no FSTD is available or accessible, in an aircraft.

### **FCL.940.TRI TRI – Revalidation and renewal**

- (a) Revalidation

- (1) Aeroplanes

To revalidate a TRI(A) certificate, applicants shall, within the 12 months immediately preceding the expiry date of the certificate fulfil at least two out of the three following requirements:

- (i) conduct one of the following parts of a complete type rating or recurrent training course: simulator session of at least 3 hours or one air exercise of at least 1 hour comprising a minimum of two take-offs and landings;
    - (ii) complete instructor refresher training as a TRI(A) at an ATO;
    - (iii) pass the assessment of competence in accordance with point FCL.935. Applicants who have complied with point FCL.910.TRI(b)(3) shall be deemed to comply with this requirement.

- (2) Helicopters and powered lift

To revalidate a TRI (H) or TRI(PL) certificate, applicants shall, within the validity period of the TRI certificate fulfil at least two out of the three following requirements:

- (i) completed at least 50 hours of flight instruction in each of the types of aircraft for which instructional privileges are held or in an FSTD representing those types, of which at least 15 hours shall be completed in the period of 12 months immediately preceding the expiry date of the TRI certificate. In the case of a TRI(PL), those hours shall be completed as a TRI or a type rating examiner (TRE), or as an SFI or a synthetic flight examiner (SFE). In the case of a TRI(H), the time flown as FIs, instrument rating instructors (IRIs), synthetic training instructors (STIs) or as any kind of examiners shall be accounted for this purpose;
  - (ii) complete instructor refresher training as a TRI(H) or TRI(PL), as relevant, at an ATO;
  - (iii) in the period of 12 months immediately preceding the expiry date of the certificate, passed an assessment of competence in accordance with points FCL.935, FCL.910.TRI(b)(3) or FCL.910.TRI(c)(3), as applicable.
- (3) For at least each alternate revalidation of a TRI certificate, holders shall pass the assessment of competence in accordance with point FCL.935.
- (4) If TRIs hold a certificate for more than one type of aircraft within the same category, the assessment of competence taken on one of those types of aircraft shall revalidate the TRI certificate for the other types held within the same category of aircraft, unless it is otherwise determined in the OSD.
- (5) Specific requirements for the revalidation of a TRI(H) certificate  
  
TRIs(H) holding an FI(H) certificate in the relevant type shall be deemed to comply with the requirements in point (a). In that case, the TRI(H) certificate shall be valid until the expiry date of the FI(H) certificate.

**(b) Renewal**

To renew a TRI certificate, applicants shall, within the 12 months immediately preceding the date of the application, have passed the assessment of competence in accordance with point FCL.935 and shall have completed the following:

- (1) for aeroplanes:
  - (i) at least 30 route sectors, including take-offs and landings on the applicable aeroplane type, of which maximum 15 sectors may be completed in an FFS;

- (ii) instructor refresher training as a TRI at an ATO which shall cover the relevant elements of the TRI training course;
- (2) for helicopters and powered lift:
  - (i) at least 10 hours of flight time, including take-offs and landings on the applicable aircraft type, of which maximum 5 hours may be completed in an FFS or FTD 2/3;
  - (ii) instructor refresher training as a TRI at an ATO, which shall cover the relevant elements of the TRI training course.
- (3) If applicants held a certificate for more than one type of aircraft within the same category, the assessment of competence taken on one of those types of aircraft shall renew the TRI certificate for the other types held within the same category of aircraft, unless it is otherwise determined in the OSD.

**AMC1 FCL.940.TRI(a)(1)(ii), (a)(2)(ii), (b)(1)(ii), (b)(2)(ii);  
FCL.940.SFI(a)(2), (e)(1)**

- (a) The refresher training for revalidation of the TRI and SFI certificates should be provided as a seminar. The seminar should consist of 6 hours of learning and may be held in the form of either one or more of the following: e-learning, two-way online meetings, face-to-face seminars. The content of the refresher seminar for revalidation should be selected from the following items:
  - (1) relevant changes to national or EU regulations;
  - (2) the role of the instructor;
  - (3) teaching and learning styles;
  - (4) observational skills;
  - (5) instructional techniques;
  - (6) briefing and debriefing skills;
  - (7) TEM;
  - (8) human performance and limitations;
  - (9) flight safety, prevention of incidents and accidents, including those specific to the ATO;

- (10) significant changes in the content of the relevant part of the aviation system;
  - (11) legal aspects and enforcement procedures;
  - (12) developments in competency-based instruction;
  - (13) report writing; and
  - (14) any additional topics proposed by the Authority.
- (b) For the refresher training for renewal of the TRI and SFI certificates:
- (1) the ATO should determine on a case-by-case basis the amount of refresher training needed, through an assessment of the candidate, taking into account the following factors:
    - (i) the experience of the applicant;
    - (ii) the amount of time elapsed since the expiry of the TRI or SFI certificate; and
    - (iii) the technical elements of the TRI or SFI training course, as determined by the assessment of the candidate by the ATO;
  - (2) the ATO should also consider the elements defined in point (a) above to determine the refresher training needed; and
  - (3) once the ATO has determined the needs of the applicant, it should develop an individual training programme that should be based on the content of the TRI or SFI training course and focus on the aspects where the applicant has the greatest needs.
- (c) After successful completion of the seminar or refresher training, as applicable, the ATO should:
- (1) in case of a seminar, in accordance with point (a), issue the applicant with a seminar completion certificate or another document specified by the Authority, which describes the content of the seminar as in point (a), as well as a statement that the seminar was successfully completed; and
  - (2) in case of refresher training, in accordance with point (b), issue the applicant with a training completion certificate or another document specified by the Authority, which describes the evaluation of the factors listed in point (b)(1) and the training received, as well as a statement that the training



was successfully completed; the training completion certificate should be presented to the examiner prior to the assessment of competence.

- (d) Upon successful completion of the seminar or refresher training, as applicable, the ATO should submit the seminar or training completion certificate, or the other document specified by the Authority, to the Authority.

## **SECTION 5 – SPECIFIC REQUIREMENTS FOR THE CLASS RATING IN- STRUCTOR – CRI**

### **FCL.905.CRI CRI – Privileges and conditions**

- (a) The privileges of a CRI are to instruct for:
  - (1) the issue, revalidation or renewal of a class or type rating for single-pilot aeroplanes, except for single-pilot high performance complex aeroplanes, when the privileges sought by the applicant are to fly in single-pilot operations;
  - (2) a towing or aerobatic rating for the aeroplane category, provided that the CRI holds the relevant rating and has demonstrated the ability to instruct for that rating to an FI qualified in accordance with point FCL.905.FI(j);
  - (3) extension of LAPL(A) privileges to another class or variant of aeroplane.
- (b) The privileges of a CRI are restricted to the class or type of aeroplane in which the instructor assessment of competence was taken. The privileges of the CRI shall be extended to further classes or types when the CRI has completed, within the last 12 months:
  - (1) 15 hours flight time as PIC on aeroplanes of the applicable class or type of aeroplane;
  - (2) one training flight from the right hand seat under the supervision of another CRI or FI qualified for that class or type occupying the other pilot's seat.
- (ba) The privileges of CRIs are to instruct for class and type ratings for single-pilot aeroplanes, except for single-pilot high-performance complex aeroplanes, in multi-pilot operations, provided that CRIs meet any of the following conditions:
  - (1) hold or have held a TRI certificate for multi-pilot aeroplanes;
  - (2) have at least 500 hours on aeroplanes in multi-pilot operations and completed an MCCI training course in accordance with point FCL.930.MCCI.
- (c) Applicants for a CRI for multi-engine aeroplanes holding a CRI certificate for single-engine aeroplanes shall have fulfilled the prerequisites for a CRI established in FCL.915.CRI(a) and the requirements of FCL.930.CRI(a)(3) and FCL.935.

### **FCL.915.CRI CRI – Prerequisites**

An applicant for a CRI certificate shall have completed at least:

- (a) for multi-engine aeroplanes:
  - (1) 500 hours flight time as a pilot on aeroplanes;
  - (2) 30 hours as PIC on the applicable class or type of aeroplane;
- (b) for single-engine aeroplanes:
  - (1) 300 hours flight time as a pilot on aeroplanes;
  - (2) 30 hours as PIC on the applicable class or type of aeroplane.

### **FCL.930.CRI CRI – Training course**

- (a) The training course for the CRI shall include, at least:
  - (1) 25 hours of teaching and learning instruction;
  - (2) 10 hours of technical training, including revision of technical knowledge, the preparation of lesson plans and the development of classroom/simulator instructional skills;
  - (3) 5 hours of flight instruction on multi-engine aeroplanes or an FSTD representing that class or type of aeroplane, including at least 3 hours on the aeroplane, or at least 3 hours of flight instruction on single-engine aeroplanes, given by an FI(A) qualified in accordance with point FCL.905.FI(j).
- (b) Applicants holding or having held an instructor certificate shall be fully credited towards the requirement of (a)(1).

### **AMC1 FCL.930.CRI CRI Training course**

#### **GENERAL**

- (a) The aim of the CRI training course is to train aircraft licence holders to the level of competence defined in FCL.920 and adequate to a CRI.
- (b) The training course should be designed to give adequate training to the applicant in theoretical knowledge instruction, flight instruction and FSTD instruction to

instruct for any class or type rating, except for single-pilot high-performance complex aeroplanes, for which the applicant is qualified.

- (c) The flight training should be aimed at ensuring that the applicant is able to teach the air exercises safely and efficiently to students undergoing a course of training for the issue of a class or type rating, except for single-pilot high-performance complex aeroplanes.
- (d) It is to be noted that airmanship is a vital ingredient of all flight operations. Therefore, in the following air exercises the relevant aspects of airmanship are to be stressed at the appropriate times during each flight.
- (e) The student instructor should learn how to identify common errors and how to correct them properly, which should be emphasised at all times.

## **CONTENT**

- (f) The training course consists of three parts:
  - (1) Part 1: teaching and learning that should be in accordance with AMC1 FCL.920;
  - (2) Part 2: technical theoretical knowledge instruction (technical training);
  - (3) Part 3: flight instruction.

### **Part 1**

The content of the teaching and learning part of the FI training course, as established in AMC1 FCL.930.FI, should be used as guidance to develop the course syllabus.

### **Part 2**

- (a) The technical theoretical-knowledge instruction should comprise at least 10 hours of training to include the revision of technical knowledge, preparation of lesson plans, and development of classroom instructional skills to enable the CRI to teach the technical theoretical-knowledge syllabus.
- (b) The type or class rating theoretical syllabus should be used to develop the CRI teaching skills in relation to the type or class technical course syllabus. The course instructor should deliver example lectures from the applicable type or class technical syllabus. The candidate instructor should prepare and deliver lectures on topics that are selected by the course instructor from the type/class rating course and the generic topics listed further below.

- (c) The 10 hours of technical theoretical-knowledge instruction should develop the applicant's ability to teach a student the knowledge and understanding that are required for the relevant air exercises for either SE or ME aeroplanes, depending on the privileges sought by the candidate.
- (d) If CRI privileges for both SE and ME aeroplanes are sought, the applicant should complete 10 hours of technical theoretical-knowledge instruction related to SE and ME aeroplanes each.
- (e) This following syllabus of general subjects concerns training only on ME aeroplanes.

### **GENERAL SUBJECTS**

- (a) Air legislation:
  - (1) aeroplane performance group definitions;
  - (2) methods of factoring gross performance.
- (b) Asymmetric power flight;
- (c) Principles of flight;
- (d) The problems:
  - (1) asymmetry;
  - (2) control;
  - (3) performance;
- (e) The forces and couples:
  - (1) offset thrust line;
  - (2) asymmetric blade effect;
  - (3) offset drag line;
  - (4) failed engine propeller drag;
  - (5) total drag increase;
  - (6) asymmetry of lift;

- (7) uneven propeller slipstream effect;
  - (8) effect of yaw in level and turning flight;
  - (9) thrust and rudder side force couples;
  - (10) effect on moment arms.
- (f) Control in asymmetric power flight:
- (1) use, misuse and limits of:
    - (i) rudder;
    - (ii) aileron;
    - (iii) elevators.
  - (2) effect of bank or sideslip and balance;
  - (3) decrease of aileron and rudder effectiveness;
  - (4) fin stall possibility;
  - (5) effect of IAS and thrust relationship;
  - (6) effect of residual unbalanced forces;
  - (7) foot loads and trimming.
- (g) Minimum control and safety speeds:
- (1) minimum control speed ( $v_{mc}$ );
  - (2) definition;
  - (3) origin;
  - (4) factors affecting ( $v_{mc}$ ):
    - (i) thrust;
    - (ii) mass and centre of gravity position;
    - (iii) altitude;

- (iv) landing gear;
  - (v) flaps;
  - (vi) cowl flaps or cooling gills;
  - (vii) turbulence or gusts;
  - (viii) pilot reaction or competence;
  - (ix) banking towards the operating engine;
  - (x) drag;
  - (xi) feathering;
  - (xii) critical engine.
- (5) take-off safety speed;
- (6) definition or origin of  $v_2$ ;
- (7) other relevant v codes;
- (h) Aeroplane performance: one engine inoperative:
  - (1) effect on excess power available;
  - (2) SE ceiling;
  - (3) cruising, range and endurance;
  - (4) acceleration and deceleration;
  - (5) zero thrust, definition and purpose;
- (i) Propellers:
  - (1) variable pitch: general principles;
  - (2) feathering and un-feathering mechanism and limitations (for example minimum RPM);
- (j) Specific aeroplane type;
- (k) Aeroplane and engine systems:

- (1) operation normal;
  - (2) operation abnormal;
  - (3) emergency procedures.
- (l) Limitations: airframe:
  - (1) load factors;
  - (2) landing gear and flap limiting speeds ( $v_{lo}$  and  $v_{fe}$ );
  - (3) rough air speed ( $v_{ra}$ );
  - (4) maximum speeds ( $v_{no}$  and  $v_{ne}$ ).
- (m) Limitations: engine:
  - (1) RPM and manifold pressure;
  - (2) oil temperature and pressure;
  - (3) emergency procedures.
- (n) Mass and balance:

(to be covered in conjunction with the flight manual or equivalent document (for example owner's manual or pilot's operating handbook))

  - (1) mass and balance documentation for aeroplane type;
  - (2) revision of basic principles;
  - (3) calculations for specific aeroplane type.
- (o) Mass and performance:

(to be covered in conjunction with the flight manual or equivalent document (for example owner's manual or pilot's operating handbook))

  - (1) calculations for specific aeroplane type (all engines operating);
  - (2) take-off run;
  - (3) take-off distance;



- (4) accelerate and stop distance;
- (5) landing distance;
- (6) landing run;
- (7) take-off or climb out flight path;
- (8) calculations for specific aeroplane type (one engine operating);
- (9) climb out flight path;
- (10) landing distance;
- (11) landing run.

### **Part 3**

#### **FLIGHT INSTRUCTION SYLLABUS: NORMAL FLIGHT**

- (a) This MCAR is similar to the air exercise sections of the SE FI course, including 'Introduction to instrument flying' except that the objectives, airmanship considerations and common errors are related to the operation of an ME aeroplane.
- (b) The purpose of this MCAR is to acquaint the applicant with the teaching aspects of the operational procedures and handling of an ME aeroplane with all engines functioning.
- (c) The following items should be covered:
  - (1) aeroplane familiarisation;
  - (2) pre-flight preparation and aeroplane inspection;
  - (3) engine starting procedures;
  - (4) taxiing;
  - (5) pre take-off procedures;
  - (6) the take-off and initial climb:
    - (i) into wind;
    - (ii) crosswind;

- (iii) short field.
- (7) climbing;
- (8) straight and level flight;
- (9) descending (including emergency descent procedures);
- (10) turning;
- (11) slow flight;
- (12) stalling and recoveries;
- (13) instrument flight: basic;
- (14) emergency drills (not including engine failure);
- (15) circuit, approach and landing:
  - (i) into wind;
  - (ii) crosswind;
  - (iii) short field;
- (16) mislanding and going round again;
- (17) actions after flight.

## **AIR EXERCISES**

- (d) The syllabus for CRI SE and ME training courses should comprise air exercises 1 to 4 and should not last less than 3 hours. In addition, the syllabus for a CRI ME training course should also include air exercise 5 to address asymmetric power flight and should not last less than 2 hours.

## **EXERCISE 1: FAMILIARISATION WITH THE AEROPLANE**

- (a) Long briefing objectives:
  - (1) introduction to the aeroplane;
  - (2) explanation of the cockpit layout;
  - (3) systems and controls;

- (4) aeroplane power plant;
- (5) checklists and drills;
- (6) differences when occupying the instructor's seat;
- (7) emergency drills:
  - (i) action in event of fire in the air and on the ground;
  - (ii) escape drills: location of exits and use of emergency equipment (for example fire extinguishers, etc.).
- (8) pre-flight preparation and aeroplane inspection:
  - (i) aeroplane documentation;
  - (ii) external checks;
  - (iii) internal checks;
  - (iv) harness, seat or rudder pedal adjustment;
- (9) engine starting procedures:
  - (i) use of checklists;
  - (ii) checks before starting;
  - (iii) checks after starting.
- (b) Air exercise:
  - (1) external features;
  - (2) cockpit layout;
  - (3) aeroplane systems;
  - (4) checklists and drills;
  - (5) action if fire in the air and on the ground;
    - (i) engine;
    - (ii) cabin;

- (iii) electrical.
- (6) systems failure (as applicable to type);
- (7) escape drills (location and use of emergency equipment and exits);
- (8) preparation for and action after flight:
  - (i) flight authorisation and aeroplane acceptance;
  - (ii) technical log or certificate of maintenance release;
  - (iii) mass and balance and performance considerations;
  - (iv) external checks;
  - (v) internal checks, adjustment of harness or rudder pedals;
  - (vi) starting and warming up engines;
  - (vii) checks after starting;
  - (viii) radio navigation and communication checks;
  - (ix) altimeter checks and setting procedures;
  - (x) power checks;
  - (xi) running down and switching off engines;
  - (xii) completion of authorisation sheet and aeroplane serviceability documents.

## **EXERCISE 2: TAXIING**

- (a) Long briefing objectives:
  - (1) pre-taxiing area precautions (greater mass: greater inertia);
  - (2) effect of differential power;
  - (3) precautions on narrow taxiways;
  - (4) pre take-off procedures:
    - (i) use of checklist;

- (ii) engine power checks;
  - (iii) pre take-off checks;
  - (iv) instructor's briefing to cover the procedure to be followed should an emergency occur during take-off, for example engine failure.
- (5) the take-off and initial climb:
  - (i) ATC considerations;
  - (ii) factors affecting the length of the take-off run or distance;
  - (iii) correct lift-off speed;
  - (iv) importance of safety speed;
  - (v) crosswind take-off, considerations and procedures;
  - (vi) short field take-off, considerations and procedures;
  - (vii) engine handling after take-off: throttle, pitch and engine synchronisation.
- (6) climbing:
  - (i) pre-climbing checks;
  - (ii) engine considerations (use of throttle or pitch controls);
  - (iii) maximum rate of climb speed;
  - (iv) maximum angle of climb speed;
  - (v) synchronising the engines.
- (b) Air exercise
  - (1) pre-taxing checks;
  - (2) starting, control of speed and stopping;
  - (3) control of direction and turning;
  - (4) turning in confined spaces;

- (5) leaving the parking area;
- (6) freedom of rudder movement (importance of pilot ability to use full rudder travel);
- (7) instrument checks;
- (8) emergencies (brake or steering failure);
- (9) pre take-off procedures:
  - (i) use of checklist;
  - (ii) engine power and system checks;
  - (iii) pre take-off checks;
  - (iv) instructor's briefing if emergencies during take-off.
- (10) the take-off and initial climb:
  - (i) ATC considerations;
  - (ii) directional control and use of power;
  - (iii) lift-off speed;
  - (iv) crosswind effects and procedure;
  - (v) short field take-off and procedure.
  - (vi) procedures after take-off (at an appropriate stage of the course):
    - (A) landing gear retraction;
    - (B) flap retraction (as applicable);
    - (C) selection of manifold pressure and RPM;
    - (D) engine synchronisation;
    - (E) other procedures (as applicable).
- (11) climbing:
  - (i) pre-climbing checks;

- (ii) power selection for normal and maximum rate climb;
- (iii) engine and RPM limitations;
- (iv) effect of altitude on manifold pressure, full throttle;
- (v) levelling off: power selection;
- (vi) climbing with flaps down;
- (vii) recovery to normal climb;
- (viii) en-route climb (cruise climb);
- (ix) maximum angle of climb;
- (x) altimeter setting procedures;
- (xi) prolonged climb and use of cowl flaps or cooling gills;
- (xii) instrument appreciation.

### **EXERCISE 3: STRAIGHT AND LEVEL FLIGHT**

- (a) Long briefing objectives:
  - (1) selection of power: throttle or pitch controls;
  - (2) engine synchronisation;
  - (3) fuel consumption aspects;
  - (4) use of trimming controls: elevator and rudder (aileron as applicable);
  - (5) operation of flaps:
    - (i) effect on pitch attitude;
    - (ii) effect on air speed.
  - (6) operation of landing gear:
    - (i) effect on pitch attitude;
    - (ii) effect on air speed.

- (7) use of mixture controls;
- (8) use of alternate air or carburettor heat controls;
- (9) operation of cowl flaps or cooling gills;
- (10) use of cabin ventilation and heating systems;
- (11) operation and use of the other systems (as applicable to type);
- (12) descending:
  - (i) pre-descent checks;
  - (ii) normal descent;
  - (iii) selection of throttle or pitch controls;
  - (iv) engine cooling considerations;
  - (v) emergency descent procedure.
- (13) turning:
  - (i) medium turns;
  - (ii) climbing and descending turns;
  - (iii) steep turns (45 ° of bank or more).
- (b) Air exercise:
  - (1) at normal cruising power:
    - (i) selection of cruise power;
    - (ii) manifold pressure or RPM;
    - (iii) engine synchronisation;
    - (iv) use of trimming controls;
    - (v) performance considerations: range or endurance.
  - (2) instrument appreciation;



- (3) operation of flaps (in stages):
  - (i) air speed below vfe;
  - (ii) effect on pitch attitude;
  - (iii) effect on air speed.
- (4) operation of landing gear:
  - (i) air speed below v<sub>lo</sub> / v<sub>le</sub>;
  - (ii) effect on pitch attitude;
  - (iii) effect on air speed.
- (5) use of mixture controls;
- (6) use of alternate air or carburettor control;
- (7) operation of cowl flaps or cooling gills;
- (8) operation of cabin ventilation or heating systems;
- (9) operation and use of other systems (as applicable to type);
- (10) descending;
  - (i) pre-descent checks;
  - (ii) power selection: manifold pressure or RPM;
  - (iii) powered descent (cruise descent);
  - (iv) engine cooling considerations: use of cowl flaps or cooling gills;
  - (v) levelling off;
  - (vi) descending with flaps down;
  - (vii) descending with landing gear down;
  - (viii) altimeter setting procedure;
  - (ix) instrument appreciation;

- (x) emergency descent:
  - (A) as applicable to type;
  - (B) limitations in turbulence vno.
- (11) turning:
  - (i) medium turns;
  - (ii) climbing and descending turns;
  - (iii) steep turns: 45 ° of bank;
  - (iv) instrument appreciation.

#### **EXERCISE 4: SLOW FLIGHT**

- (a) Long briefing objectives:
  - (1) aeroplane handling characteristics during slow flight: flight at  $V_{S1}$  and  $V_{SO} + 5$  knots;
  - (2) simulated go-around from slow flight:
    - (i) at  $V_{SSE}$  with flaps down;
    - (ii) note pitch trim change.
  - (3) stalling:
    - (i) power selection;
    - (ii) symptoms approaching the stall;
    - (iii) full stall characteristics;
    - (iv) recovery from the full stall;
    - (v) recovery at the incipient stall;
    - (vi) stalling and recovery in the landing configuration;
    - (vii) recovery at the incipient stage in the landing configuration.
  - (4) instrument flight (basic):

- (i) straight and level;
  - (ii) climbing;
  - (iii) turning;
  - (iv) descending.
- (5) emergency drills (not including engine failure), as applicable to type;
- (6) circuit approach and landing:
  - (i) downwind leg:
    - (A) air speed below vfe;
    - (B) use of flaps (as applicable);
    - (C) pre-landing checks;
    - (D) position to turn onto base leg.
  - (ii) base leg:
    - (A) selection of power (throttle or pitch), flaps and trimming controls;
    - (B) maintenance of correct air speed.
  - (iii) final approach:
    - (A) power adjustments (early reaction to undershooting);
    - (B) use of additional flaps (as required);
    - (C) confirmation of landing gear down;
    - (D) selection 'touch down' point;
    - (E) air speed reduction to Vat;
    - (F) maintenance of approach path.
  - (iv) landing:
    - (A) greater sink rate;

- (B) longer landing distance and run;
  - (C) crosswind approach and landing;
  - (D) crosswind considerations;
  - (E) short field approach and landing;
  - (F) short field procedure: considerations.
- (b) Air exercise
- (1) safety checks;
  - (2) setting up and maintaining (flaps up);
    - (i)  $v_{s1} + 5$  knots;
    - (ii) note aeroplane handling characteristics.
  - (3) setting up and maintaining (flaps down):
    - (i)  $v_{so} + 5$  knots;
    - (ii) note aeroplane handling characteristics.
  - (4) simulated go-around from a slow flight with flaps:
    - (i) down and air speed not below  $V_{sse}$ , for example air speed at  $V_{sse}$  or  $v_{mca} + 10$  knots;
    - (ii) increase to full power and enter a climb;
    - (iii) note pitch change.
  - (5) resume normal flight.
  - (6) stalling;
    - (i) selection of RPM;
    - (ii) stall symptoms;
    - (iii) full stall characteristics;
    - (iv) recovery from the full stall: care in application of power;

- (v) recovery at the incipient stage;
- (vi) stalling and recovery in landing configuration;
- (vii) stall recovery at the incipient stage in the landing configuration.
- (7) instrument flight (basic):
  - (i) straight and level;
  - (ii) climbing;
  - (iii) turning;
  - (iv) descending.
- (8) emergency drills (not including engine failure), as applicable to type;
- (9) circuit, approach and landing:
  - (i) downwind leg:
    - (A) control of speed (below vfe);
    - (B) flaps as applicable;
    - (C) pre-landing checks;
    - (D) control of speed and height;
    - (E) base leg turn.
  - (ii) base leg:
    - (A) power selection;
    - (B) use of flap and trimming controls;
    - (C) maintenance of correct air speed.
  - (iii) final approach:
    - (A) use of additional flap (as required);
    - (B) confirmation of landing gear down;

- (C) selection of touchdown point;
- (D) air speed reduction to  $V_{at}$ ;
- (E) maintaining correct approach path: use of power.
- (iv) landing:
  - (A) control of sink rate during flare;
  - (B) crosswind considerations;
  - (C) longer landing roll;
  - (D) short or soft field approach and landing;
  - (E) considerations and precautions.
- (10) Asymmetric power flight.

During this part, special emphasis is to be placed on the:

  - (i) circumstances in which actual feathering and un-feathering practice will be done, for example safe altitude; compliance with regulations about minimum altitude or height for feathering practice, weather conditions, distance from nearest available aerodrome;
  - (ii) procedure to use for instructor and student co-operation, for example the correct use of touch drills and the prevention of misunderstandings, especially during feathering and unfeathering practice and when zero thrust is being used for asymmetric circuits. This procedure is to include positive agreement as to which engine is being shut down or re-started or set at zero thrust and identifying each control and naming the engine it is going to affect;
  - (iii) consideration to be given to avoid over-working the operating engine, and the degraded performance when operating the aeroplane during asymmetric flight;
  - (iv) need to use the specific checklist for the aeroplane type.

### **EXERCISE 5: FLIGHT ON ASYMMETRIC POWER**

- (a) Long briefing objectives:

- (1) introduction to asymmetric flight:
- (2) feathering the propeller: method of operation;
- (3) effects on aeroplane handling at cruising speed;
- (4) introduction to effects upon aeroplane performance;
- (5) note foot load to maintain a constant heading (no rudder trim);
- (6) un-feathering the propeller;
- (7) return to normal flight finding the zero thrust setting;
- (8) comparison of foot load when feathered and with zero thrust set.
- (9) effects and recognition of engine failure in level flight;
- (10) forces and the effects of yaw;
- (11) types of failure:
  - (i) sudden or gradual;
  - (ii) complete or partial.
- (12) yaw, direction and further effects of yaw;
- (13) flight instrument indications;
- (14) identification of failed engine;
- (15) the couples and residual out of balance forces: resultant flight attitude;
- (16) use of rudder to counteract yaw;
- (17) use of aileron: dangers of misuse;
- (18) use of elevator to maintain level flight;
- (19) use of power to maintain a safe air speed and altitude;
- (20) supplementary recovery to straight and level flight: simultaneous increase of speed and reduction in power;
- (21) identification of failed engine: idle leg = idle engine;

- (22) use of engine instruments for identification:
  - (i) fuel pressure or flow;
  - (ii) RPM gauge response effect of CSU action at lower and higher air speed;
  - (iii) engine temperature gauges.
- (23) confirmation of identification: close the throttle of identified failed engine;
- (24) effects and recognition of engine failure in turns;
- (25) identification and control;
- (26) side forces and effects of yaw.
- (27) During turning flight:
  - (i) effect of 'inside' engine failure: effect sudden and pronounced;
  - (ii) effect of 'outside' engine failure: effect less sudden and pronounced;
  - (iii) the possibility of confusion in identification (particularly at low power):
    - (A) correct use of rudder;
    - (B) possible need to return to lateral level flight to confirm correct identification.
  - (iv) visual and flight instrument indications;
  - (v) effect of varying speed and power;
  - (vi) speed and thrust relationship;
  - (vii) at normal cruising speed and cruising power: engine failure clearly recognised;
  - (viii) at low safe speed and climb power: engine failure most positively recognised;
  - (ix) high speed descent and low power: possible failure to notice asymmetry (engine failure).
- (28) Minimum control speeds:



- (i) ASI colour coding: red radial line.

Note: this exercise is concerned with the ultimate boundaries of controllability in various conditions that a student can reach in a steady asymmetric power state, approached by a gradual speed reduction. Sudden and complete failure should not be given at the Flight Manual vmca. The purpose of the exercise is to continue the gradual introduction of a student to control an aeroplane in asymmetric power flight during extreme or critical situations. It is not a demonstration of vmca.

- (ii) Techniques for assessing critical speeds with wings level and recovery: dangers involved when minimum control speed and the stalling speed are very close: use of Vsse;
- (iii) Establish a minimum control speed for each asymmetrically disposed engine to establish critical engine (if applicable);
- (iv) Effects on minimum control speeds of:
  - (A) bank;
  - (B) zero thrust setting;
  - (C) take-off configuration:
    - (a) landing gear down and take-off flap set;
    - (b) landing gear up and take-off flap set.

Note: it is important to appreciate that the use of 5 ° of bank towards the operating engine produces a lower vmca and also a better performance than that obtained with the wings held level. It is now normal for manufacturers to use 5 ° of bank in this manner when determining the vmca for the specific type. Thus, the vmca quoted in the aeroplane manual will have been obtained using the technique.

- (29) Feathering and un-feathering:

- (i) minimum heights for practising feathering or un-feathering drills;
- (ii) engine handling: precautions (overheating, icing conditions, priming, warm-up, method of simulating engine failure: reference to aircraft engine manual and service instructions and bulletins).

(30) Engine failure procedure:

- (i) once the maintenance of control has been achieved, the order in which the procedures are carried out will be determined by the phase of operation and the aircraft type.
- (ii) flight phase:
  - (A) in cruising flight;
  - (B) critical phase such as immediately after take-off or during the approach to landing or during a go-around.

(31) Aircraft type:

Variations will inevitably occur in the order of certain drills and checks due to differences between aeroplane types and perhaps between models of the same type, and the flight manual or equivalent document (for example owner's manual or pilot's operating handbook) is to be consulted to establish the exact order of these procedures.

For example, one flight manual or equivalent document (for example owner's manual or pilot's operating handbook) may call for the raising of flaps and landing gear before feathering, whilst another may recommend feathering as a first step. The reason for this latter procedure could be due to the fact that some engines cannot be feathered if the RPM drops below a certain figure.

Again, in some aeroplanes, the raising of the landing gear may create more drag during retraction due to the transient position of the landing gear doors and as a result of this retraction would best be left until feathering has been accomplished and propeller drag reduced.

Therefore, the order in which the drills and checks are shown in this syllabus under 'immediate actions' and 'subsequent actions' are to be used as a general guide only and the exact order of precedence is determined by reference to the flight manual or equivalent document (for example owner's manual or pilot's operating handbook) for the specific aeroplane type being used on the course.

(32) In-flight engine failure in cruise or other flight phase not including take-off or landing:

- (i) immediate actions:

- (A) recognition of asymmetric condition and control of the aircraft;
  - (B) identification and confirmation of failed engine:
    - (a) idle leg = idle engine;
    - (b) closing of throttle for confirmation.
  - (C) cause and fire check:
    - (a) typical reasons for failure;
    - (b) methods of rectification.
  - (D) feathering decision and procedure:
    - (a) reduction of other drag;
    - (b) need for speed but not haste;
    - (c) use of rudder trim.
- (ii) subsequent actions;
- (A) live engine:
    - (a) temperature, pressures and power;
    - (b) remaining services;
    - (c) electrical load: assess and reduce as necessary;
    - (d) effect on power source for air driven instruments;
    - (e) landing gear;
    - (f) flaps and other services.
  - (B) re-plan flight:
    - (a) ATC and weather;
    - (b) terrain clearance, SE cruise speed;
    - (c) decision to divert or continue.

- (C) fuel management: best use of remaining fuel;
  - (D) dangers of re-starting damaged engine;
  - (E) action if unable to maintain altitude: effect of altitude on power available;
  - (F) effects on performance;
  - (G) effects on power available and power required;
  - (H) effects on various airframe configuration and propeller settings;
  - (I) use of flight manual or equivalent document (for example owner's manual or pilot's operating handbook):
    - (a) cruising;
    - (b) climbing: ASI colour coding (blue line);
    - (c) descending;
    - (d) turning.
  - (J) 'live' engine limitations and handling;
  - (K) take-off and approach: control and performance.
- (33) Significant factors:
- (i) significance of take-off safety speed:
    - (A) effect of landing gear, flap, feathering, take-off, trim setting, systems for operating landing gear and flaps;
    - (B) effect on mass, altitude and temperature (performance).
  - (ii) significance of best SE climb speed ( $V_{yse}$ ):
    - (A) acceleration to best engine climb speed and establishing a positive climb;
    - (B) relationship of SE climb speed to normal climb speed;
    - (C) action if unable to climb.

- (iii) significance of asymmetric committal height and speed: action if baulked below asymmetric committal height.
- (34) Engine failure during take-off:
  - (i) below vmca or unstick speed:
    - (A) accelerate or stop distance considerations;
    - (B) prior use of flight manual data if available.
  - (ii) above vmca or unstick speed and below safety speed;
  - (iii) immediate re-landing or use of remaining power to achieve forced landing;
  - (iv) considerations:
    - (A) degree of engine failure;
    - (B) speed at the time;
    - (C) mass, altitude and temperature (performance);
    - (D) configuration;
    - (E) length of runway remaining;
    - (F) position of any obstacles ahead.
- (35) Engine failure after take-off:
  - (i) simulated at a safe height and at or above take-off safety speed;
  - (ii) considerations:
    - (A) need to maintain control;
    - (B) use of bank towards operating engine;
    - (C) use of available power achieving best SE climb speed;
    - (D) mass, altitude, temperature (performance);
    - (E) effect of prevailing conditions and circumstances.

- (36) Immediate actions: maintenance of control, including air speed and use of power:
- (i) recognition of asymmetric condition;
  - (ii) identification and confirmation of failed engine;
  - (iii) feathering and removal of drag (procedure for type);
  - (iv) establishing best SE climb speed.
- (37) Subsequent actions: whilst carrying out an asymmetric power climb to the downwind position at SE best rate of climb speed:
- (i) cause and fire check;
  - (ii) live engine, handling considerations;
  - (iii) remaining services;
  - (iv) ATC liaison;
  - (v) fuel management.

Note: these procedures are applicable to aeroplane type and flight situation.

- (38) Significance of asymmetric committal height:
- (i) Asymmetric committal height is the minimum height needed to establish a positive climb whilst maintaining adequate speed for control and removal of drag during an approach to a landing.

Because of the significantly reduced performance of many CS/JAR/FAR 23 aeroplanes when operating on one engine, consideration is to be given to a minimum height from which it would be safely possible to attempt a go-around procedure, during an approach when the flight path will have to be changed from a descent to a climb with the aeroplane in a high drag configuration.

Due to the height loss which will occur during the time that the operating engine is brought up to full power, landing gear and flap retracted, and the aeroplane established in a climb at *vy* a minimum height (often referred to as 'Asymmetric committal height') is to be selected, below which the pilot should not attempt to take the aeroplane round again for another circuit. This height will be

compatible with the aeroplane type, all up weight, altitude of the aerodrome being used, air temperature, wind, the height of obstructions along the climb out path, and pilot competence.

- (ii) circuit approach and landing on asymmetric power:
    - (A) definition and use of asymmetric committal height;
    - (B) use of standard pattern and normal procedures;
    - (C) action if unable to maintain circuit height;
    - (D) speed and power settings required;
    - (E) decision to land or go-around at asymmetric committal height: factors to be considered.
  - (iii) undershooting importance of maintaining correct air speed (not below vyse).
- (39) Speed and heading control:
- (i) height, speed and power relationship: need for minimum possible drag;
  - (ii) establishing positive climb at best SE rate of climb speed:
    - (A) effect of availability of systems, power for flap and landing gear;
    - (B) operation and rapid clean up.

Note 1: The air speed at which the decision is made to commit the aeroplane to a landing or to go-around should normally be the best SE rate of climb speed and in any case not less than the safety speed.

Note 2: On no account should instrument approach 'decision height' and its associated procedures be confused with the selection of minimum height for initiating a go-around in asymmetric power flight.

- (40) Engine failure during an all engines approach or missed approach:
- (i) use of asymmetric committal height and speed considerations;
  - (ii) speed and heading control;

- (iii) decision to attempt a landing, go-around or force land as circumstances dictate.

Note: at least one demonstration and practice of engine failure in this situation should be performed during the course.

(41) Instrument flying on asymmetric power:

- (i) considerations relating to aircraft performance during:
  - (A) straight and level flight;
  - (B) climbing and descending;
  - (C) standard rate turns;
  - (D) level, climbing and descending turns including turns onto preselected headings.
- (ii) availability of vacuum operated instruments;
- (iii) availability of electrical power source.

(b) Air exercise

This section covers the operation of a SP ME aeroplane when one engine has failed and it is applicable to all such light piston aeroplanes. Checklists should be used as applicable.

- (1) introduction to asymmetric flight;
- (2) close the throttle of one engine;
- (3) feather its propeller;
- (4) effects on aeroplane handling at cruising speed;
- (5) effects on aeroplane performance for example cruising speed and rate of climb;
- (6) note foot load to maintain a constant heading;
- (7) un-feather the propeller;
- (8) return to normal flight finding the zero thrust throttle setting;



- (9) comparison of foot load when feathered and with zero thrust set.
- (10) effects and recognition of engine failure in level flight with the aeroplane straight and level at cruise speed:
  - (i) slowly close the throttle of one engine;
  - (ii) note yaw, roll and spiral descent.
- (11) return to normal flight:
  - (i) close throttle of other engine;
  - (ii) note same effects in opposite direction.
- (12) methods of control and identification of failed engine close one throttle and maintain heading and level flight by use of:
  - (i) rudder to control yaw;
  - (ii) aileron to hold wings level;
  - (iii) elevators to maintain level flight;
  - (iv) power (as required) to maintain air speed and altitude.
- (13) alternative or supplementary method of control:
  - (i) simultaneously;
  - (ii) lower aeroplane nose to increase air speed;
  - (iii) reduce power;
  - (iv) loss of altitude: inevitable.
- (14) identification of failed engine: idle foot = idle engine;
- (15) use of instruments for identification:
  - (i) fuel pressure or fuel flow;
  - (ii) RPM gauge or CSU action may mask identification;
  - (iii) engine temperature gauges.

- (16) confirmation of identification: close the throttle of the identified failed engine;
- (17) effects and recognition of engine failure in turns and effects of 'inside' engine failure:
  - (i) more pronounced yaw;
  - (ii) more pronounced roll;
  - (iii) more pronounced pitch down.
- (18) effects of 'outside' engine failure:
  - (i) less pronounced yaw;
  - (ii) less pronounced roll;
  - (iii) less pronounced pitch down.
- (19) possibility of confusion in identification:
  - (i) use of correct rudder application;
  - (ii) return to lateral level flight if necessary.
- (20) flight instrument indications;
- (21) effect of varying speed and power;
- (22) failure of one engine at cruise speed and power: engine failure clearly recognised;
- (23) failure of one engine at low speed and high power (not below  $v_{sse}$ ): engine failure most positively recognised;
- (24) failure of one engine at higher speeds and low power: possible failure to recognise engine failure;
- (25) minimum control speeds;
- (26) establish the  $v_{yse}$ :
  - (i) select maximum permitted manifold pressure and RPM;
  - (ii) close the throttle on one engine;

- (iii) raise the aeroplane nose and reduce the air speed;
- (iv) note the air speed when maximum rudder deflection is being applied and when directional control can no longer be maintained;
- (v) lower the aeroplane nose and reduce power until full directional control is regained;
- (vi) the lowest air speed achieved before the loss of directional control will be the  $V_{mc}$  for the flight condition;
- (vii) repeat the procedure closing the throttle of the other engine;
- (viii) the higher of these two air speeds will identify the most critical engine to fail.

Note: warning - in the above situations the recovery is to be initiated immediately before directional control is lost with full rudder applied, or when a safe margin above the stall remains, for example when the stall warning device operates, for the particular aeroplane configuration and flight conditions. On no account should the aeroplane be allowed to decelerate to a lower air speed.

- (27) establish the effect of using  $5^\circ$  of bank at  $v_{mc}$ :
  - (i) close the throttle of one engine;
  - (ii) increase to full power on the operating engine;
  - (iii) using  $5^\circ$  of bank towards the operating engine reduce speed to the  $V_{mc}$ ;
  - (iv) note lower  $V_{mc}$  when  $5^\circ$  of bank is used.
- (28) 'in-flight' engine failure procedure;
- (29) in cruise and other flight circumstances not including take-off and landing.
- (30) Immediate actions: maintenance of control including air speed and use of power:
  - (i) identification and confirmation of failed engine;
  - (ii) failure cause and fire check;

- (iii) feathering decision and implementation;
  - (iv) reduction of any other drag, for example flaps, cowl flaps etc.;
  - (v) retrim and maintain altitude.
- (31) Subsequent actions:
- (i) live engine:
    - (A) oil temperature, pressure, fuel flow and power;
    - (B) remaining services;
    - (C) electrical load: assess and reduce as necessary;
    - (D) effect on power source for air driven instruments;
    - (E) landing gear;
    - (F) flaps and other services.
  - (ii) re-plan flight:
    - (A) ATC and weather;
    - (B) terrain clearance;
    - (C) SE cruise speed;
    - (D) decision to divert or continue;
  - (iii) fuel management: best use of
  - (iv) dangers of re-starting damaged engine;
  - (v) action if unable to maintain altitude:
    - (A) adopt  $V_{yse}$ ;
    - (B) effect of altitude on power available.
  - (vi) effects on performance;
  - (vii) effects on power available and power required;

- (viii) effects on various airframe configurations and propeller settings;
  - (ix) use of flight manual or equivalent document (for example owner's manual or pilot's operating handbook):
    - (A) cruising;
    - (B) climbing: ASI colour coding (blue line);
    - (C) descending;
    - (D) turning.
  - (x) 'live' engine limitations and handling;
  - (xi) take-off and approach: control and handling;  
Note: to be done at a safe height away from the circuit;
  - (xii) take-off case with landing gear down and take-off flap set (if applicable);
  - (xiii) significance of take-off at or above safety speed (at safety speed. The ability to maintain control and to accelerate to SE climb speed with aeroplane clean and zero thrust set. Thereafter to achieve a positive climb);
  - (xiv) significance of flight below safety speed (below safety speed and above vmca. A greater difficulty to maintain control, a possible loss of height whilst maintaining speed, cleaning up, accelerating to SE climb speed and establishing a positive climb);
  - (xv) significance of best SE climb speed (the ability to achieve the best rate of climb on one engine with minimum delay).
- (32) Significance of asymmetric committal height:
- (i) the ability to maintain or accelerate to the best SE rate of climb speed and to maintain heading whilst cleaning up with perhaps a slight height loss before climbing away;
  - (ii) below this height, the aeroplane is committed to continue the approach to a landing.
- (33) Engine failure during take-off run and below safety speed briefing only;

(34) Engine failure after take-off;

Note: to be initiated at a safe height and at not less than take-off safety speed with due regard to the problems of a prolonged SE climb in the prevailing conditions.

(i) immediate actions:

- (A) control of direction and use of bank;
- (B) control of air speed and use of power;
- (C) recognition of asymmetric condition;
- (D) identification and confirmation of failed engine feathering and reduction of drag (procedure for type);
- (E) re-trim;

(ii) subsequent actions: whilst carrying out an asymmetric power climb to the downwind position at SE best rate of climb speed:

- (A) cause and fire check;
- (B) live engine, handling considerations;
- (C) drills and procedures applicable to aeroplane type and flight situation;
- (D) ATC liaison;
- (E) fuel management.

(35) Asymmetric circuit, approach and landing;

(i) downwind and base legs:

- (A) use of standard pattern;
- (B) normal procedures;
- (C) landing gear and flap lowering considerations;
- (D) position for base leg;
- (E) live engine handling;

- (F) air speed and power settings;
- (G) maintenance of height.
- (ii) final approach:
  - (A) asymmetric committal height drill;
  - (B) control of air speed and descent rate;
  - (C) flap considerations.
- (iii) going round again on asymmetric power (missed approach):
  - (A) not below asymmetric committal height;
  - (B) speed and heading control;
  - (C) reduction of drag, landing gear retraction;
  - (D) maintaining Vyse;
  - (E) establish positive rate of climb.
- (36) Engine failure during all engines approach or missed approach:

Note: to be started at not less than asymmetric committal height and speed and not more than part flap set:

  - (i) speed and heading control;
  - (ii) reduction of drag flap;
  - (iii) decision to attempt landing or go-around;
  - (iv) control of descent rate if approach is continued;
  - (v) if go-around is initiated, maintain vyse, flaps and landing gear retracted and establish positive rate of climb.

Note: at least one demonstration and practice of engine failure in this situation should be performed during the course.
- (37) Instrument flying on asymmetric power;
- (38) Flight instrument checks and services available:

- (i) straight and level flight;
- (ii) climbing and descending;
- (iii) standard rate turns;
- (iv) level, climbing and descending turns including turns onto preselected headings.

### **EXERCISE 5: UPRT**

Instructors should have the specific competence to provide UPRT during the type rating course, including the ability to demonstrate knowledge and understanding of the type-specific upset recovery procedures and of the recommendations that are developed by the OEMs. Therefore, during the CRI training course, the student instructor should:

- (a) be able to apply the correct upset recovery techniques for the specific aeroplane type;
- (b) understand the importance of applying type-specific OEM procedures for recovery manoeuvres;
- (c) be able to distinguish between the applicable SOPs and OEM recommendations (if available);
- (d) understand the capabilities and limitations of the FSTDs that are used for UPRT;
- (e) ensure that the training remains within the FSTD training envelope to avoid the risk of negative transfer of training;
- (f) understand and be able to use the IOS of the FSTD in the context of providing effective UPRT;
- (g) understand and be able to use the available FSTD instructor tools to provide accurate feedback on pilot performance;
- (h) understand the importance of adhering to the FSTD UPRT scenarios that are validated by the training programme developer; and
- (i) understand the missing critical human factor aspects due to the limitations of the FSTD, and convey this to the student pilot(s) receiving the training.



### **FCL.940.CRI CRI – Revalidation and renewal**

- (a) To revalidate a CRI certificate, applicants shall fulfil, within the validity period of the CRI certificate, at least two out of the following three requirements:
  - (1) conduct at least 10 hours of flight instruction as a CRI. If applicants have CRI privileges on both single-engine and multi-engine aeroplanes, those hours of flight instruction shall be equally divided between single-engine and multi-engine aeroplanes;
  - (2) complete a refresher training as a CRI at an ATO or at the Authority;
  - (3) pass the assessment of competence in accordance with point FCL.935 for multi-engine or single-engine aeroplanes, as relevant.
- (b) For at least each alternate revalidation of a CRI certificate, holders shall have complied with the requirement in point (a)(3).
- (c) Renewal

If the CRI certificate has expired, it shall be renewed if the applicants in the period of 12 months before the application for the renewal:

- (1) have completed a refresher training as a CRI at an ATO or at the Authority;
- (2) have completed the assessment of competence as required by point FCL.935.

### **AMC1 FCL.940.CRI CRI Revalidation and renewal**

#### **REFRESHER TRAINING**

- (a) Paragraph (c)(1) of FCL.940.CRI determine that an applicant for renewal of a CRI certificate shall complete refresher training as a CRI at an ATO or Authority. Paragraph (a)(2) also establishes that an applicant for revalidation of the CRI certificate that has not completed a minimum amount of instruction hours (established in paragraph (a)(1)) during the validity period of the certificate shall undertake refresher training at an ATO or Authority for the revalidation of the certificate. The amount of refresher training needed should be determined on a case by case basis by the ATO or Authority, taking into account the following factors:
  - (1) the experience of the applicant;

- (2) whether the training is for revalidation or renewal;
  - (3) the amount of time elapsed since the last time the applicant has conducted training, in the case of revalidation, or since the certificate has lapsed, in the case of renewal. The amount of training needed to reach the desired level of competence should increase with the time elapsed.
- (b) Once the ATO or Authority has determined the needs of the applicant, it should develop an individual training programme that should be based on the CRI training course and focus on the aspects where the applicant has shown the greatest needs.
- (c) After successful completion of the refresher training, as applicable, the ATO or Authority, should, in accordance with point (b), issue the applicant with a training completion certificate or another document specified by the Authority, which describes the evaluation of the factors listed in point (a)(1) (the experience of the applicant) and the training received, as well as a statement that the training was successfully completed. The training completion certificate should be presented to the examiner prior to the assessment of competence.

Upon successful completion of the refresher training, as applicable, the ATO should submit the training completion certificate, or the other document specified by the Authority, to the Authority.

## **SECTION 6 – SPECIFIC REQUIREMENTS FOR THE INSTRUMENT RATING INSTRUCTOR – IRI**

### **FCL.905.IRI IRI – Privileges and conditions**

- (a) The privileges of IRIs are to instruct for the issue, revalidation and renewal of a BIR and an IR in the appropriate aircraft category.
- (b) Specific requirements for the MPL course. To instruct for the basic phase of training on an MPL course, the IRI(A) shall:
  - (1) hold an IR for multi-engine aeroplanes; and
  - (2) have completed at least 1 500 hours of flight time in multi-crew operations.
  - (3) In the case of IRI already qualified to instruct on ATP(A) or CPL(A)/IR integrated courses, the requirement of point FCL.905.IRI(b)(2) may be replaced by the completion of the course provided for in point FCL.905.FI(k)(3).

### **FCL.915.IRI IRI – Prerequisites**

Applicants for an IRI certificate shall:

- (a) in case of an IRI(A):
  - (1) to provide training in FSTDs during an approved training course at an ATO, have completed at least 200 hours of flight time under IFR after the issuance of the BIR or the IR, of which at least 50 hours shall be in aeroplanes;
  - (2) to provide training in an aeroplane, have completed at least 800 hours of flight time under IFR, of which at least 400 hours shall be in aeroplanes;
  - (3) to apply for an IRI(A) for multi-engine aeroplanes, meet the requirements of points FCL.915.CRI(a), FCL.930.CRI and FCL.935;
- (b) for an IRI(H):
  - (1) to provide training in FSTDs during an approved training course at an ATO, have completed at least 125 hours of flight time under IFR after the issuance of the IR, of which at least 65 hours shall be instrument flight time in helicopters;

- (2) to provide training in a helicopter, have completed at least 500 hours of flight time under IFR, of which at least 250 hours shall be instrument flight time in helicopters; and
  - (3) when seeking privileges to provide training in multi-engine helicopters, meet the requirements of points FCL.910.TRI(c)(1) and FCL.915.TRI(d)(2);
- (c) Applicants for an IRI(As) certificate shall have completed at least 300 hours of flight time under IFR, of which at least 100 hours shall be instrument flight time in airships.

### **FCL.930.IRI IRI – Training course**

- (a) The training course for the IRI shall include, at least:
  - (1) 25 hours of teaching and learning instruction;
  - (2) 10 hours of technical training, including revision of instrument theoretical knowledge, the preparation of lesson plans and the development of classroom instructional skills;
  - (3)
    - (i) for the IRI(A), at least 10 hours of flight instruction on an aeroplane, FFS, FTD 2/3 or FPNT II. In the case of applicants holding an FI(A) certificate, these hours are reduced to 5;
    - (ii) for the IRI(H), at least 10 hours of flight instruction on a helicopter, FFS, FTD 2/3 or FNPT II/III. In the case of applicants holding an FI(H) certificate, those hours are reduced to at least 5;
    - (iii) for the IRI(As), at least 10 hours of flight instruction on an airship, FFS, FTD 2/3 or FNPT II.
- (b) Flight instruction shall be given by an FI qualified in accordance with point FCL.905.FI(j).
- (c) Applicants holding or having held an instructor certificate shall be fully credited towards the requirement of (a)(1).

### **AMC1 FCL.930.IRI IRI – Training course**

#### **GENERAL**

- (a) The aim of the IRI training course is to train aircraft licence holders to the level of competence defined in FCL.920, and adequate for an IRI.

- (b) The IRI training course should give particular stress to the role of the individual in relation to the importance of human factors in the manmachine environment.
- (c) Special attention should be paid to the applicant's levels of maturity and judgement including an understanding of adults, their behavioural attitudes and variable levels of education.
- (d) With the exception of the section on 'teaching and learning', all the subject detail contained in the theoretical and flight training syllabus is complementary to the instrument rating pilot course syllabus which should already be known by the applicant. Therefore, the objective of the course is to:
  - (1) refresh and bring up to date the technical knowledge of the student instructor;
  - (2) train pilots in accordance with the requirements of the modular instrument flying training course;
  - (3) enable the applicant to develop the necessary instructional techniques required for teaching of instrument flying, radio navigation and instrument procedures to the level required for the issue of an instrument rating;
  - (4) ensure that the student instrument rating instructor's flying is of a sufficiently high standard.
- (e) In part 3 some of the air exercises of the flight instruction syllabus of this AMC may be combined in the same flight.
- (f) During the training course the applicants should be made aware of their own attitudes to the important aspects of flight safety. Improving safety awareness should be a fundamental objective throughout the training course. It will be of major importance for the training course to aim at giving applicants the knowledge, skills and attitudes relevant to an instructor's task. To achieve this, the course curriculum, in terms of objectives, should comprise at least the following areas.
- (g) It is to be noted that airmanship is a vital ingredient of all flight operations. Therefore, in the following air exercises the relevant aspects of airmanship are to be stressed at the appropriate times during each flight.
- (h) The student instructor should learn how to identify common errors and how to correct them properly, which should be emphasised at all times.

## **CONTENT**

- (i) The training course consists of three parts:

- (1) Part 1: teaching and learning that should follow the content of AMC1 FCL.920.
- (2) Part 2: instrument technical theoretical knowledge instruction (technical training).
- (3) Part 3: flight instruction.

### **Part 1**

The content of the teaching and learning part of the FI training course, as established in AMC1 FCL.930.FI, should be used as guidance to develop the course syllabus.

### **Part 2**

#### **THEORETICAL KNOWLEDGE INSTRUCTION SYLLABUS**

- (a) The instrument theoretical knowledge instruction should comprise not less than 10 hours training to include the revision of instrument theoretical knowledge, the preparation of lesson plans and the development of classroom instructional skills to enable the IRI to instruct the instrument theoretical knowledge syllabus.
- (b) All the subject detail contained in the instrument theoretical knowledge instruction syllabus and flight instruction syllabus is complementary to the instrument rating pilot course syllabus which should already be known by the applicant. Therefore, the objective of the course is to:
  - (1) refresh and bring up to date the technical knowledge of the student instructor;
  - (2) train pilots in accordance with the requirements of the modular instrument flying training course;
  - (3) enable the applicant to develop the necessary instructional techniques required for teaching of instrument flying, radio navigation and instrument procedures to the level required for the issue of an instrument rating; and
  - (4) ensure that the student instrument rating instructor's flying is of a sufficiently high standard.
- (c) The theoretical subjects covered below should be used to develop the instructor's teaching skills. The items selected should relate to the student's background and should be applied to training for an IR.

#### **GENERAL SUBJECTS**

- (d) Physiological and psychological factors:
  - (1) the senses;
  - (2) spatial disorientation;
  - (3) sensory illusions;
  - (4) stress.
- (e) Flight instruments:
  - (1) air speed indicator;
  - (2) altimeter;
  - (3) vertical speed indicator;
  - (4) attitude indicator;
  - (5) heading indicator;
  - (6) turn and slip indicator;
  - (7) magnetic compass;
  - (8) in relation to the above instruments the following items should be covered:
    - (i) principles of operation;
    - (ii) errors and in-flight serviceability checks;
    - (iii) system failures.
- (f) Radio navigation aids:
  - (1) basic radio principles;
  - (2) use of VHF RTF channels;
  - (3) the Morse code;
  - (4) basic principles of radio aids;
  - (5) use of VOR;

- (6) ground and aeroplane equipment;
  - (7) use of NDB/ADF;
  - (8) ground and aeroplane equipment;
  - (9) use of VHF/DF;
  - (10) radio detection and ranging (radar);
  - (11) ground equipment;
  - (12) primary radar;
  - (13) secondary surveillance radar;
  - (14) aeroplane equipment;
  - (15) transponders;
  - (16) precision approach system;
  - (17) other navigational systems (as applicable) in current operational use;
  - (18) ground and aeroplane equipment;
  - (19) use of DME;
  - (20) ground and aeroplane equipment;
  - (21) marker beacons;
  - (22) ground and aeroplane equipment;
  - (23) pre-flight serviceability checks;
  - (24) range, accuracy and limitations of equipment.
- (g) Flight planning considerations;
- (h) Aeronautical information publications:
- (1) the training course should cover the items listed below, but the applicant's aptitude and previous aviation experience should be taken into account when determining the amount of instructional time allotted. Although a number of items contained under this heading are complementary to those



contained in the PPL/CPL/IR syllabi, the instructor should ensure that they have been covered during the applicant's training and due allowance should be made for the time needed to revise these items as necessary.

- (2) AIP
- (3) NOTAM class 1 and 2;
- (4) AIC;
- (5) information of an operational nature;
- (6) the rules of the air and ATS;
- (7) visual flight rules and instrument flight rules;
- (8) flight plans and ATS messages;
- (9) use of radar in ATS;
- (10) radio failure;
- (11) classification of airspace;
- (12) airspace restrictions and hazards;
- (13) holding and approach to land procedures;
- (14) precision approaches and non precision approaches;
- (15) radar approach procedures;
- (16) missed approach procedures;
- (17) visual manoeuvring after an instrument approach;
- (18) conflict hazards in uncontrolled airspace;
- (19) communications;
- (20) types of services;
- (21) extraction of AIP data relating to radio aids;
- (22) charts available;

- (23) en-route;
  - (24) departure and arrival;
  - (25) instrument approach and landing;
  - (26) amendments, corrections and revision service.
- (i) flight planning general:
- (1) the objectives of flight planning;
  - (2) factors affecting aeroplane and engine performance;
  - (3) selection of alternate(s);
  - (4) obtaining meteorological information;
  - (5) services available;
  - (6) meteorology briefing;
  - (7) telephone or electronic data processing;
  - (8) actual weather reports (TAFs, METARs and SIGMET messages);
  - (9) the route forecast;
  - (10) the operational significance of the meteorological information obtained (including icing, turbulence and visibility);
  - (11) altimeter considerations;
  - (12) definitions of:
    - (i) transition altitude;
    - (ii) transition level;
    - (iii) flight level;
    - (iv) QNH;
    - (v) regional QNH;
    - (vi) standard pressure setting;

- (vii) QFE.
- (13) altimeter setting procedures;
- (14) pre-flight altimeter checks;
- (15) take-off and climb;
- (16) en-route;
- (17) approach and landing;
- (18) missed approach;
- (19) terrain clearance;
- (20) selection of a minimum safe en-route altitude;
- (21) IFR;
- (22) preparation of charts;
- (23) choice of routes and flight levels;
- (24) compilation of flight plan or log sheet;
- (25) log sheet entries;
- (26) navigation ground aids to be used;
- (27) frequencies and identification;
- (28) radials and bearings;
- (29) tracks and fixes;
- (30) safety altitude(s);
- (31) fuel calculations;
- (32) ATC frequencies (VHF);
- (33) tower, approach, en-route, radar, FIS, ATIS, and weather reports;
- (34) minimum sector altitudes at destination and alternate aerodromes;

- (35) determination of minimum safe descent heights or altitudes (decision heights) at destination and alternate aerodromes.
- (j) The privileges of the instrument rating:
  - (1) outside controlled airspace;
  - (2) within controlled airspace;
  - (3) period of validity and renewal procedures.

### **Part 3**

#### **FLIGHT INSTRUCTION SYLLABUS**

- (a) An approved IRI course should comprise of at least 10 hours of flight instruction, of which a maximum of 8 hours may be conducted in an FSTD. A similar number of hours should be used for the instruction and practice of preflight and post-flight briefing for each exercise.
- (b) The flight instruction should aim to ensure that the applicant is able to teach the air exercises safely and efficiently.

#### **A. AEROPLANES**

##### **LONG BRIEFINGS AND AIR EXERCISES**

##### **EXERCISE 1: INSTRUMENT FLYING (Basic)**

(for revision, as deemed necessary by the instructor)

- (a) Long briefing objectives:
  - (1) flight instruments;
  - (2) physiological considerations;
  - (3) instrument appreciation:
    - (i) attitude instrument flight;
    - (ii) pitch indications;
    - (iii) bank indications;
    - (iv) different instrument presentations;

- (v) introduction to the use of the attitude indicator;
  - (vi) pitch attitude;
  - (vii) bank attitude;
  - (viii) maintenance of heading and balanced flight;
  - (ix) instrument limitations (inclusive system failures).
- (4) attitude, power and performance:
  - (i) attitude instrument flight;
  - (ii) control instruments;
  - (iii) performance instruments;
  - (iii) effect of changing power and configuration;
  - (iv) cross-checking the instrument indications;
  - (v) instrument interpretation;
  - (vi) direct and indirect indications (performance instruments);
  - (vii) instrument lag;
  - (viii) selective radial scan.
- (5) the basic flight manoeuvres (full panel):
  - (i) straight and level flight at various air speeds and aeroplane configurations;
  - (ii) climbing;
  - (iii) descending;
  - (iv) standard rate turns;
  - (v) level, climbing and descending on to pre-selected headings.
- (b) Air exercise:
  - (1) instrument flying (basic);

- (i) physiological sensations;
- (ii) instrument appreciation;
- (iii) attitude instrument flight;
- (iv) pitch attitude;
- (v) bank attitude;
- (vi) maintenance of heading and balanced flight;
- (vii) attitude instrument flight;
- (viii) effect of changing power and configuration;
- (ix) cross-checking the instruments;
- (x) selective radial scan;
- (2) the basic flight manoeuvres (full panel):
  - (i) straight and level flight at various air speeds and aeroplane configurations;
  - (ii) climbing;
  - (iii) descending;
  - (iv) standard rate turns;
  - (v) level, climbing and descending on to pre-selected headings.

## **EXERCISE 2: INSTRUMENT FLYING (Advanced)**

- (a) Long briefing objectives:
  - (1) full panel;
  - (2) 30 ° level turns;
  - (3) unusual attitudes: recoveries;
  - (4) transference to instruments after take-off;
  - (5) limited panel;

- (6) basic flight manoeuvres;
- (7) unusual attitudes: recoveries.
- (b) Air exercise:
  - (1) full panel;
  - (2) 30 ° level turns;
  - (3) unusual attitudes: recoveries;
  - (4) limited panel;
  - (5) repeat of the above exercises.

**EXERCISE 3: RADIO NAVIGATION (APPLIED PROCEDURES): USE OF VOR**

- (a) Long briefing objectives:
  - (1) availability of VOR stations en-route;
  - (2) station frequencies and identification;
  - (3) signal reception range;
  - (4) effect of altitude;
  - (5) VOR radials;
  - (6) use of OBS;
  - (7) to or from indicator;
  - (8) orientation;
  - (9) selecting radials;
  - (10) intercepting a pre-selected radial;
  - (11) assessment of distance to interception;
  - (12) effects of wind;
  - (13) maintaining a radial;

- (14) tracking to and from a VOR station;
  - (15) procedure turns;
  - (16) station passage;
  - (17) use of two stations for obtaining a fix;
  - (18) pre-selecting fixes along a track;
  - (19) assessment of ground speed and timing;
  - (20) holding procedures;
  - (21) various entries;
  - (22) communication (R/T procedures and ATC liaison).
- (b) Air exercise:
- (1) station selection and identification;
  - (2) orientation;
  - (3) intercepting a pre-selected radial;
  - (4) R/T procedures and ATC liaison;
  - (5) maintaining a radial inbound;
  - (6) recognition of station passage;
  - (7) maintaining a radial outbound;
  - (8) procedure turn;
  - (9) use of two stations to obtain a fix along the track;
  - (10) assessment of ground speed and timing;
  - (11) holding procedures and entries;
  - (12) holding at a pre-selected fix;
  - (13) holding at a VOR station.



**EXERCISE 4: RADIO NAVIGATION (APPLIED PROCEDURES): USE OF NDB**

(a) Long briefing objectives:

- (1) availability of an NDB facilities en-route;
- (2) location, frequencies, tuning (as applicable) and identification codes;
- (3) signal reception range;
- (4) static interference;
- (5) night effect;
- (6) station interference;
- (7) mountain effect;
- (8) coastal refraction;
- (9) orientation in relation to an NDB;
- (10) homing;
- (11) intercepting a pre-selected magnetic bearing and tracking inbound;
- (12) station passage;
- (13) tracking outbound;
- (14) time and distance checks;
- (15) use of two NDBs to obtain a fix or alternatively use of one NDB and one other navaid;
- (16) holding procedures and various approved entries;
- (17) communication (R/T procedures and ATC liaison).

(b) Air exercise:

- (1) selecting, tuning and identifying an NDB;
- (2) ADF orientation;
- (3) communication (R/T procedures and ATC liaison);

- (4) homing;
- (5) tracking inbound;
- (6) station passage;
- (7) tracking outbound;
- (8) time and distance checks;
- (9) intercepting a pre-selected magnetic bearing;
- (10) determining the aeroplane's position from two NDBs or alternatively from one NDB and one other navaid;
- (11) ADF holding procedures and various approved entries.

**EXERCISE 5: RADIO NAVIGATION (APPLIED PROCEDURES): USE OF VHF/DF**

(a) Long briefing objectives:

- (1) availability of VHF/DF facilities en-route;
- (2) location, frequencies, station call signs and hours of operation;
- (3) signal and reception range;
- (4) effect of altitude;
- (5) communication (R/T procedures and ATC liaison);
- (6) obtaining and using types of bearings, for example QTE, QDM and QDR;
- (7) homing to a station;
- (8) effect of wind;
- (9) use of two VHF/DF stations to obtain a fix (or alternatively one VHF/DF station and one other navaid);
- (10) assessment of groundspeed and timing.

(b) Air exercise:

- (1) establishing contact with a VHF/DF station;

- (2) R/T Procedures and ATC liaison;
- (3) obtaining and using a QDR and QTE;
- (4) homing to a station;
- (5) effect of wind;
- (6) use of two VHF/DF stations to obtain a fix (or alternatively one VHF/DF station and one other navaid);
- (7) assessment of groundspeed and timing.

**EXERCISE 6: RADIO NAVIGATION (APPLIED PROCEDURES): USE OF DME**

- (a) Long briefing objectives:
  - (1) availability of DME facilities;
  - (2) location, frequencies and identification codes;
  - (3) signal reception range;
  - (4) slant range;
  - (5) use of DME to obtain distance, groundspeed and timing;
  - (6) use of DME to obtain a fix.
- (b) Air exercise:
  - (1) station selection and identification;
  - (2) use of equipment functions;
  - (3) distance;
  - (4) groundspeed;
  - (5) timing;
  - (6) DME arc approach;
  - (7) DME holding.

**EXERCISE 7: RADIO NAVIGATION (APPLIED PROCEDURES): USE OF TRANSPONDERS (SSR)**

- (a) Long briefing objectives:
  - (1) operation of transponders;
  - (2) code selection procedure;
  - (3) emergency codes;
  - (4) precautions when using airborne equipment.
- (b) Air exercise:
  - (1) operation of transponders;
  - (2) types of transponders;
  - (3) code selection procedure;
  - (4) emergency codes;
  - (5) precautions when selecting the required code.

**EXERCISE 8: RADIO NAVIGATION (APPLIED PROCEDURES): USE OF ENROUTE RADAR**

- (a) Long briefing objectives:
  - (1) availability of radar services;
  - (2) location, station frequencies, call signs and hours of operation;
  - (3) AIP and NOTAMs;
  - (4) provision of service;
  - (5) communication (R/T, procedures and ATC liaison);
  - (6) airspace radar advisory service;
  - (7) emergency service;
  - (8) aircraft separation standards.

(b) Air exercise:

- (1) communication (R/T procedures and ATC liaison);
- (2) establishing the service required and position reporting;
- (3) method of reporting conflicting traffic;
- (4) terrain clearance.

**EXERCISE 9: PRE-FLIGHT AND AERODROME DEPARTURE AND ARRIVAL PROCEDURES**

(a) Long briefing objectives:

- (1) determining the serviceability of the aeroplane radio;
- (2) navigation equipment;
- (3) obtaining the departure clearance;
- (4) setting up radio nav aids before take-off for example VOR frequencies, required radials, etc.;
- (5) aerodrome departure procedures, frequency changes;
- (6) altitude and position reporting as required;
- (7) SID procedures;
- (8) obstacle clearance considerations.

(b) Air exercise:

- (1) radio equipment serviceability checks;
- (2) departure clearance;
- (3) nav aid selection;
- (4) frequencies, radials, etc.;
- (5) aerodrome departure checks, frequency changes, altitude and position reports;
- (6) SID procedures.

**EXERCISE 10: INSTRUMENT APPROACH: ILS APPROACHES TO SPECIFIED MINIMA AND MISSED APPROACH PROCEDURE**

- (a) Long briefing objectives:
- (1) precision approach charts;
  - (2) approach to the initial approach fix and minimum sector altitude;
  - (3) navaid requirements, for example radar, ADF, etc.;
  - (4) communication (ATC liaison and R/T phraseology);
  - (5) holding procedure;
  - (6) the final approach track;
  - (7) forming a mental picture of the approach;
  - (8) completion of aerodrome approach checks;
  - (9) initial approach procedure;
  - (10) selection of the ILS frequency and identification;
  - (11) obstacle clearance altitude or height;
  - (12) operating minima;
  - (13) achieving the horizontal and vertical patterns;
  - (14) assessment of distance, groundspeed time, and rate of descent from the final approach fix to the aerodrome;
  - (15) use of DME (as applicable);
  - (16) go-around and missed approach procedure;
  - (17) review of the published instructions;
  - (18) transition from instrument to visual flight (sensory illusions);
  - (19) visual manoeuvring after an instrument approach:
    - (i) circling approach;

- (ii) visual approach to landing.
- (b) Air exercise:
  - (1) initial approach to the ILS;
  - (2) completion of approach planning;
  - (3) holding procedure;
  - (4) frequency selection and identification of ILS;
  - (5) review of the published procedure and minimum sector altitude;
  - (6) communication (ATC liaison and R/T phraseology);
  - (7) determination of operating minima and altimeter setting;
  - (8) weather consideration, for example cloud base and visibility;
  - (9) availability of runway lighting;
  - (10) ILS entry methods;
  - (11) radar vectors;
  - (12) procedural method;
  - (13) assessment of approach time from the final approach fix to the aerodrome;
  - (14) determination of:
    - (i) the descent rate on final approach;
    - (ii) the wind velocity at the surface and the length of the landing runway;
    - (iii) the obstruction heights to be borne in mind during visual manoeuvring after an instrument approach;
  - (15) circling approach;
  - (16) the approach:
    - (i) at the final approach fix;
    - (ii) use of DME (as applicable);

- (iii) ATC liaison;
- (iv) note time and establish air speed and descent rate;
- (v) maintaining the localiser and glide path;
- (vi) anticipation in change of wind velocity and its effect on drift;
- (vii) decision height;
- (17) runway direction;
- (18) overshoot and missed approach procedure;
- (19) transition from instrument to visual flight;
- (20) circling approach;
- (21) visual approach to landing.

**EXERCISE 11: INSTRUMENTS APPROACH: NDB APPROACHES TO SPECIFIED MINIMA AND MISSED APPROACH PROCEDURES**

- (a) Long briefing objectives:
  - (1) non-precision approach charts;
  - (2) initial approach to the initial approach fix and minimum sector altitude;
  - (3) ATC liaison;
  - (4) communication (ATC procedures and R/T phraseology);
  - (5) approach planning;
  - (6) holding procedure;
  - (7) the approach track;
  - (8) forming a mental picture of the approach;
  - (9) initial approach procedure;
  - (10) operating minima;
  - (11) completion of approach planning;



- (12) achieving the horizontal and vertical patterns;
  - (13) assessment of distance, groundspeed time, and rate of descent from the final approach fix to the aerodrome;
  - (14) use of DME (as applicable);
  - (15) go-around and missed approach procedure;
  - (16) review of the published instructions;
  - (17) transition from instrument to visual flight (sensory illusions);
  - (18) visual manoeuvring after an instrument approach;
  - (19) circling approach
  - (20) visual approach to landing.
- (b) Air exercise:
- (1) completion of approach planning including determination of:
    - (i) descent rate from the final approach fix;
    - (ii) the wind velocity at the surface and length of the landing runway;
    - (iii) the obstruction heights to be borne in mind during visual manoeuvring after an instrument approach;
  - (2) circling approach;
  - (3) go-around and missed approach procedure;
  - (4) initial approach;
  - (5) frequency selection and identification;
  - (6) review of the published procedure and minimum safe sector altitude;
  - (7) ATC liaison and R/T phraseology;
  - (8) determination of decision height and altimeter setting;
  - (9) weather considerations, for example cloud base and visibility;

- (10) availability of runway lighting;
- (11) determination of inbound track;
- (12) assessment of time from final approach fix to the missed approach point;
- (13) ATC liaison;
- (14) the outbound procedure (inclusive completion of pre-landing checks);
- (15) the inbound procedure;
- (16) re-check of identification code;
- (17) altimeter setting re-checked;
- (18) the final approach;
- (19) note time and establish air speed and descent rate
- (20) maintaining the final approach track;
- (21) anticipation of change in wind velocity and its effect on the drift;
- (22) minimum descent altitude or height;
- (23) runway direction;
- (24) go-around and missed approach procedure;
- (25) transition from instrument to visual flight (sensory illusions);
- (26) visual approach.

**EXERCISE 12: RADIO NAVIGATION (APPLIED PROCEDURES): USE OF GNSS (to be developed)**

- (a) Long briefing objectives: use of GNSS.
- (b) Air exercise: use of GNSS.

**B. HELICOPTERS**

**LONG BRIEFINGS AND AIR EXERCISES**

**EXERCISE 1: INSTRUMENT FLYING (Basic)**

(for revision as deemed necessary by the instructor)

(a) Long briefing objectives:

- (1) flight instruments;
- (2) physiological considerations;
- (3) instrument appreciation:
  - (i) attitude instrument flight;
  - (ii) pitch indications;
  - (iii) bank indications;
  - (iv) different instrument presentations;
  - (v) introduction to the use of the attitude indicator;
  - (vi) pitch attitude;
  - (vii) bank attitude;
  - (viii) maintenance of heading and balanced flight;
  - (ix) instrument limitations (inc. system failures);
- (4) attitude, power and performance:
  - (i) attitude instrument flight;
  - (ii) control instruments;
  - (iii) performance instruments;
  - (iv) effect of changing power;
  - (v) cross-checking the instrument indications;
  - (vi) instrument interpretation;
  - (vii) direct and indirect indications (performance instruments);
  - (viii) instrument lag;

- (ix) selective radial scan;
- (5) the basic flight manoeuvres (full panel):
  - (i) straight and level flight at various air speeds;
  - (ii) climbing;
  - (iii) descending;
  - (iv) standard rate turns;
  - (v) level, climbing and descending on to pre-selected headings.
- (b) Air exercise:
  - (1) physiological sensations;
  - (2) instrument appreciation;
  - (3) attitude instrument flight;
  - (4) pitch attitude;
  - (5) bank attitude;
  - (6) maintenance of heading and balanced flight;
  - (7) attitude instrument flight;
  - (8) effect of changing power;
  - (9) cross-checking the instruments;
  - (10) selective radial scan;
  - (11) the basic flight manoeuvres (full panel):
    - (i) straight and level flight at various air speeds and helicopter configurations;
    - (ii) climbing;
    - (iii) descending;
    - (iv) standard rate turns;

- (v) level, climbing and descending on to pre-selected headings; (vi) manoeuvring at minimum and maximum IMC speed.

### **EXERCISE 2: INSTRUMENT FLYING (Advanced)**

- (a) Long briefing objectives:
  - (1) full panel;
  - (2) 30° level turns;
  - (3) unusual attitudes: recoveries;
  - (4) transition to instruments after take-off;
  - (5) limited panel;
  - (6) basic flight manoeuvres;
  - (7) unusual attitudes: recoveries.
- (b) Air exercise:
  - (1) full panel;
  - (2) 30° level turns;
  - (3) unusual attitudes: recoveries;
  - (4) identification and recovery from low pitch steep bank and high pitch steep bank attitudes (at low and high power settings);
  - (5) limited panel;
  - (6) repeat of the above exercises.

### **EXERCISE 3: RADIO NAVIGATION (APPLIED PROCEDURES): USE OF VOR**

- (a) Long briefing objectives:
  - (1) availability of VOR stations en-route;
  - (2) station frequencies and identification;
  - (3) signal reception range;

- (4) effect of altitude;
  - (5) VOR radials;
  - (6) use of OBS;
  - (7) to and from indicator;
  - (8) orientation;
  - (9) selecting radials;
  - (10) intercepting a pre-selected radial;
  - (11) assessment of distance to interception;
  - (12) effects of wind;
  - (13) maintaining a radial;
  - (14) tracking to and from a VOR station;
  - (15) procedure turns;
  - (16) station passage;
  - (17) use of two stations for obtaining a fix;
  - (18) pre-selecting fixes along a track;
  - (19) assessment of ground speed and timing;
  - (20) holding procedures;
  - (21) various entries;
  - (22) communication (R/T procedures and ATC liaison).
- (b) Air exercise:
- (1) station selection and identification;
  - (2) orientation;
  - (3) intercepting a pre-selected radial;

- (4) R/T procedures and ATC liaison;
- (5) maintaining a radial inbound;
- (6) recognition of station passage;
- (7) maintaining a radial outbound;
- (8) procedure turns;
- (9) use of two stations to obtain a fix along the track;
- (10) assessment of ground speed and timing;
- (11) holding procedures and entries;
- (12) holding at a pre-selected fix;
- (13) holding at a VOR station.

**EXERCISE 4: RADIO NAVIGATION (APPLIED PROCEDURES): USE OF NDB**

- (a) Long briefing objectives:
  - (1) availability of NDB facilities en-route;
  - (2) location, frequencies, tuning (as applicable) and identification codes;
  - (3) signal reception range;
  - (4) static interference;
  - (5) night effect;
  - (6) station interference;
  - (7) mountain effect;
  - (8) coastal refraction;
  - (9) orientation in relation to an NDB;
  - (10) homing;
  - (11) intercepting a pre-selected magnetic bearing and tracking inbound;

- (12) station passage;
  - (13) tracking outbound;
  - (14) time and distance checks;
  - (15) use of two NDBs to obtain a fix or alternatively use of one NDB and one other navaid;
  - (16) holding procedures;
  - (17) communication (R/T procedures and ATC liaison).
- (b) Air exercise:
- (1) selecting, tuning and identifying an NDB;
  - (2) ADF orientation;
  - (3) communication (R/T procedures and ATC liaison);
  - (4) homing;
  - (5) tracking inbound;
  - (6) station passage;
  - (7) tracking outbound;
  - (8) time and distance checks;
  - (9) intercepting a pre-selected magnetic bearing;
  - (10) determining the helicopter's position from two NDBs or alternatively from one NDB and one other navaid;
  - (11) ADF holding procedures.

**EXERCISE 5: RADIO NAVIGATION (APPLIED PROCEDURES): USE OF VHF/DF**

- (a) Long briefing objectives:
- (1) availability of VHF/DF facilities en-route;
  - (2) location, frequencies, station call signs and hours of operation;



- (3) signal and reception range;
  - (4) effect of altitude;
  - (5) communication (R/T procedures and ATC liaison);
  - (6) obtaining and using types of bearings, for example QTE, QDM, QDR;
  - (7) homing to a station;
  - (8) effect of wind;
  - (9) use of two VHF/DF stations to obtain a fix (or alternatively one VHF/DF station and one other navaid);
  - (10) assessment of groundspeed and timing.
- (b) Air exercise:
- (1) establishing contact with a VHF/DF station;
  - (2) R/T procedures and ATC liaison;
  - (3) obtaining and using a QDR and QTE;
  - (4) homing to a station;
  - (5) effect of wind;
  - (6) use of two VHF/DF stations to obtain a fix (or alternatively one VHF/DF station and one other navaid);
  - (7) assessment of groundspeed and timing.

**EXERCISE 6: RADIO NAVIGATION (APPLIED PROCEDURES): USE OF DME**

- (a) Long briefing objectives:
- (1) availability of DME facilities;
  - (2) location, frequencies and identification codes;
  - (3) signal reception range;
  - (4) slant range;

- (5) use of DME to obtain distance, groundspeed and timing;
- (6) use of DME to obtain a fix;
- (b) Air exercise:
  - (1) station selection and identification;
  - (2) use of equipment functions;
  - (3) distance;
  - (4) groundspeed;
  - (5) timing;
  - (6) DME arc approach;
  - (7) DME holding.

**EXERCISE 7: RADIO NAVIGATION (APPLIED PROCEDURES): USE OF TRANSPONDERS**

- (a) Long briefing objectives:
  - (1) operation of transponders;
  - (2) code selection procedure;
  - (3) emergency codes;
  - (4) precautions when using airborne equipment.
- (b) Air exercise:
  - (1) operation of transponders;
  - (2) types of transponders;
  - (3) code selection procedure;
  - (4) emergency codes;
  - (5) precautions when selecting the required code.

**EXERCISE 8: RADIO NAVIGATION (APPLIED PROCEDURES): USE OF ENROUTE RADAR SERVICES**

- (a) Long briefing objectives:
  - (1) availability of radar services;
  - (2) location, station frequencies, call signs and hours of operation;
  - (3) AIP and NOTAMS;
  - (4) provision of service;
  - (5) communication (R/T procedures and ATC liaison);
  - (6) airspace radar advisory service;
  - (7) emergency service
  - (8) aircraft separation standards.
- (b) Air exercise:
  - (1) communication (R/T procedures and ATC liaison);
  - (2) establishing the service required and position reporting;
  - (3) method of reporting conflicting traffic;
  - (4) terrain clearance.

**EXERCISE 9: PRE-FLIGHT AND AERODROME DEPARTURE AND ARRIVAL PROCEDURES**

- (a) Long briefing objectives:
  - (1) determining the serviceability of the radio equipment;
  - (2) navigation equipment;
  - (3) obtaining the departure clearance;
  - (4) setting up radio navaids before take-off for example VOR frequencies, required radials, etc.;
  - (5) aerodrome departure procedures, frequency changes;

- (6) altitude and position reporting as required;
  - (7) SID procedures;
  - (8) obstacle clearance considerations.
- (b) Air exercise:
- (1) radio equipment serviceability checks;
  - (2) departure clearance;
  - (3) navaid selection;
  - (4) frequencies, radials, etc.;
  - (5) aerodrome departure checks, frequency changes, altitude and position reports;
  - (6) SID procedures.

**EXERCISE 10: INSTRUMENT APPROACH: PRECISION APPROACH AID TO SPECIFIED MINIMA AND MISSED APPROACH PROCEDURES**

- (a) Long briefing objectives:
- (1) precision approach charts;
  - (2) approach to the initial approach fix and minimum sector altitude;
  - (3) navaid requirements, for example radar, ADF, etc.;
  - (4) communication (ATC liaison and R/T phraseology);
  - (5) holding procedure;
  - (6) the final approach track;
  - (7) forming a mental picture of the approach;
  - (8) completion of aerodrome approach checks;
  - (9) initial approach procedure;
  - (10) selection of the ILS frequency and identification;

- (11) obstacle clearance altitude or height;
  - (12) operating minima;
  - (13) achieving the horizontal and vertical patterns;
  - (14) assessment of distance, groundspeed time, and rate of descent from the final approach fix to the aerodrome;
  - (15) use of DME (as applicable);
  - (16) go-around and missed approach procedure;
  - (17) review of the published instructions;
  - (18) transition from instrument to visual flight (sensory illusions);
  - (19) visual manoeuvring after an instrument approach;
    - (i) circling approach;
    - (ii) visual approach to landing.
- (b) Air exercise:
- (1) initial approach to the ILS;
  - (2) completion of approach planning;
  - (3) holding procedure;
  - (4) frequency selection and identification of ILS;
  - (5) review of the published procedure and minimum sector altitude;
  - (6) communication (ATC liaison and R/T phraseology);
  - (7) determination of operating minima and altimeter setting;
  - (8) weather consideration, for example cloud base and visibility;
  - (9) availability of landing site lighting;
  - (10) ILS entry methods;
  - (11) radar vectors;

- (12) procedural method;
- (13) assessment of approach time from the final approach fix to the aerodrome;
- (14) determination of:
  - (i) the descent rate on final approach;
  - (ii) the wind velocity at the surface and the length of the landing site;
  - (iii) the obstruction heights to be borne in mind during visual manoeuvring after an instrument approach;
- (15) circling approach;
- (16) the approach:
  - (i) at the final approach fix;
  - (ii) use of DME (as applicable);
  - (iii) ATC liaison;
  - (iv) note time and establish air speed and descent rate;
  - (v) maintaining the localizer and glide path;
  - (vi) anticipation in change of wind velocity and its effect on drift;
  - (vii) decision height.
- (17) landing direction;
- (18) go-around and missed approach procedure;
- (19) transition from instrument to visual flight;
- (20) circling approach;
- (21) visual approach to landing.

**EXERCISE 11: INSTRUMENT APPROACH: NON-PRECISION APPROACH TO SPECIFIED MINIMA AND MISSED APPROACH PROCEDURES**

- (a) Long briefing objectives:

- (1) non-precision approach charts;
  - (2) initial approach to the initial approach fix and minimum sector altitude;
  - (3) ATC liaison;
  - (4) communication (ATC procedures and R/T phraseology);
  - (5) approach planning;
  - (6) holding procedure;
  - (7) the approach track;
  - (8) forming a mental picture of the approach;
  - (9) initial approach procedure;
  - (10) operating minima;
  - (11) completion of approach planning;
  - (12) achieving the horizontal and vertical patterns;
  - (13) assessment of distance, groundspeed time, and rate of descent from the final approach fix to the aerodrome;
  - (14) use of DME (as applicable);
  - (15) go-around and missed approach procedure;
  - (16) review of the published instructions;
  - (17) transition from instrument to visual flight (sensory illusions);
  - (18) visual manoeuvring after an instrument approach;
  - (19) circling approach;
  - (20) visual approach to landing.
- (b) Air exercise:
- (1) completion of approach planning, including determination of:
    - (i) descent rate from the final approach fix;

- (ii) the wind velocity at the surface and length of the landing site;
  - (iii) the obstruction heights to be borne in mind during visual manoeuvring after an instrument approach.
- (2) circling approach;
  - (3) go-around and missed approach procedure;
  - (4) initial approach;
  - (5) frequency selection and identification;
  - (6) review of the published procedure and minimum safe sector altitude;
  - (7) ATC liaison and R/T phraseology;
  - (8) determination of decision height and altimeter setting;
  - (9) weather considerations, for example cloud base and visibility;
  - (10) availability of landing site lighting;
  - (11) determination of inbound track;
  - (12) assessment of time from final approach fix to the missed approach point;
  - (13) ATC liaison;
  - (14) the outbound procedure (incl. completion of pre-landing checks);
  - (15) the inbound procedure;
  - (16) re-check of identification code;
  - (17) altimeter setting re-checked;
  - (18) the final approach;
  - (19) note time and establish air speed and descent rate;
  - (20) maintaining the final approach track;
  - (21) anticipation of change in wind velocity and its effect on the drift;
  - (22) minimum descent altitude or height;



- (23) landing site direction;
- (24) go-around and missed approach procedure;
- (25) transition from instrument to visual flight (sensory illusions);
- (26) visual approach.

#### **EXERCISE 12: USE OF GNSS (to be developed)**

- (a) Long briefing objectives: use of GNSS.
- (b) Air exercise: use of GNSS.

### **C. AIRSHIPS**

#### **LONG BRIEFINGS AND AIR EXERCISES**

##### **EXERCISE 1: INSTRUMENT FLYING (Basic)**

(for revision as deemed necessary by the instructor)

- (a) Long briefing objectives:
  - (1) flight instruments;
  - (2) physiological considerations;
  - (3) instrument appreciation:
    - (i) attitude instrument flight;
    - (ii) pitch indications;
    - (iii) different instrument presentations;
    - (iv) introduction to the use of the attitude indicator;
    - (v) pitch attitude;
    - (vi) maintenance of heading and balanced flight;
    - (vii) instrument limitations (inclusive system failures).
  - (4) attitude, power and performance:

- (i) attitude instrument flight;
  - (ii) control instruments;
  - (iii) performance instruments;
  - (iii) effect of changing power, trim and configuration;
  - (iv) cross-checking the instrument indications;
  - (v) instrument interpretation;
  - (vi) direct and indirect indications (performance instruments);
  - (vii) instrument lag;
  - (viii) selective radial scan.
- (5) the basic flight manoeuvres (full panel):
  - (i) straight and level flight at various air speeds and airship configurations;
  - (ii) climbing;
  - (iii) descending;
  - (iv) standard rate turns;
  - (v) level, climbing and descending on to pre-selected headings.
- (b) Air exercise:
  - (1) physiological sensations;
  - (2) instrument appreciation;
  - (3) attitude instrument flight;
  - (4) pitch attitude;
  - (5) bank attitude;
  - (6) maintenance of heading and balanced flight;
  - (7) attitude instrument flight;

- (8) effect of changing power and configuration;
- (9) cross-checking the instruments;
- (10) selective radial scan;
- (11) the basic flight manoeuvres (full panel):
  - (i) straight and level flight at various air speeds and airship configurations;
  - (ii) climbing;
  - (iii) descending;
  - (iv) standard rate turns;
  - (v) level, climbing and descending on to pre-selected headings.

**EXERCISE 2: INSTRUMENT FLYING (Advanced)**

- (a) Long briefing objectives:
  - (1) full panel;
  - (2) unusual attitudes: recoveries;
  - (3) transference to instruments after take-off;
  - (4) limited panel;
  - (5) basic flight manoeuvres;
  - (6) unusual attitudes: recoveries.
- (b) Air exercise:
  - (1) full panel;
  - (2) unusual attitudes: recoveries;
  - (3) limited panel;
  - (4) repeat of the above exercises.

**EXERCISE 3: RADIO NAVIGATION (APPLIED PROCEDURES): USE OF VOR**

- (a) Long briefing objectives:
- (1) availability of VOR stations en-route;
  - (2) station frequencies and identification;
  - (3) signal reception range;
  - (4) effect of altitude;
  - (5) VOR radials;
  - (6) use of OBS;
  - (7) to or from indicator;
  - (8) orientation;
  - (9) selecting radials;
  - (10) intercepting a pre-selected radial;
  - (11) assessment of distance to interception;
  - (12) effects of wind;
  - (13) maintaining a radial;
  - (14) tracking to and from a VOR station;
  - (15) procedure turns;
  - (16) station passage;
  - (17) use of two stations for obtaining a fix;
  - (18) pre-selecting fixes along a track;
  - (19) assessment of ground speed and timing;
  - (20) holding procedures;
  - (21) various entries;
  - (22) communication (R/T procedures and ATC liaison).

- (b) Air exercise:
- (1) station selection and identification;
  - (2) orientation;
  - (3) intercepting a pre-selected radial;
  - (4) R/T procedures and ATC liaison;
  - (5) maintaining a radial inbound;
  - (6) recognition of station passage;
  - (7) maintaining a radial outbound;
  - (8) procedure turns;
  - (9) use of two stations to obtain a fix along the track;
  - (10) assessment of ground speed and timing;
  - (11) holding procedures and entries;
  - (12) holding at a pre-selected fix;
  - (13) holding at a VOR station.

**EXERCISE 4: RADIO NAVIGATION (APPLIED PROCEDURES): USE OF ADF**

(Automatic DF equipment)

- (a) Long briefing objectives:
- (1) availability of NDB facilities en-route;
  - (2) location, frequencies, tuning (as applicable) and identification codes;
  - (3) signal reception range;
  - (4) static interference;
  - (5) night effect;
  - (6) station interference;

- (7) mountain effect;
  - (8) coastal refraction;
  - (9) orientation in relation to an NDB;
  - (10) homing;
  - (11) intercepting a pre-selected magnetic bearing and tracking inbound;
  - (12) station passage;
  - (13) tracking outbound;
  - (14) time and distance checks;
  - (15) use of two NDBs to obtain a fix or alternatively use of one NDB and one other navaid;
  - (16) holding procedures and various approved entries;
  - (17) communication (R/T procedures and ATC liaison).
- (b) Air exercise:
- (1) selecting, tuning and identifying an NDB;
  - (2) ADF orientation;
  - (3) communication (R/T procedures and ATC liaison);
  - (4) homing;
  - (5) tracking inbound;
  - (6) station passage;
  - (7) tracking outbound;
  - (8) time and distance checks;
  - (9) intercepting a pre-selected magnetic bearing;
  - (10) determining the airship's position from two NDBs or alternatively from one NDB and one other navaid;

- (11) ADF holding procedures and various approved entries.

**EXERCISE 5: RADIO NAVIGATION (APPLIED PROCEDURES): USE OF VHF/DF**

- (a) Long briefing objectives:

- (1) availability of VHF/DF facilities en-route;
- (2) location, frequencies, station call signs and hours of operation;
- (3) signal and reception range;
- (4) effect of altitude;
- (5) communication (R/T procedures and ATC liaison);
- (6) obtaining and using types of bearings, for example QTE, QDM, QDR;
- (7) homing to a station;
- (8) effect of wind;
- (9) use of two VHF/DF stations to obtain a fix (or alternatively one VHF/DF station and one other navaid);
- (10) assessment of groundspeed and timing.

- (b) Air exercise:

- (1) establishing contact with a VHF/DF station;
- (2) R/T procedures and ATC liaison;
- (3) obtaining and using a QDR and QTE;
- (4) homing to a station;
- (5) effect of wind;
- (6) use of two VHF/DF stations to obtain a fix (or alternatively one VHF/DF station and one other navaid);
- (7) assessment of groundspeed and timing.

**EXERCISE 6: RADIO NAVIGATION (APPLIED PROCEDURES): USE OF DME**

- (a) Long briefing objectives:
  - (1) availability of DME facilities;
  - (2) location, frequencies and identification codes;
  - (3) signal reception range;
  - (4) slant range;
  - (5) use of DME to obtain distance, groundspeed and timing;
  - (6) use of DME to obtain a fix.
- (b) Air exercise:
  - (1) station selection and identification;
  - (2) use of equipment functions;
  - (3) distance;
  - (4) groundspeed;
  - (5) timing;
  - (6) DME arc approach;
  - (7) DME holding.

**EXERCISE 7: RADIO NAVIGATION (APPLIED PROCEDURES): USE OF TRANSPONDERS**

- (a) Long briefing objectives:
  - (1) operation of transponders;
  - (2) code selection procedure;
  - (3) emergency codes;
  - (4) precautions when using airborne equipment.
- (b) Air exercise:
  - (1) operation of transponders;



- (2) types of transponders;
- (3) code selection procedure;
- (4) emergency codes;
- (5) precautions when selecting the required code.

**EXERCISE 8: RADIO NAVIGATION (APPLIED PROCEDURES): USE OF ENROUTE RADAR SERVICES**

- (a) Long briefing objectives:
  - (1) availability of radar services;
  - (2) location, station frequencies, call signs and hours of operation;
  - (3) AIP and NOTAMS;
  - (4) provision of service;
  - (5) communication (R/T, procedures and ATC liaison);
  - (6) airspace radar advisory service;
  - (7) emergency service;
  - (8) aircraft separation standards.
- (b) Air exercise:
  - (1) communication (R/T procedures and ATC liaison);
  - (2) establishing the service required and position reporting;
  - (3) method of reporting conflicting traffic;
  - (4) terrain clearance.

**EXERCISE 9: PRE-FLIGHT AND AERODROME DEPARTURE AND ARRIVAL PROCEDURES**

- (a) Long briefing objectives:
  - (1) determining the serviceability of the airship radio;

- (2) navigation equipment;
  - (3) obtaining the departure clearance;
  - (4) setting up radio nav aids before take-off for example VOR frequencies, required radials, etc.;
  - (5) aerodrome departure procedures, frequency changes;
  - (6) altitude and position reporting as required;
  - (7) SID procedures;
  - (8) obstacle clearance considerations.
- (b) Air exercise:
- (1) radio equipment serviceability checks;
  - (2) departure clearance;
  - (3) nav aid selection;
  - (4) frequencies, radials, etc.;
  - (5) aerodrome departure checks, frequency changes, altitude and position reports;
  - (6) SID procedures.

**EXERCISE 10: INSTRUMENT APPROACHES: ILS APPROACHES TO SPECIFIED MINIMA AND MISSED APPROACHES PROCEDURES**

- (a) Long briefing objectives:
- (1) precision approach charts;
  - (2) approach to the initial approach fix and minimum sector altitude;
  - (3) nav aid requirements, for example radar, ADF, etc.;
  - (4) communication (ATC liaison and R/T phraseology);
  - (5) review;
  - (6) holding procedure;

- (7) the final approach track;
  - (8) forming a mental picture of the approach;
  - (9) completion of aerodrome approach checks;
  - (10) initial approach procedure;
  - (11) selection of the ILS frequency and identification;
  - (12) obstacle clearance altitude or height;
  - (13) operating minima;
  - (14) achieving the horizontal and vertical patterns;
  - (15) assessment of distance, groundspeed time, and rate of descent from the final approach fix to the aerodrome;
  - (16) use of DME (as applicable);
  - (17) go-around and missed approach procedure;
  - (18) review of the published instructions;
  - (19) transition from instrument to visual flight (sensory illusions);
  - (20) visual manoeuvring after an instrument approach;
    - (i) circling approach;
    - (ii) visual approach to landing.
- (b) Air exercise:
- (1) initial approach to the ILS;
  - (2) completion of approach planning;
  - (3) holding procedure;
  - (4) frequency selection and identification of ILS;
  - (5) review of the published procedure and minimum sector altitude;
  - (6) communication (ATC liaison and R/T phraseology);

- (7) determination of operating minima and altimeter setting;
- (8) weather consideration, for example cloud base and visibility;
- (9) availability of runway lighting;
- (10) ILS entry methods;
- (11) radar vectors;
- (12) procedural method;
- (13) assessment of approach time from the final approach fix to the aerodrome;
- (14) determination of:
  - (i) the descent rate on final approach;
  - (ii) the wind velocity at the surface (and the length of the landing runway);
  - (iii) the obstruction heights to be borne in mind during visual manoeuvring after an instrument approach;
- (15) circling approach;
- (16) the approach:
  - (i) at the final approach fix;
  - (ii) use of DME (as applicable);
  - (iii) ATC liaison;
  - (iv) note time and establish air speed and descent rate;
  - (v) maintaining the localiser and glide path;
  - (vi) anticipation in change of wind velocity and its effect on drift;
  - (vii) decision height;
  - (viii) runway direction.
- (17) missed approach procedure;

- (18) transition from instrument to visual flight;
- (19) circling approach;
- (20) visual approach to landing.

**EXERCISE 11: INSTRUMENT APPROACHES: NDB APPROACHES TO SPECIFIED MINIMA AND MISSED APPROACHES PROCEDURE**

- (a) Long briefing objectives:
  - (1) non-precision approach charts;
  - (2) initial approach to the initial approach fix and minimum sector altitude;
  - (3) ATC liaison;
  - (4) communication (ATC procedures and R/T phraseology);
  - (5) approach planning:
    - (i) holding procedure;
    - (ii) the approach track;
    - (iii) forming a mental picture of the approach;
    - (iv) initial approach procedure;
    - (v) operating minima;
    - (vi) completion of approach planning.
  - (6) achieving the horizontal and vertical patterns;
  - (7) assessment of distance, groundspeed time, and rate of descent from the final approach fix to the aerodrome;
  - (8) use of DME (as applicable);
  - (9) go-around and missed approach procedure;
  - (10) review of the published instructions;
  - (11) transition from instrument to visual flight (sensory illusions);

- (12) visual manoeuvring after an instrument approach;
  - (13) circling approach;
  - (14) visual approach to landing.
- (b) Air exercise:
- (1) completion of approach planning including;
  - (2) determination of:
    - (i) descent rate from the final approach fix;
    - (ii) the wind velocity at the surface and length of the landing runway;
    - (iii) the obstruction heights to be borne in mind during visual manoeuvring after an instrument approach.
  - (3) circling approach;
  - (4) go-around and missed approach procedure;
  - (5) initial approach;
  - (6) frequency selection and identification;
  - (7) review of the published procedure and minimum safe sector altitude;
  - (8) ATC liaison and R/T phraseology;
  - (9) determination of decision height and altimeter setting;
  - (10) weather considerations, for example cloud base and visibility;
  - (11) availability of runway lighting;
  - (12) determination of inbound track;
  - (13) assessment of time from final approach fix to the missed approach point;
  - (14) ATC liaison;
  - (15) the outbound procedure (inclusive completion of pre-landing checks);
  - (16) the inbound procedure;

- (17) re-check of identification code;
- (18) altimeter setting re-checked;
- (19) the final approach;
- (20) note time and descent rate;
- (21) maintaining the final approach track;
- (22) anticipation of change in wind velocity and its effect on the drift;
- (23) minimum descent altitude or height;
- (24) runway direction;
- (25) go-around and missed approach procedure;
- (26) transition from instrument to visual flight (sensory illusions);
- (27) visual approach.

**EXERCISE 12: RADIO NAVIGATION (APPLIED PROCEDURES): USE OF GNSS (to be developed)**

- (a) Long briefing objectives: use of GNSS.
- (b) Air exercise: use of GNSS.

**FCL.940.IRI IRI – Revalidation and renewal**

For revalidation and renewal of an IRI certificate, the holder shall meet the requirements for revalidation and renewal of an FI certificate, in accordance with FCL.940.FI.

## **SECTION 7 – SPECIFIC REQUIREMENTS FOR THE SYNTHETIC FLIGHT INSTRUCTOR – SFI**

### **FCL.905.SFI SFI – Privileges and conditions**

- (a) The privileges of SFIs are to carry out synthetic flight instruction, within the relevant aircraft category, for:
  - (1) the revalidation and renewal of an IR, provided that they hold or have held an IR in the relevant aircraft category;
  - (2) the issue of an IR, provided that they hold or have held an IR in the relevant aircraft category and have completed an IRI training course.
- (b) The privileges of SFIs for single-pilot aeroplanes are to carry out synthetic flight instruction for:
  - (1) the issue, revalidation and renewal of type ratings for single-pilot high performance complex aeroplanes, if applicants seek privileges to operate in single-pilot operations.

The privileges of SFIs for single-pilot aeroplanes may be extended to flight instruction for single-pilot high performance complex aeroplanes type ratings in multi-pilot operations, provided that they meet any of the following conditions:

    - (i) hold or have held a TRI certificate for multi-pilot aeroplanes;
    - (ii) have at least 500 hours on aeroplanes in multi-pilot operations and have completed an MCCI training course in accordance with point FCL.930.MCCI;
  - (2) the MCC and the MPL training courses on the basic phase, provided that the privileges of SFIs(SPA) have been extended to multi-pilot operations in accordance with point (1).
- (c) The privileges of SFIs for multi-pilot aeroplanes are to carry out synthetic flight instruction for:
  - (1) the issue, revalidation and renewal of type ratings for multi-pilot aeroplanes and if applicants seek privileges to operate in multi-pilot operations, for single-pilot high-performance complex aeroplanes;



- (2) the MCC training course;
- (3) the MPL course on the basic, intermediate and advanced phases, provided that, for the basic phase, they hold or have held an FI(A) or an IRI(A) certificate;
- (d) The privileges of SFIs for helicopters are to carry out synthetic flight instruction for:
  - (1) the issue, revalidation and renewal of helicopter type ratings;
  - (2) MCC training, provided that they have at least 350 hours as a pilot in multi-pilot operations in any aircraft category.
- (e) The privileges of an SFI include privileges to conduct EBT practical assessment at an EBT operator, provided that the instructor complies with the requirements of MCAR-Part-ORO for EBT instructor standardisation at that EBT operator.

#### **FCL.910.SFI SFI – Restricted privileges**

The privileges of SFIs shall be restricted to the FTD 2/3 or FFS of the aircraft type in which the SFI training course was taken.

Unless otherwise specified in the operational suitability data established in accordance with MCAR-Part-21, to extend the privileges of SFIs to other FSTDs representing further types of the same category of aircraft, SFIs shall have:

- (a) completed the simulator content of the relevant type rating course;
- (b) completed the relevant parts of the technical training and the FSTD content of the flight instruction syllabus of the applicable TRI course;
- (c) conducted on a complete type rating course at least 3 hours of flight instruction related to the duties of an SFI on the applicable type under the supervision and to the satisfaction of a TRE or an SFE qualified for this purpose.

The privileges of the SFI shall be extended to further variants in accordance with the OSD if the SFI has completed the type relevant parts of the technical training and the FSTD content of the flight instruction syllabus of the applicable TRI course.

#### **FCL.915.SFI SFI – Prerequisites**

An applicant for an SFI certificate shall:

- (a) hold or have held a CPL, MPL or ATPL in the appropriate aircraft category;

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- (b) have completed the proficiency check for the issue of the specific aircraft type rating in an FFS representing the applicable type, within the 12 months preceding the application; and
- (c) additionally, for an SFI(A) for multi-pilot aeroplanes or SFI(PL), have:
  - (1) at least 1 500 hours flight time as a pilot on multi-pilot aeroplanes or powered-lift, as applicable;
  - (2) completed, as a pilot or as an observer, within the 12 months preceding the application, at least:
    - (i) 3 route sectors on the flight deck of the applicable aircraft type; or
    - (ii) 2 line-orientated flight training-based simulator sessions conducted by qualified flight crew on the flight deck of the applicable type. These simulator sessions shall include 2 flights of at least 2 hours each between 2 different aerodromes, and the associated pre-flight planning and de-briefing;
- (d) additionally, for an SFI(A) for single-pilot high performance complex aeroplanes:
  - (1) have completed at least 500 hours of flight time as PIC on single-pilot aeroplanes;
  - (2) hold or have held a multi-engine IR(A) rating; and
  - (3) have met the requirements in (c)(2);
- (e) additionally, for an SFI(H), have:
  - (1) completed, as a pilot or as an observer, at least 1 hour of flight time on the flight deck of the applicable type, within the 12 months preceding the application; and
  - (2) in the case of multi-pilot helicopters, at least 1 000 hours of flying experience as a pilot in helicopters, including at least 350 hours in multi-pilot operations in any aircraft category;
  - (3) in the case of single-pilot multi-engine helicopters, completed 500 hours as pilot of helicopters, including 100 hours as PIC on single-pilot multi-engine helicopters;
  - (4) in the case of single-pilot single-engine helicopters, completed 250 hours as a pilot on helicopters;

- (5) in the case of single-pilot helicopters in multi-pilot operations, completed at least 350 hours in multi-pilot operations in any aircraft category.

### **FCL.930.SFI SFI – Training course**

- (a) The training course for the SFI shall include:
  - (1) the FSTD content of the applicable type rating course;
  - (2) the relevant parts of the technical training and the FSTD content of the flight instruction syllabus of the applicable TRI training course;
  - (3) 25 hours of teaching and learning instruction.
- (b) An applicant for an SFI certificate who:
  - (1) holds a TRI certificate for the relevant type shall be fully credited towards the requirements of point (a);
  - (2) holds or has held an instructor certificate shall be fully credited towards the requirement of point (a)(3).

### **FCL.940.SFI SFI – Revalidation and renewal**

- (a) Revalidation

To revalidate an SFI certificate, applicants shall fulfil, before the expiry date of the SFI certificate, at least two out of the following three requirements:

  - (1) have completed at least 50 hours as instructors or examiners in FSTDs, of which at least 15 hours in the period of 12 months immediately preceding the expiry date of the SFI certificate;
  - (2) have completed instructor refresher training as an SFI at an ATO;
  - (3) have passed the relevant sections of the assessment of competence in accordance with point FCL.935.
- (b) Additionally, applicants shall have completed, on an FFS, the proficiency checks for the issue of the specific aircraft type ratings representing the types for which privileges are held.
- (c) For at least each alternate revalidation of an SFI certificate, holders shall comply with the requirement in point (a)(3).

(d) If an SFI holds a certificate in more than one type of aircraft within the same category, the assessment of competence taken on one of those types shall revalidate the SFI certificate for the other types held within the same category of aircraft, unless otherwise is determined in the OSD.

(e) **Renewal**

To renew the SFI certificate, applicants shall, within the period of 12 months immediately preceding the application for the renewal, comply with all of the following conditions:

- (1) have completed instructor refresher training as an SFI at an ATO;
- (2) have passed the assessment of competence in accordance with point FCL.935;
- (3) have completed, on an FSTD, the skill test for the issue of the specific aircraft type ratings representing the types for which privileges are to be renewed.

## **SECTION 8 – SPECIFIC REQUIREMENTS FOR THE MULTI-CREW CO- OPERATION INSTRUCTOR – MCCI**

### **FCL.905.MCCI MCCI – Privileges and conditions**

- (a) The privileges of an MCCI are to carry out flight instruction during:
  - (1) the practical part of MCC courses when not combined with type rating training; and
  - (2) in the case of MCCI(A), the basic phase of the MPL integrated training course, provided he/she holds or has held an FI(A) or an IRI(A) certificate.

### **FCL.910.MCCI MCCI – Restricted privileges**

The privileges of the holder of an MCCI certificate shall be restricted to the FNPT II/III MCC, FTD 2/3 or FFS in which the MCCI training course was taken.

The privileges may be extended to other FSTDs representing further types of aircraft when the holder has completed the practical training of the MCCI course on that type of FNPT II/III MCC, FTD 2/3 or FFS.

### **FCL.915.MCCI MCCI – Prerequisites**

An applicant for an MCCI certificate shall:

- (a) hold or have held a CPL, MPL or ATPL in the appropriate aircraft category;
- (b) have at least:
  - (1) in the case of aeroplanes, airships and powered-lift aircraft, 1 500 hours of flying experience as a pilot in multi-pilot operations, of which at least 350 hours in the appropriate aircraft category;
  - (2) in the case of helicopters, 1 000 hours of flying experience as a pilot in multi-pilot operations, of which at least 350 hours in helicopters.

### **FCL.930.MCCI MCCI – Training course**

- (a) The training course for the MCCI shall include, at least:

- (1) 25 hours of teaching and learning instruction;
  - (2) technical training related to the type of FSTD where the applicant wishes to instruct;
  - (3) 3 hours of practical instruction, which may be flight instruction or MCC instruction on the relevant FNPT II/III MCC, FTD 2/3 or FFS, under the supervision of a TRI, SFI or MCCI nominated by the ATO for that purpose. These hours of flight instruction under supervision shall include the assessment of the applicant's competence as described in FCL.920.
- (b) Applicants holding or having held an FI, TRI, CRI, IRI or SFI certificate shall be fully credited towards the requirement of (a)(1).

### **AMC1 FCL.930.MCCI MCCI — Training course**

#### **AEROPLANES**

##### **GENERAL**

- (a) The objective of the technical training is to apply the core instructor competencies acquired during the teaching and learning training to MCC training.
- (b) During the practical training the applicant should demonstrate the ability to instruct a pilot in MCC.
- (c) To supervise applicants for MCCI certificates, the adequate experience should include at least three type rating or MCC courses.
- (d) It is to be noted that airmanship is a vital ingredient of all flight operations. Therefore, in the following air exercises the relevant aspects of airmanship are to be stressed at the appropriate times during each flight.
- (e) The student instructor should learn how to identify common errors and how to correct them properly, which should be emphasised at all times.

##### **COURSE OBJECTIVE**

- (f) The course should be designed to give adequate training to the applicant in theoretical knowledge instruction and FSTD instruction to instruct those aspects of MCC required by an applicant for a type rating on a first MP aeroplane.
- (g) Confirmation of competency of the applicant to be authorised as an MCCI(A) will be determined by the applicant conducting at least 3 hours MCC instruction to a

satisfactory standard on the relevant FNPT or FFS under the supervision of a TRI(A), SFI(A) or MCCI(A) nominated by the ATO for this purpose.

- (h) The course consists of three parts:
- (1) Part 1: teaching and learning that should follow the content of AMC1 FCL.920;
  - (2) Part 2: technical theoretical knowledge instruction (technical training);
  - (3) Part 3: flight instruction.

### **Part 1**

The content of the teaching and learning part of the FI training course, as established in AMC1 FCL.930.FI, should be used as guidance to develop the course syllabus.

### **Part 2**

#### **TECHNICAL THEORETICAL KNOWLEDGE INSTRUCTION SYLLABUS**

- (a) The FSTD training consists of the application of core instructor competencies to MCC training in a commercial air transport environment, including principles of threat and error management and CRM.

The content of the training programme should cover MCC course exercises in sufficient depth to meet the standard required for issue of the MCCI(A) certificate.

- (b) The course should be related to the type of FSTD on which the applicant wishes to instruct. A training programme should give details of all theoretical knowledge instruction.
- (c) Identification and application of human factors (as set in the ATPL syllabus 040) related to MCC aspects of the training.

### **Part 3**

#### **FLIGHT INSTRUCTION SYLLABUS**

- (a) The content of the instruction programme should cover training exercises as applicable to the MCC requirements of an applicant for a MP type rating.
- (b) Training exercises:

The exercises should be accomplished as far as possible in a simulated commercial air transport environment. The instruction should cover the following areas:

- (1) pre-flight preparation, including documentation, and computation of take-off performance data;
- (2) pre-flight checks, including radio and navigation equipment checks and setting;
- (3) before take-off checks, including powerplant checks, and take-off briefing by the PF;
- (4) normal take-offs with different flap settings, tasks of PF and PNF, callouts;
- (5) rejected take-offs; crosswind take-offs; take-offs at maximum takeoff mass; engine failure after v1;
- (6) normal and abnormal operation of aircraft systems, use of checklists;
- (7) selected emergency procedures to include engine failure and fire, smoke control and removal, windshear during take-off and landing, emergency descent, incapacitation of a flight crew member;
- (8) early recognition of and reaction on approaching stall in differing aircraft configurations;
- (9) instrument flight procedures, including holding procedures; precision approaches using raw navigation data, flight director and automatic pilot, one engine simulated inoperative approaches, non-precision and circling approaches, approach briefing by the PF, setting of navigation equipment, call-out procedures during approaches; computation of approach and landing data;
- (10) go-arounds; normal and with one engine simulated inoperative, transition from instrument to visual flight on reaching decision height or minimum descent height or altitude;
- (11) landings, normal, crosswind and with one engine simulated inoperative, transition from instrument to visual flight on reaching decision height or minimum descent height or altitude.



**FCL.940.MCCI MCCI – Revalidation and renewal**

- (a) For revalidation of an MCCI certificate the applicant shall have completed the requirements of FCL.930.MCCI(a)(3) on the relevant type of FNPT II/III, FTD 2/3 or FFS, within the last 12 months of the validity period of the MCCI certificate.
- (b) Renewal. If the MCCI certificate has lapsed, the applicant shall complete the requirements of FCL.930.MCCI(a)(2) and (3) on the relevant type of FNPT II/III MCC, FTD 2/3 or FFS.

## **SECTION 9 – SPECIFIC REQUIREMENTS FOR THE SYNTHETIC TRAINING INSTRUCTOR – STI**

### **FCL.905.STI STI – Privileges and conditions**

- (a) The privileges of an STI are to carry out synthetic flight instruction in the appropriate aircraft category for:
  - (1) the issue of a licence;
  - (2) the issue, revalidation or renewal of a BIR and an IR and a class or type rating for single pilot aircraft, except for single-pilot high-performance complex aeroplanes.
- (b) Additional privileges for the STI(A). The privileges of an STI(A) shall include synthetic flight instruction during the core flying skills training of the MPL integrated training course.

### **FCL.910.STI STI – Restricted privileges**

The privileges of STIs shall be restricted to the FSTD in which the STI training course was taken.

The privileges may be extended to other FSTDs representing further types of aircraft if in the period of 12 months immediately preceding the application the holders have:

- (a) completed the FSTD content of the CRI or TRI course on the class or type of aircraft for which instructional privileges are sought;
- (b) passed in the FSTD on which flight instruction is to be conducted, the applicable section of the proficiency check in accordance with Appendix 9 to this MCAR for the appropriate class or type of aircraft.

For STIs(A) instructing on BITD only, the proficiency check shall include only the exercises appropriate for the skill test for the issue of a PPL(A);

- (c) conducted, on a CPL, an IR, a PPL or a class or type rating course, at least 3 hours of flight instruction under the supervision of an FI, a CRI(A), an IRI or a TRI nominated by the ATO for this purpose, including at least 1 hour of flight instruction that is supervised by an FIE in the appropriate aircraft category.

### **FCL.915.STI STI – Prerequisites**

- (a) Applicants for the issue of an STI certificate shall:
- (1) hold, or have held within the 3 years prior to the application, a pilot licence and instructional privileges appropriate to the courses on which instruction is intended;
  - (2) have completed in an FSTD the relevant proficiency check for the class or type rating, in the period of 12 months immediately preceding the application.

Applicants for the issue of an STI(A) wishing to instruct on BITDs only, shall complete the exercises appropriate for a skill test for the issue of a PPL(A) only;

- (b) Additionally to the requirements laid down in point (a), applicants for the issue of an STI(H) certificate shall have completed at least 1 hour of flight time as an observer on the flight deck of the applicable type of helicopter, in the period of 12 months immediately preceding the application.

### **FCL.930.STI STI – Training course**

- (a) The training course for the STI shall comprise at least 3 hours of flight instruction related to the duties of an STI in an FFS, FTD 2/3 or FNPT II/III, under the supervision of an FIE. These hours of flight instruction under supervision shall include the assessment of the applicant's competence as described in FCL.920.

Applicants for an STI(A) wishing to instruct on a BITD only, shall complete the flight instruction on a BITD.

- (b) For applicants for an STI(H), the course shall also include the FFS content of the applicable TRI course.

### **FCL.940.STI Revalidation and renewal of the STI certificate**

- (a) Revalidation

To revalidate an STI certificate, applicants shall, within the period of 12 months immediately preceding the expiry date of the STI certificate, comply with all of the following conditions:

- (1) have conducted at least 3 hours of flight instruction in an FSTD, as part of a complete CPL, IR, PPL or class or type rating course;

- (2) have passed in the FSTD on which flight instruction is conducted, the applicable sections of the proficiency check in accordance with Appendix 9 to this MCAR for the appropriate class or type of aircraft.

For STIs(A) instructing on BITDs only, the proficiency check shall include the exercises appropriate for a skill test for the issue of a PPL(A) only.

**(b) Renewal**

To renew STI certificate, the applicants shall within the period of 12 months immediately preceding the application for the renewal:

- (1) complete a refresher training as an STI at an ATO;
- (2) pass in the FSTD on which flight instruction is conducted, the applicable sections of the proficiency check in accordance with Appendix 9 to this MCAR for the appropriate class or type of aircraft.

For an STI(A) instructing on BITDs only, the proficiency check shall include the exercises appropriate for a skill test for the issue of a PPL(A) only;

- (3) conduct, in the relevant aircraft category, on a complete CPL, IR, PPL or class or type rating course, at least 3 hours of flight instruction under the supervision of an FI, a CRI, an IRI or a TRI nominated by the ATO for this purpose, including at least 1 hour of flight instruction supervised by a flight instructor examiner (FIE).

## **SECTION 10 – MOUNTAIN RATING INSTRUCTOR – MI**

### **FCL.905.MI MI – Privileges and conditions**

The privileges of an MI are to carry out flight instruction for the issue of a mountain rating.

### **FCL.915.MI MI – Prerequisites**

An applicant for an MI certificate shall:

- (a) hold a, FI, CRI, or TRI certificate, with privileges for single-pilot aeroplanes;
- (b) hold a mountain rating.

### **FCL.930.MI MI – Training course**

- (a) The training course for the MI shall include the assessment of the applicant's competence as described in FCL.920.
- (b) Before attending the course, applicants shall have passed a pre-entry flight test with an MI holding an FI certificate to assess their experience and ability to undertake the training course.

### **FCL.940.MI Validity of the MI certificate**

The MI certificate is valid as long as the, FI, TRI or CRI certificate is valid.

## **SECTION 11 – SPECIFIC REQUIREMENTS FOR THE FLIGHT TEST INSTRUCTOR – FTI**

### **FCL.905.FTI FTI – Privileges and conditions**

- (a) The privileges of a flight test instructor (FTI) are to instruct, within the appropriate aircraft category, for:
  - (1) the issue of category 1 or 2 flight test ratings, provided he/she holds the relevant category of flight test rating;
  - (2) the issue of an FTI certificate, within the relevant category of flight test rating, provided that the instructor has at least 2 years of experience instructing for the issue of flight test ratings.
- (b) The privileges of an FTI holding a category 1 flight test rating include the provision of flight instruction also in relation to category 2 flight test ratings.

### **FCL.915.FTI FTI – Prerequisites**

An applicant for an FTI certificate shall:

- (a) hold a flight test rating issued in accordance with FCL.820;
- (b) have completed at least 200 hours of category 1 or 2 flight tests.

### **FCL.930.FTI FTI – Training course**

- (a) The training course for the FTI shall include, at least:
  - (1) 25 hours of teaching and learning;
  - (2) 10 hours of technical training, including revision of technical knowledge, the preparation of lesson plans and the development of classroom/simulator instructional skills;
  - (3) 5 hours of practical flight instruction under the supervision of an FTI qualified in accordance with FCL.905.FTI(b). These hours of flight instruction shall include the assessment of the applicant's competence as described in FCL.920.
- (b) Crediting:

- (1) Applicants holding or having held an instructor certificate shall be fully credited towards the requirement of (a)(1).
- (2) In addition, applicants holding or having held an FI or TRI certificate in the relevant aircraft category shall be fully credited towards the requirements of (a)(2).

#### **FCL.940.FTI FTI – Revalidation and renewal**

- (a) Revalidation. For revalidation of an FTI certificate, the applicant shall, within the validity period of the FTI certificate, fulfil one of the following requirements:
  - (1) complete at least:
    - (i) 50 hours of flight tests, of which at least 15 hours shall be within the 12 months preceding the expiry date of the FTI certificate; and
    - (ii) 5 hours of flight test flight instruction within the 12 months preceding the expiry date of the FTI certificate; or
  - (2) receive refresher training as an FTI at an ATO. The refresher training shall be based on the practical flight instruction element of the FTI training course, in accordance with FCL.930.FTI(a)(3), and include at least 1 instruction flight under the supervision of an FTI qualified in accordance with FCL.905.FTI(b).
- (b) Renewal. If the FTI certificate has lapsed, the applicant shall receive refresher training as an FTI at an ATO. The refresher training shall comply at least with the requirements of FCL.930.FTI(a)(3).

**SUBPART K – EXAMINERS**

**SECTION 1 – COMMON REQUIREMENTS**

**FCL.1000 Examiner certificates**

**(a) General**

Holders of an examiner certificate shall:

- (1) hold, unless otherwise determined in this MCAR, an equivalent licence, rating or certificate to the ones for which they are authorised to conduct skill tests, proficiency checks or assessments of competence and the privilege to instruct for them;
- (2) be qualified to act as PIC in the aircraft during a skill test, proficiency check or assessment of competence if conducted on the aircraft.

**(b) Special conditions:**

- (1) The Authority may issue a specific certificate granting privileges for the conduct of skill tests, proficiency checks and assessments of competence if compliance with the requirements established in this Subpart is not possible because of the introduction of any of the following:
  - (i) new aircraft in the State or in an operator's fleet;
  - (ii) new training courses in this MCAR.

Such a certificate shall be limited to the skill tests, proficiency checks and assessments of competence necessary for the introduction of the new type of aircraft or the new training course and its validity shall not, in any case, exceed 1 year.

- (2) Holders of a certificate issued in accordance with point (b)(1) who wish to apply for an examiner certificate shall comply with the prerequisites and revalidation requirements for that category of examiner certificate.
- (3) Where no qualified examiner is available, competent authorities may, on a case-by-case basis, authorise inspectors or examiners who do not meet the relevant instructor, type or class rating requirements as specified in (a), to perform skill tests, proficiency checks and assessments of competence.



- (c) Examination provided outside the territory of the State:
- (1) By way of derogation from point (a), in the case of skill tests and proficiency checks provided outside the State responsible under the Chicago Convention, the Authority shall issue an examiner certificate to applicants holding a pilot licence that is compliant with Annex 1 to the Chicago Convention, provided that those applicants:
    - (i) hold at least an equivalent licence, rating, or certificate to the one for which they are authorised to conduct skill tests, proficiency checks or assessments of competence, and in any case at least a CPL;
    - (ii) are qualified to act as PIC in the aircraft during a skill test or proficiency check that is conducted in the aircraft;
    - (iii) comply with the requirements established in this Subpart for the issue of the relevant examiner certificate; and
    - (iv) demonstrate to the Authority an adequate level of knowledge of European aviation safety rules to be able to exercise examiner privileges in accordance with this MCAR.
  - (2) The certificate referred to in point (1) shall be limited to performing skill tests and proficiency checks:
    - (i) outside the State responsible under the Chicago Convention; and
    - (ii) to pilots who have sufficient knowledge of the language in which the test/check is given.

## **GM1 FCL.1000 Examiner certificates**

### **SPECIAL CONDITIONS**

When new aircraft are introduced, requirements such as to hold a licence and rating equivalent to the one for which the skill test is being conducted, or to have adequate flight experience, may not be possible to comply with. In this case, to allow for the first ratings for these aircraft to be issued to applicants, competent authorities need the possibility to issue a specific certificate that does not have to comply with the requirements established in this Subpart.

The Authority should only give these certificates to holders of other examiner certificates. As far as possible, preference should be given to persons with experience in similar types

or classes of aircraft, for example, in aircraft having the same kind and number of engines or rotors and of the same order of mass or technology.

The certificate should be limited in validity to the time needed to qualify the first examiners for the new aircraft in accordance with this Subpart, but in any case, it should not exceed the 1 year established in the rule.

### **GM2 FCL.1000 Examiner certificates**

When examiners conduct a skill test, proficiency check or assessment of competence, in addition to a licence for the relevant aircraft category, they are required to hold the rating or certificate equivalent to the one for which they conduct the skill test, proficiency check or assessment of competence.

For example, a candidate who holds a CPL(A) may make a class rating proficiency check on an SE piston aeroplane with an examiner who holds a PPL(A) with an SE piston class rating and related examiner privileges.

### **FCL.1005 Limitation of privileges in case of vested interests**

Examiners shall not conduct:

- (a) skill tests or assessments of competence of applicants for the issue of a licence, rating or certificate to whom they have provided more than 25 % of the required flight instruction for the licence, rating or certificate for which the skill test or assessment of competence is being taken; and
- (b) skill tests, proficiency checks or assessments of competence whenever they feel that their objectivity may be affected.

### **GM1 FCL.1005(b) Limitation of privileges in case of vested interests**

Examples of a situation where the examiner should consider if their objectivity is affected are when the applicant is a relative or a friend of the examiner, or when they are linked by economic interests or political affiliations, etc.

### **FCL.1010 Prerequisites for examiners**

Applicants for an examiner certificate shall demonstrate:

- (a) relevant knowledge, background and appropriate experience related to the privileges of an examiner;

- (b) that they have not been subject to any sanctions, including the suspension, limitation or revocation of any of their licences, ratings or certificates issued in accordance with this MCAR, for non-compliance with the Basic Regulation and its Implementing Rules during the last 3 years.

### **AMC1 FCL.1010 Prerequisites for examiners**

When evaluating the applicant's background, the Authority should evaluate the personality and character of the applicant, and his/her cooperation with the Authority.

The Authority may also take into account whether the applicant has been convicted of any relevant criminal or other offenses, taking into account national law and principles of non-discrimination.

### **FCL.1015 Examiner standardisation**

- (a) An applicant for an examiner certificate shall undertake a standardisation course which is provided by the Authority or which is provided by an ATO and approved by the Authority.
- (b) The standardisation course shall consist of theoretical and practical instruction and shall include, at least:
  - (1) the conduct of 2 skill tests, proficiency checks or assessments of competences for the licences, ratings or certificates for which the applicant seeks the privilege to conduct tests and checks;
  - (2) instruction on the applicable requirements in this MCAR and the applicable air operations requirements, the conduct of skill tests, proficiency checks and assessments of competence, and their documentation and reporting;
  - (3) a briefing on the national administrative procedures, requirements for protection of personal data, liability, accident insurance and fees.
  - (4) a briefing on the need to review and apply the items in (3) when conducting skill tests, proficiency checks or assessments of competence of an applicant for which the Authority is not the same that issued the examiner's certificate; and
  - (5) an instruction on how to get access to these national procedures and requirements of other competent authorities when needed;
- (c) Holders of an examiners certificate shall not conduct skill tests, proficiency checks or assessments of competence of an applicant for which the Authority is not the

same that issued the examiner's certificate, unless they have reviewed the latest available information containing the relevant national procedures of the applicant's Authority.

## **AMC1 FCL.1015 Examiner standardisation**

### **GENERAL**

- (a) The Authority may provide the course itself or through an arrangement with an ATO or, in the case of examiners for sailplanes and balloons, with a DTO.

This arrangement should clearly state that the ATO or the DTO is acting under the management system of the Authority.

- (b) The course should last:
- (1) for the FE and FIE, at least 1 day, divided into theoretical and practical training;
  - (2) for other examiners, at least 3 days, divided into theoretical training (1 day) and practical training in an FFS conducting real or role-played proficiency checks, skill tests or assessments of competence (at least 2 days).
- (c) The Authority, the ATO or the DTO should determine any further training required before presenting the candidate for the examiner assessment of competence.

### **CONTENT**

- (d) The training should comprise:
- (1) Theoretical training covering at least:
    - (i) the contents of AMC2 FCL.1015 and the FEM;
    - (ii) Part-FCL and related AMCs and GM relevant to their duties;
    - (iii) operational requirements and related AMCs and GM relevant to their duties;
    - (iv) national requirements relevant to their examination duties;
    - (v) fundamentals of human performance and limitations relevant to flight examination;
    - (vi) fundamentals of evaluation relevant to applicant's performance;

- (vii) the management system of ATOs and the organisational structure of DTOs;
- (viii) MCC, human performance and limitations, if applicable.
- (2) Examiners should also be briefed on the protection requirements for personal data, liability, accident insurance and fees, as applicable in the State concerned.
- (3) All items above are the core knowledge requirements for an examiner and are recommended as the core course material. This core course may be studied before recommended examiner training is commenced. The core course may utilise any suitable training format.
- (4) Practical training consisting of at least:
  - (i) knowledge and management of the test for which the certificate is to be sought. These are described in the relevant modules in the FEM;
  - (ii) knowledge of the administrative procedures pertaining to that test or check.
- (5) For an initial examiner certificate, practical training should include the examination of the test profile sought, consisting of the conduct of at least two test or check profiles in the role of examiner (these two tests or checks profiles can be performed in the same simulator session), including briefing, conduct of the skill test and proficiency check, assessment of the applicant to whom the test or check is given, debriefing and recording or documentation under the supervision of an examiner of the appropriate category on the applicable type. This training is conducted in the aircraft if approval for testing or checking in the aircraft is required. If examiner privileges in FSTD's are required, practical instruction in the use of FSTD(s) for testing or checking should also be completed.
- (6) If examiner privileges are to include the conduct of proficiency checks for the revalidation or renewal of an instrument rating, practical instruction should include the conduct of at least four instrument check profiles in the role of examiner, including briefing, conduct of the skill test and proficiency check, assessment of the applicant to whom the test or check is given, debriefing and recording or documentation under the supervision of an examiner of the appropriate category on the applicable type. This training is conducted in the aircraft if approval for testing or checking in the aircraft is required. If examiner privileges in both FSTD and aircraft are required, at least one of the instrument check profiles should be conducted in an FSTD.

- (7) For extension of an examiner certificate to further types (as required for TRE), further practical training on the new type may be required, consisting of the conduct of at least one test or check profile in the role of examiner on the new type, including briefing, conduct of the skill test and proficiency check, assessment of the applicant to whom the test or check is given, debriefing and recording or documentation under the supervision of an examiner of the appropriate category on the applicable type. A further examiner check on the new type may be required, which may be supervised by an inspector of the Authority or a suitably authorised senior examiner.

## **AMC2 FCL.1015 Examiner standardisation**

### **STANDARDISATION ARRANGEMENTS FOR EXAMINERS**

#### **LIMITATIONS**

- (a) An examiner should allow an applicant adequate time to prepare for a test or check, normally not more than 1 hour.
- (b) An examiner should plan a test or check flight so that all required exercises can be performed while allowing sufficient time for each of the exercises and with due regard to the weather conditions, traffic situation, ATC requirements and local procedures.

#### **PURPOSE OF A TEST OR CHECK**

- (c) Determine through practical demonstration during a test or check that an applicant has acquired or maintained the required level of knowledge and skill or proficiency.
- (d) Improve training and flight instruction in ATOs or DTOs by feedback of information from examiners about items or sections of tests or checks that are most frequently failed.
- (e) Assist in maintaining and, where possible, improving air safety standards by having examiners display good airmanship and flight discipline during tests or checks.

#### **CONDUCT OF TEST OR CHECK**

- (f) An examiner will ensure that an applicant completes a test or check in accordance with MCAR-Part-FCL requirements and is assessed against the required test or check standards.
- (g) Each item within a test or check section should be completed and assessed separately. The test or check schedule, as briefed, should not normally be altered

by an examiner. A failed item is not always a failed section, for example type rating skill test where a failure of an item in a section does not fail the entire section, only the failed item is taken again.

- (h) Marginal or questionable performance of a test or check item should not influence an examiner's assessment of any subsequent items.
- (i) An examiner should verify the requirements and limitations of a test or check with an applicant during the pre-flight briefing.
- (j) When a test or check is completed or discontinued, an examiner should debrief the applicant and give reasons for items or sections failed. In case of a failed or discontinued skill test and proficiency check, the examiner should provide appropriate advice to assist the applicant in re-tests or re-checks.
- (k) Any comment on, or disagreement with, an examiner's test or check evaluation or assessment made during a debriefing will be recorded by the examiner on the test or check report, and will be signed by the examiner and countersigned by the applicant.

#### **EXAMINER PREPARATION**

- (l) An examiner should supervise all aspects of the test or check flight preparation, including, where necessary, obtaining or assuring an ATC 'slot' time.
- (m) An examiner will plan a test or check in accordance with MCAR-Part-FCL requirements. Only the manoeuvres and procedures set out in the appropriate test or check form will be undertaken. The same examiner should not reexamine a failed applicant without the agreement of the applicant.

#### **EXAMINER APPROACH**

- (n) An examiner should encourage a friendly and relaxed atmosphere to develop both before and during a test or check flight. A negative or hostile approach should not be used. During the test or check flight, the examiner should avoid negative comments or criticisms and all assessments should be reserved for the debriefing.

#### **ASSESSMENT SYSTEM**

- (o) Although test or checks may specify flight test tolerances, an applicant should not be expected to achieve these at the expense of smoothness or stable flight. An examiner should make due allowance for unavoidable deviations due to turbulence, ATC instructions, etc. An examiner should terminate a test or check only when it is clear that the applicant has not been able to demonstrate the required level of knowledge, skill or proficiency and that a full re-test will be

necessary or for safety reasons. An examiner will use one of the following terms for assessment:

- (1) a 'pass', provided that the applicant demonstrates the required level of knowledge, skill or proficiency and, where applicable, remains within the flight test tolerances for the licence or rating;
- (2) a 'fail' provided that any of the following apply:
  - (i) the flight test tolerances have been exceeded after the examiner has made due allowance for turbulence or ATC instructions;
  - (ii) the aim of the test or check is not completed;
  - (iii) the aim of exercise is completed but at the expense of safe flight, violation of a rule or regulation, poor airmanship or rough handling;
  - (iv) an acceptable level of knowledge is not demonstrated;
  - (v) an acceptable level of flight management is not demonstrated;
  - (vi) the intervention of the examiner or safety pilot is required in the interest of safety.
- (3) a 'partial pass' in accordance with the criteria shown in the relevant skill test appendix of MCAR-Part-FCL.

## **METHOD AND CONTENTS OF THE TEST OR CHECK**

- (p) Before undertaking a test or check, an examiner will verify that the aircraft or FSTD intended to be used is suitable and appropriately equipped for the test or check. Aircraft that fall under the Civil Aviation Regulations and MCAR-Part-ARA can be used provided that they are subject to an authorisation as per point ORA.ATO.135 or point DTO.GEN.240.
- (q) A test or check flight will be conducted in accordance with the AFM and, if applicable, the AOM.
- (r) A test or check flight will be conducted within the limitations contained in the operations manual of an ATO or the operator for which the applicant is flying, as applicable, or, if available, within the limitations placed by the DTO.
- (s) Contents:
  - (1) a test or check is comprised of:



- (i) oral examination on the ground (where applicable);
  - (ii) pre-flight briefing;
  - (iii) in-flight exercises;
  - (iv) post-flight debriefing.
- (2) oral examination on the ground should include:
  - (i) aircraft general knowledge and performance;
  - (ii) planning and operational procedures;
  - (iii) other relevant items or sections of the test or check.
- (3) pre-flight briefing should include:
  - (i) test or check sequence;
  - (ii) power setting, speeds and approach minima, if applicable;
  - (iii) safety considerations.
- (4) in-flight exercises will include each relevant item or section of the test or check;
- (5) post-flight debriefing should include:
  - (i) assessment or evaluation of the applicant;
  - (ii) documentation of the test or check with the applicant's FI present, if possible.
- (t) A test or check is intended to simulate a practical flight. Thus, an examiner may set practical scenarios for an applicant while ensuring that the applicant is not confused and air safety is not compromised.
- (u) When manoeuvres are to be flown by sole reference to instruments, the examiner should ensure that a suitable method of screening is used to simulate IMC.
- (v) An examiner should maintain a flight log and assessment record during the test or check for reference during the post or flight debriefing.

- (w) An examiner should be flexible to the possibility of changes arising to preflight briefings due to ATC instructions, or other circumstances affecting the test or check.
- (x) Where changes arise to a planned test or check an examiner should be satisfied that the applicant understands and accepts the changes. Otherwise, the test or check flight should be terminated.
- (y) Should an applicant choose not to continue a test or check for reasons considered inadequate by an examiner, the applicant will be assessed as having failed those items or sections not attempted. If the test or check is terminated for reasons considered adequate by the examiner, only these items or sections not completed will be tested during a subsequent test or check.
- (z) An examiner may terminate a test or check at any stage, if it is considered that the applicant's competency requires a complete re-test or re-check.

### **GM1 FCL.1015 Examiner standardisation**

- (a) An examiner should plan per day not more than:
  - (1) three tests or checks relating to PPL, CPL, IR or class ratings;
  - (2) four tests or checks relating to LAPL, SPL or BPL;
  - (3) two tests or checks related to MPL or ATPL;
  - (4) two assessments of competence related to instructor certificates;
  - (5) four tests or checks relating to SP type ratings.
- (b) An examiner should plan at least 2 hours for a LAPL, SPL or BPL, 3 hours for a PPL, CPL, IR or class rating test or checks, and at least 4 hours for instructor certificates, MPL, ATPL or MP type rating tests or checks, including preflight briefing and preparation, conduct of the test, check or assessment of competence, de-briefing, evaluation of the applicant and documentation.
- (c) For the conduct of the test, check or assessment of competence, without additional activities specified in point (b), the following values may be used as guidance:
  - (1) 45 minutes for a LAPL(B) or BPL and SP class ratings VFR only;
  - (2) 60 minutes for extension of BPL commercial privileges;

- (3) 90 minutes for LAPL(A) or (H), PPL(A) or (H), and CPL(A) or (H), including the navigation section;
  - (4) 60 minutes for PPL(As) and CPL(As);
  - (5) 60 minutes for IR, EIR, instructor certificates, and SP type or class ratings; and
  - (6) 120 minutes for MPL, ATPL, and MP type ratings.
- (d) For the LAPL(S) and SPL test or check flight the flight time must be sufficient to allow that all the items in each test or check section can be fully completed. If not all the items can be completed in one flight, additional flights have to be done.

### **GM1 FCL.1015(a); FCL.1025(b)(2)**

#### **EXAMINER STANDARDISATION COURSES AT AN ATO OR A DTO**

In point FCL.1015(a) (second sentence) and in point FCL.1025(b)(2) (second sentence), the word 'may' is used to indicate that completing an examiner standardisation course or an examiner refresher course at a DTO is an option which can be used by examiners for sailplanes and balloons as an alternative to completing such courses provided by the Authority or an ATO (first sentence in both point FCL.1015(a) and point FCL.1025(b)(2)).

### **FCL.1020 Examiners assessment of competence**

Applicants for an examiner certificate shall demonstrate their competence to an inspector from the Authority or a senior examiner specifically authorised to do so by the Authority responsible for the examiner's certificate through the conduct of a skill test, proficiency check or assessment of competence in the examiner role for which privileges are sought, including briefing, conduct of the skill test, proficiency check or assessment of competence, and assessment of the person to whom the test, check or assessment is given, debriefing and recording documentation.

### **AMC1 FCL.1020 Examiners assessment of competence**

#### **GENERAL**

- (a) The Authority may nominate either one of its inspectors or a senior examiner to assess the competence of applicants for an examiner certificate.

#### **DEFINITIONS**

(b) Definitions:

- (1) 'Inspector': the inspector of the Authority conducting the examiner competence assessment;
- (2) 'Examiner applicant': the person seeking certification as an examiner;
- (3) 'Candidate': the person being tested or checked by the examiner applicant. This person may be a pilot for whom the test or check would be required, or the inspector of the Authority who is conducting the examiner certification acceptance test.

**CONDUCT OF THE ASSESSMENT**

- (c) An inspector of the Authority or a senior examiner will observe all examiner applicants conducting a test on a 'candidate' in an aircraft for which examiner certificate is sought. Items from the related training course and test or check schedule will be selected by the inspector for examination of the 'candidate' by the examiner applicant. Having agreed with the inspector the content of the test, the examiner applicant will be expected to manage the entire test. This will include briefing, the conduct of the flight, assessment and debriefing of the 'candidate'. The inspector will discuss the assessment with the examiner applicant before the 'candidate' is debriefed and informed of the result.

**BRIEFING THE 'CANDIDATE'**

- (d) The 'candidate' should be given time and facilities to prepare for the test flight. The briefing should cover the following:
- (1) the objective of the flight;
  - (2) licensing checks, as necessary;
  - (3) freedom for the 'candidate' to ask questions;
  - (4) operating procedures to be followed (for example operators manual);
  - (5) weather assessment;
  - (6) operating capacity of 'candidate' and examiner;
  - (7) aims to be identified by 'candidate';
  - (8) simulated weather assumptions (for example icing and cloud base);

- (9) use of screens (if applicable);
  - (10) contents of exercise to be performed;
  - (11) agreed speed and handling parameters (for example V-speeds, bank angle, approach minima);
  - (12) use of R/T;
  - (13) respective roles of 'candidate' and examiner (for example during emergency);
  - (14) administrative procedures (for example submission of flight plan).
- (e) The examiner applicant should maintain the necessary level of communication with the 'candidate'. The following check details should be followed by the examiner applicant:
- (1) involvement of examiner in a MP operating environment;
  - (2) the need to give the 'candidate' precise instructions;
  - (3) responsibility for safe conduct of the flight;
  - (4) intervention by examiner, when necessary;
  - (5) use of screens;
  - (6) liaison with ATC and the need for concise, easily understood intentions;
  - (7) prompting the 'candidate' about required sequence of events (for example following a go-around);
  - (8) keeping brief, factual and unobtrusive notes.

## **ASSESSMENT**

- (f) The examiner applicant should refer to the flight test tolerances given in the relevant skill test. Attention should be paid to the following points:
- (1) questions from the 'candidate';
  - (2) give results of the test and any sections failed;
  - (3) give reasons for failure.

## DEBRIEFING

- (g) The examiner applicant should demonstrate to the inspector the ability to conduct a fair, unbiased debriefing of the 'candidate' based on identifiable factual items. A balance between friendliness and firmness should be evident. The following points should be discussed with the 'candidate', at the applicant's discretion:
- (1) advise the candidate on how to avoid or correct mistakes;
  - (2) mention any other points of criticism noted;
  - (3) give any advice considered helpful.

## RECORDING OR DOCUMENTATION

- (h) The examiner applicant should demonstrate to the inspector the ability to complete the relevant records correctly. These records may be:
- (1) the relevant test or check form;
  - (2) licence entry;
  - (3) notification of failure form;
  - (4) relevant company forms where the examiner has privileges of conducting operator proficiency checks.

## DEMONSTRATION OF THEORETICAL KNOWLEDGE

- (i) The examiner applicant should demonstrate to the inspector a satisfactory knowledge of the regulatory requirements associated with the function of an examiner.

## **FCL.1025 Validity, revalidation and renewal of examiner certificates**

- (a) Validity

An examiner certificate shall be valid for 3 years.

- (b) Revalidation

To revalidate an examiner certificate, holders shall comply with all of the following conditions:

- (1) before the expiry date of the certificate, have conducted at least six skill tests, proficiency checks, assessments of competence, or EBT evaluation phases during an EBT module referred to in point ORO.FC.231 of MCAR-Part-ORO;
- (2) in the period of 12 months immediately preceding the expiry date of the certificate, have completed an examiner refresher course which is provided by the Authority or which is provided by an ATO and approved by the Authority;
- (3) one of the skill tests, proficiency checks, assessments of competence or EBT evaluation phases conducted in accordance with point (1) shall take place in the period of 12 months immediately preceding the expiry date of the examiner certificate and shall:
  - (i) have been assessed by an inspector from the Authority or by a senior examiner specifically authorised to do so by the Authority responsible for the examiner certificate; or
  - (ii) comply with the requirements in point FCL.1020.

If applicants for the revalidation hold privileges for more than one category of examiner, all examiner privileges may be revalidated if applicants comply with the requirements laid down in points (b)(1) and (2) and point FCL.1020 for one of the categories of examiner certificates held, in agreement with the Authority.

**(c) Renewal**

If the certificate has expired, before resuming the exercise of the privileges, the applicants shall comply with the requirements in point (b)(2) and point FCL.1020 in the period of 12 months immediately preceding the application for the renewal.

- (d)** An examiner certificate shall only be revalidated or renewed if applicants demonstrate continued compliance with the requirements laid down in points FCL.1010 and FCL.1030.

**AMC1 FCL.1020; FCL.1025**

**QUALIFICATION OF SENIOR EXAMINERS**

- (a)** A senior examiner specifically tasked by the Authority to observe skill tests or proficiency checks for the revalidation of examiner certificates should:

- (1) hold a valid or current examiner certificate appropriate to the privileges being given;
  - (2) have examiner experience level acceptable to the Authority;
  - (3) have conducted a number of skill tests or proficiency checks as a MCAR-Part-FCL examiner.
- (b) The Authority may conduct a pre-assessment of the applicant or candidate carrying out a skill test and proficiency check under supervision of an inspector of the Authority.
- (c) Applicants should be required to attend a senior examiner briefing, course or seminar arranged by the Authority. Content and duration will be determined by the Authority and should include:
  - (1) pre-course self-study;
  - (2) legislation;
  - (3) the role of the senior examiner;
  - (4) an examiner assessment;
  - (5) national administrative requirements.
- (d) The validity of the authorisation should not exceed the validity of the examiners certificate, and in any case should not exceed 3 years. The authorisation may be revalidated in accordance with procedures established by the Authority.

### **AMC1 FCL.1025 Validity, revalidation and renewal of examiner certificates**

#### **EXAMINER REFRESHER COURSE**

The examiner refresher course should follow the content of the examiner standardisation course, included in AMC1 FCL.1015, and take into account specific contents adequate to the category of examiner affected.



## **GM1 FCL.1015(a); FCL.1025(b)(2)**

### **EXAMINER STANDARDISATION COURSES AT AN ATO OR A DTO**

In point FCL.1015(a) (second sentence) and in point FCL.1025(b)(2) (second sentence), the word 'may' is used to indicate that completing an examiner standardisation course or an examiner refresher course at a DTO is an option which can be used by examiners for sailplanes and balloons as an alternative to completing such courses provided by the Authority or an ATO (first sentence in both point FCL.1015(a) and point FCL.1025(b)(2)).

## **FCL.1030 Conduct of skill tests, proficiency checks and assessments of competence**

- (a) When conducting skill tests, proficiency checks and assessments of competence, examiners shall:
  - (1) ensure that communication with the applicant can be established without language barriers;
  - (2) verify that the applicant complies with all the qualification, training and experience requirements in this MCAR for the issue, revalidation or renewal of the licence, rating or certificate for which the skill test, proficiency check or assessment of competence is taken;
  - (3) make the applicant aware of the consequences of providing incomplete, inaccurate or false information related to their training and flight experience.
- (b) After completion of the skill test or proficiency check, the examiner shall:
  - (1) inform the applicant of the result of the test. In the event of a partial pass or fail, the examiner shall inform the applicant that he/she may not exercise the privileges of the rating until a full pass has been obtained. The examiner shall detail any further training requirement and explain the applicant's right of appeal;
  - (2) in the event of a pass in a proficiency check or assessment of competence for revalidation or renewal, endorse the applicant's licence or certificate with the new expiry date of the rating or certificate, if specifically authorised for that purpose by the Authority responsible for the applicant's licence;
  - (3) provide the applicant with a signed report of the skill test or proficiency check and submit without delay copies of the report to the Authority responsible for the applicant's licence, and to the Authority that issued the examiner certificate. The report shall include:

- (i) a declaration that the examiner has received information from the applicant regarding his/her experience and instruction, and found that experience and instruction complying with the applicable requirements in this MCAR;
  - (ii) confirmation that all the required manoeuvres and exercises have been completed, as well as information on the verbal theoretical knowledge examination, when applicable. If an item has been failed, the examiner shall record the reasons for this assessment;
  - (iii) the result of the test, check or assessment of competence;
  - (iv) a declaration that the examiner has reviewed and applied the national procedures and requirements of the applicant's competent authority if the competent authority responsible for the applicant's licence is not the same that issued the examiner's certificate;
  - (v) a copy of the examiner certificate containing the scope of his/her privileges as examiner in the case of skill tests, proficiency checks or assessments of competence of an applicant for which the Authority is not the same that issued the examiner's certificate.
- (c) Examiners shall maintain records for 5 years with details of all skill tests, proficiency checks and assessments of competence performed and their results.
- (d) Upon request by the competent authority responsible for the examiner certificate, or the competent authority responsible for the applicant's licence, examiners shall submit all records and reports, and any other information, as required for oversight activities.

### **AMC1 FCL.1030(b)(3) Conduct of skill tests, proficiency checks and assessments of competence**

#### **OBLIGATIONS FOR EXAMINERS APPLICATION AND REPORT FORMS**

Common application and report forms can be found:

- (a) For skill tests or proficiency checks for issue, revalidation or renewal of LAPL, BPL, SPL, PPL, CPL and IR in AMC1 to Appendix 7;
- (b) For training, skill tests or proficiency checks for ATPL, MPL or class and type ratings, in AMC1 to Appendix 9;
- (c) For EBT practical assessment, in AMC1 to Appendix 10;

- (d) For assessments of competence for instructors, in AMC5 FCL.935.

**GM1 FCL.1030(b)(3)(ii) Conduct of skill tests, proficiency checks and assessments of competence**

**REVALIDATION OF CLASS AND TYPE RATINGS — AEROPLANES — REQUIRED MANOEUVRES AND EXERCISES IN THE CONTEXT OF APPENDIX 10 (EBT PRACTICAL ASSESSMENT)**

The confirmation that all the required manoeuvres and exercises have been completed means that during the period of validity of the type rating, the applicant has completed the operator's EBT programme applicable to that period.

## **SECTION 2 – SPECIFIC REQUIREMENTS FOR FLIGHT EXAMINERS – FE**

### **FCL.1005.FE FE – Privileges and conditions**

- (a) FE(A). The privileges of an FE for aeroplanes are to conduct:
- (1) skill tests for the issue of the PPL(A) and skill tests and proficiency checks for associated/ single-pilot class and type ratings, except for single-pilot high performance complex aeroplanes, provided that the examiner has completed at least 1 000 hours of flight time as a pilot on aeroplanes or TMGs, including at least 250 hours of flight instruction;
  - (2) skill tests for the issue of the CPL(A) and skill tests and proficiency checks for the associated single-pilot class and type ratings, except for single-pilot high performance complex aeroplanes, provided that the examiner has completed at least 2 000 hours of flight time as a pilot on aeroplanes or TMGs, including at least 250 hours of flight instruction;
  - (3) skill tests and proficiency checks for the LAPL(A), provided that the examiner has completed at least 500 hours of flight time as a pilot on aeroplanes or TMGs, including at least 100 hours of flight instruction;
  - (4) skill tests for the issue of a mountain rating, provided that the examiner has completed at least 500 hours of flight time as a pilot on aeroplanes or TMGs, including at least 500 take-offs and landings of flight instruction for the mountain rating.
  - (5) proficiency checks for the revalidation and renewal of EIRs, provided that the FE has completed at least 1 500 hours as a pilot on aeroplanes and complies with the requirements in FCL.1010.IRE(a)(2).
- (b) FE(H). The privileges of an FE for helicopters are to conduct:
- (1) skill tests for the issue of the PPL(H) and skill tests and proficiency checks for single-pilot single-engine helicopter type ratings entered in a PPL(H), provided that the examiner has completed 1 000 hours of flight time as a pilot on helicopters, including at least 250 hours of flight instruction;
  - (2) skill tests for the issue of the CPL(H) and skill tests and proficiency checks for single-pilot single-engine helicopter type ratings entered in a CPL(H),

provided the examiner has completed 2 000 hours of flight time as pilot on helicopters, including at least 250 hours of flight instruction;

- (3) skill tests and proficiency checks for single-pilot multi-engine helicopter type ratings entered in a PPL(H) or a CPL(H), provided the examiner has completed the requirements in (1) or (2), as applicable, and holds a CPL(H) or ATPL(H) and, when applicable, an IR(H);
  - (4) skill tests and proficiency checks for the LAPL(H), provided that the examiner has completed at least 500 hours of flight time as a pilot on helicopters, including at least 150 hours of flight instruction.
- (c) FE(As). The privileges of an FE for airships are to conduct skill tests for the issue of the PPL(As) and CPL(As) and skill tests and proficiency checks for the associated airship type ratings, provided that the examiner has completed 500 hours of flight time as a pilot on airships, including 100 hours of flight instruction.

#### **FCL.1010.FE FE – Prerequisites**

An applicant for an FE certificate shall hold:

an FI certificate in the appropriate aircraft category.

## **SECTION 3 – SPECIFIC REQUIREMENTS FOR TYPE RATING EXAMINERS – TRE**

### **FCL.1005.TRE TRE – Privileges and conditions**

- (a) TRE(A) and TRE(PL). The privileges of a TRE for aeroplanes or powered-lift aircraft are to conduct:
  - (1) skill tests for the initial issue of type ratings for aeroplanes or powered-lift aircraft, as applicable;
  - (2) proficiency checks for the revalidation or renewal of type ratings and IRs;
  - (3) skill tests for ATPL(A) issue;
  - (4) skill tests for MPL issue, provided that the examiner has complied with the requirements in FCL.925;
  - (5) assessments of competence for the issue, revalidation or renewal of a TRI or SFI certificates in the applicable aircraft category, provided that they have completed at least 3 years as a TRE and have undergone specific training for the assessment of competence in accordance with point FCL.1015 (b).
- (b) TRE(H). The privileges of a TRE(H) are to conduct:
  - (1) skill tests and proficiency checks for the issue, revalidation or renewal of helicopter type ratings;
  - (2) proficiency checks for the revalidation or renewal of IRs, provided the TRE(H) holds a valid IR(H);
  - (3) skill tests for ATPL(H) issue;
  - (4) assessments of competence for the issue, revalidation or renewal of a TRI(H) or SFI(H) certificates, provided that they have completed at least 3 years as a TRE and have undergone specific training for the assessment of competence in accordance with point FCL.1015 (b).

### **FCL.1010.TRE TRE – Prerequisites**

- (a) TRE(A) and TRE(PL). Applicants for a TRE certificate for aeroplanes and powered-lift aircraft shall:

- (1) in the case of multi-pilot aeroplanes or powered-lift aircraft, have completed 1500 hours of flight time as a pilot of multi-pilot aeroplanes or powered-lift aircraft, as applicable, of which at least 500 hours shall be as PIC;
  - (2) in the case of single-pilot high performance complex aeroplanes, have completed 500 hours of flight time as a pilot of single-pilot aeroplanes, of which at least 200 hours shall be as PIC;
  - (3) hold a CPL or ATPL and a TRI certificate for the applicable type;
  - (4) for the initial issue of an TRE certificate, have completed at least 50 hours of flight instruction as a TRI, FI or SFI in the applicable type or an FSTD representing that type.
- (b) TRE(H). Applicants for a TRE (H) certificate for helicopters shall:
- (1) hold a TRI(H) certificate or, in the case of single-pilot single-engine helicopters, a valid FI(H) certificate, for the applicable type;
  - (2) for the initial issue of a TRE certificate, have completed 50 hours of flight instruction as a TRI, FI or SFI in the applicable type or an FSTD representing that type;
  - (3) in the case of multi-pilot helicopters, hold a CPL(H) or ATPL(H) and have completed 1500 hours of flight as a pilot on multi-pilot helicopters, of which at least 500 hours shall be as PIC;
  - (4) in the case of single-pilot multi-engine helicopters:
    - (i) have completed 1000 hours of flight as pilot on helicopters, of which at least 500 hours shall be as PIC;
    - (ii) hold a CPL(H) or ATPL(H) and, when applicable, a valid IR(H);
  - (5) in the case of single-pilot single-engine helicopters:
    - (i) have completed 750 hours of flight as a pilot on helicopters, of which at least 500 hours shall be as PIC;
    - (ii) hold a CPL(H) or ATPL(H).
  - (6) Before the privileges of a TRE(H) are extended from single-pilot operations to multi-pilot operations on the same type of helicopter, the holder shall have either:

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- (i) at least 100 hours in multi-pilot operations on this type; or
  - (ii) at least 350 hours in multi-pilot operations in any aircraft category.
- (7) In the case of applicants for the first multi-pilot multi-engine TRE certificate, the 1500 hours of flight experience on multi-pilot helicopters required in (b)(3) may be considered to have been met if they have completed the 500 hours of flight time as PIC on a multi-pilot helicopter of the same type.



## **SECTION 4 – SPECIFIC REQUIREMENTS FOR CLASS RATING EXAM- INER – CRE**

### **FCL.1005.CRE CRE – Privileges**

The privileges of a CRE are to conduct, for single-pilot aeroplanes, except for single-pilot high performance complex aeroplanes:

- (a) skill tests for the issue of class and type ratings;
- (b) proficiency checks for:
  - (1) revalidation or renewal of class and type ratings;
  - (2) revalidation of IRs, provided that they have completed at least 1500 hours as pilots of aeroplanes and have completed at least 450 hours of flight time under IFR;
  - (3) renewal of IRs, provided that they comply with the requirements laid down in point FCL.1010.IRE(a); and (4) revalidation and renewal of EIRs, provided that they have completed at least 1 500 hours as a pilot on aeroplanes and comply with the requirements laid down in point FCL.1010.IRE(a)(2).
  - (4) revalidation and renewal of BIRs, provided that the CRE has completed:
    - (i) 1 500 hours of flight time as a pilot of aeroplanes; and
    - (ii) 450 hours of flight time under IFR; and
- (c) skill tests for the extension of LAPL(A) privileges to another class or variant of aeroplane.

### **FCL.1010.CRE CRE – Prerequisites**

Applicants for a CRE certificate shall:

- (a) hold a CPL(A), MPL(A) or ATPL(A) with single-pilot privileges or have held it and hold a PPL(A);
- (b) hold a CRI or FI certificate with instructional privileges for the applicable class or type;

- (c) have completed 500 hours of flight time as a pilot on aeroplanes.

## **SECTION 5 – SPECIFIC REQUIREMENTS FOR INSTRUMENT RATING EXAMINER – IRE**

### **FCL.1005.IRE IRE – Privileges**

The privileges of holders of an instrument rating examiner (IRE) certificate are to conduct skill tests for the issue and proficiency checks for the revalidation or renewal of BIRs and IRs.

### **FCL.1010.IRE IRE – Prerequisites**

(a) IRE(A)

Applicants for an IRE certificate for aeroplanes shall hold an IRI(A) or an FI(A) certificate with the privilege to instruct for the IR(A) and shall have completed:

- (1) 2000 hours of flight time as pilots of aeroplanes; and
- (2) 450 hours of flight time under IFR, of which 250 hours shall be as an instructor.

(b) IRE(H)

Applicants for an IRE certificate for helicopters shall hold an IRI(H) or an FI(H) certificate with the privilege to instruct for the IR(H) and shall have completed:

- (1) 2 000 hours of flight time as a pilot on helicopters; and
- (2) 300 hours of instrument flight time on helicopters, of which 200 hours shall be as an instructor.

(c) IRE(As)

Applicants for an IRE certificate for airships shall hold an IRI(As) or an FI(As) certificate with the privilege to instruct for the IR(As) and shall have completed:

- (1) 500 hours of flight time as a pilot on airships; and
- (2) 100 hours of instrument flight time on airships, of which 50 hours shall be as an instructor.

## **SECTION 6 – SPECIFIC REQUIREMENTS FOR SYNTHETIC FLIGHT EXAMINER – SFE**

### **FCL.1005.SFE SFE – Privileges and conditions**

**(a) SFE for aeroplanes (SFE(A)) and SFE for powered-lift aircraft (SFE(PL))**

The privileges of SFEs for aeroplanes or powered-lift aircraft are to conduct in an FFS, or for the assessments in point (5) on the applicable FSTD:

- (1) skill tests and proficiency checks for the issue, revalidation or renewal of type ratings for aeroplanes or powered-lift aircraft, as applicable;
- (2) proficiency checks for the revalidation or renewal of IRs if combined with the revalidation or renewal of a type rating, provided that they have passed a proficiency check for the aircraft type including the instrument rating within the last year;
- (3) skill tests for ATPL(A) issue;
- (4) skill tests for MPL issue, provided that they have complied with the requirements laid down in point FCL.925; and
- (5) assessments of competence for the issue, revalidation or renewal of an SFI certificate in the relevant aircraft category, provided that they have completed at least 3 years as an SFE(A) and have undergone specific training for the assessment of competence in accordance with point FCL.1015(b).

**(b) SFE for helicopters (SFE(H))**

The privileges of an SFEs(H) are to conduct in an FFS or for the assessments in point (4) on the applicable FSTD:

- (1) skill tests and proficiency checks for the issue, revalidation and renewal of type ratings;
- (2) proficiency checks for the revalidation and renewal of IRs if those checks are combined with the revalidation or renewal of a type rating, provided that the SFEs have passed a proficiency check for the aircraft type including the instrument rating within the last year preceding the proficiency check;
- (3) skill tests for ATPL(H) issue; and

- (4) assessments of competence for the issue, revalidation or renewal of an SFI(H) certificate, provided that they have completed at least 3 years as an SFE(H) and have undergone specific training for the assessment of competence in accordance with point FCL.1015(b).

### **FCL.1010.SFE SFE – Prerequisites**

#### **(a) SFE(A)**

Applicants for an SFE(A) certificate shall comply with all of the following conditions:

- (1) in the case of multi-pilot aeroplanes:
  - (i) hold or have held an ATPL(A) and a type rating;
  - (ii) hold an SFI(A) certificate for the applicable type of aeroplane; and
  - (iii) have at least 1 500 hours of flight time as pilots of multi-pilot aeroplanes;
- (2) in the case of single-pilot high-performance complex aeroplanes:
  - (i) hold or have held a CPL(A) or an ATPL(A) and a type rating;
  - (ii) hold an SFI(A) certificate for the applicable class or type of aeroplane; and
  - (iii) have at least 500 hours of flight time as pilots of single-pilot aeroplanes;
- (3) for the initial issue of an SFE certificate, have completed at least 50 hours of synthetic flight instruction as a TRI(A) or an SFI(A) on the applicable type.

#### **(b) SFE(H)**

Applicants for an SFE(H) certificate shall comply with all of the following conditions:

- (1) hold or have held an ATPL(H), and a type rating for the applicable type of helicopter;
- (2) hold an SFI(H) certificate for the applicable type of helicopter;
- (3) in the case of multi-pilot helicopters, have at least 1 000 hours of flight time as pilots of multi-pilot helicopters;

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- (4) in the case of single-pilot helicopters in multi-pilot operations, have completed at least 350 hours in multi-pilot operations in any aircraft category;
- (5) for the initial issue of an SFE certificate, have completed at least 50 hours of synthetic flight instruction as a TRI(H) or an SFI(H) on the applicable type.

## **SECTION 7 – SPECIFIC REQUIREMENTS FOR THE FLIGHT INSTRUCTOR EXAMINER – FIE**

### **FCL.1005.FIE FIE – Privileges and conditions**

- (a) FIE(A). The privileges of an FIE on aeroplanes are to conduct assessments of competence for the issue, revalidation or renewal of certificates for FI(A), CRI(A), IRI(A) and TRI(A) on single-pilot aeroplanes, provided that the relevant instructor certificate is held.
- (b) FIE(H). The privileges of an FIE on helicopters are to conduct assessments of competence for the issue, revalidation or renewal of certificates for FI(H), IRI(H) and TRI(H) on single-pilot helicopters, provided that the relevant instructor certificate is held.
- (c) FIE(As). The privileges of an FIE on airships are to conduct assessments of competence for the issue, revalidation or renewal of instructor certificates of airships, provided that the relevant instructor certificate is held.

### **FCL.1010.FIE FIE – Prerequisites**

- (a) FIE(A). Applicants for an FIE certificate for aeroplanes shall:  
in case of applicants wishing to conduct assessments of competence:
  - (1) hold the relevant instructor certificate, as applicable;
  - (2) have completed 2000 hours of flight time as a pilot on aeroplanes or TMGs;  
and
  - (3) have at least 100 hours of flight time instructing applicants for an instructor certificate.
- (b) FIE(H). Applicants for an FIE certificate for helicopters shall:
  - (1) hold the relevant instructor certificate, as applicable;
  - (2) have completed 2000 hours of flight time as pilot on helicopters;
  - (3) have at least 100 hours of flight time instructing applicants for an instructor certificate.

- (c) FIE(As). Applicants for an FIE certificate for airships shall:
- (1) have completed 500 hours of flight time as a pilot on airships;
  - (2) have at least 20 hours of flight time instructing applicants for an FI(AS) certificate;
  - (3) hold the relevant instructor certificate.



**APPENDICES TO MCAR-PART-FCL**

**Appendix 1 – Crediting of theoretical knowledge**

**A. CREDITING OF THEORETICAL KNOWLEDGE IN THE SAME OR ANOTHER CATEGORY OF AIRCRAFT — BRIDGE INSTRUCTION AND EXAMINATION REQUIREMENTS**

**1. LAPL and PPL**

- 1.1. For the issue of an LAPL, the holder of an LAPL in another category of aircraft shall be fully credited towards requirements of theoretical knowledge on the common subjects established in point FCL.120(a).
- 1.2. For the issue of an LAPL or a PPL, holders of a PPL, CPL or ATPL in another category of aircraft shall be credited towards requirements of theoretical knowledge on the common subjects established in point FCL.215(a). This credit shall also apply to applicants for an LAPL or a PPL who hold a BPL issued in accordance with MCAR-Part-BFCL or an SPL issued in accordance with MCAR-Part-SFCL, except that the subject 'navigation' shall not be credited.
- 1.3. For the issue of a PPL, the holder of an LAPL in the same category of aircraft shall be fully credited towards the requirements of theoretical knowledge instruction and examination. That credit shall also apply to applicants for a PPL who have already successfully completed the theoretical knowledge examination for the LAPL in the same aircraft category, as long as it is within the validity period specified in point FCL.025(c).
- 1.4. By way of derogation from point 1.2, for the issue of an LAPL(A), the holder of an SPL issued in accordance with MCAR-Part-SFCL with privileges to fly TMGs shall demonstrate an adequate level of theoretical knowledge for the SEP aeroplane-land class in accordance with point FCL.135.A(a)(2).

**2. CPL**

- 2.1. Applicants for the issue of a CPL holding a CPL in another category of aircraft shall have received theoretical knowledge bridge instruction at an ATO on an approved course according to the differences identified between the CPL syllabi for different aircraft categories.

- 2.2. Applicants shall pass theoretical knowledge examinations as set out in this MCAR-Part-FCL for the following subjects in the appropriate aircraft category:

021 — Aircraft general knowledge: airframe and systems, electrics, power plant and emergency equipment;

022 — Aircraft general knowledge: instrumentation;

032/034 — Performance aeroplanes or helicopters, as applicable;

070 — Operational procedures;

081/082 — Principles of flight for aeroplanes or helicopters, as applicable.

- 2.3. Applicants for the issue of a CPL having passed the relevant theoretical knowledge examinations for an IR in the same category of aircraft are credited towards the theoretical knowledge requirements in human performance and meteorology unless they have completed the IR training course in accordance with Appendix 6, Section Aa, to this MCAR-Part-FCL.

- 2.4. Applicants for a CPL that have passed the relevant theoretical knowledge examinations for an IR in the same category of aircraft are credited towards the theoretical knowledge requirements in the communications subject.

### **3. ATPL**

- 3.1. Applicants for the issue of an ATPL holding an ATPL in another category of aircraft shall have received theoretical knowledge bridge instruction at an ATO on an approved course according to the differences identified between the ATPL syllabi for different aircraft categories.

- 3.2. Applicants shall pass theoretical knowledge examinations as defined in this MCAR-Part-FCL for the following subjects in the appropriate aircraft category:

021 — Aircraft general knowledge: airframe and systems, electrics, power plant and emergency equipment;

022 — Aircraft general knowledge: instrumentation;

032/034 — Performance aeroplanes or helicopters, as applicable;

070 — Operational procedures;

081/082 — Principles of flight for aeroplanes or helicopters, as applicable.

- 3.3. Applicants for the issue of an ATPL(A) having passed the relevant theoretical examination for a CPL(A) are credited towards the theoretical knowledge requirements in the subject 'communications'.
- 3.4. Applicants for the issue of an ATPL(H) having passed the relevant theoretical examinations for a CPL(H) are credited towards the theoretical knowledge requirements in the following subjects:
  - air law;
  - principles of flight (helicopter); and
  - communications.
- 3.5. Applicants for the issue of an ATPL(A) having passed the relevant theoretical examination for an IR(A) are credited towards the theoretical knowledge requirements in the subject 'communications'.
- 3.6. Applicants for the issue of an ATPL(H) with an IR(H) having passed the relevant theoretical examinations for a CPL(H) are credited towards the theoretical knowledge requirements in the following subjects:
  - principles of flight (helicopter); and
  - communications.

#### **4. IR**

- 4.1. Applicants for an IR, or for a BIR, who have passed the relevant theoretical examinations for a CPL in the same aircraft category, shall be credited towards the theoretical knowledge requirements in the following subjects:
  - Human Performance,
  - Meteorology,
  - Communication.
- 4.2. Applicants for the issue of an IR(H) having passed the relevant theoretical examinations for an ATPL(H) VFR are required to pass the following examination subjects:
  - air law;

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- flight planning and flight monitoring; and
- radio navigation.

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**Appendix 2 – Language Proficiency Rating Scale – Expert, extended and operational level**

LEVEL	PRONUNCIATION	STRUCTURE	VOCABULARY	FLUENCY	COMPREHENSION	INTERACTIONS
Expert (Level 6)	Pronunciation, stress, rhythm, and intonation, though possibly influenced by the first language or regional variation, almost never interfere with ease of understanding.	Both basic and complex grammatical structures and sentence patterns are consistently well controlled.	Vocabulary range and accuracy are sufficient to communicate effectively on a wide variety of familiar and unfamiliar topics. Vocabulary is idiomatic, nuanced and sensitive to register.	Able to speak at length with a natural, effortless flow. Varies speech flow for stylistic effect, e.g. to emphasize a point. Uses appropriate discourse markers and connectors spontaneously.	Comprehension is consistently accurate in nearly all contexts and includes comprehension of linguistic and cultural subtleties.	Interacts with ease in nearly all situations. Is sensitive to verbal and non-verbal cues, and responds to them appropriately.
Extended (Level 5)	Pronunciation, stress, rhythm, and intonation, though influenced by the first language or regional variation, rarely interfere with ease of understanding.	Basic grammatical structures and sentence patterns are consistently well controlled. Complex structures are attempted but with errors which sometimes interfere with meaning.	Vocabulary range and accuracy are sufficient to communicate effectively on common, concrete, and work-related topics. Paraphrases consistently and successfully. Vocabulary is sometimes idiomatic.	Able to speak at length with relative ease on familiar topics, but may not vary speech flow as a stylistic device. Can make use of appropriate discourse markers or connectors.	Comprehension is accurate on common, concrete, and work-related topics and mostly accurate when the speaker is confronted with a linguistic or situational complication or an unexpected turn of events. Is able to comprehend a range of speech varieties (dialect and/or accent) or registers.	Responses are immediate, appropriate, and informative. Manages the speaker/listener relationship effectively.

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LEVEL	PRONUNCIATION	STRUCTURE	VOCABULARY	FLUENCY	COMPREHENSION	INTERACTIONS
Operational (Level 4)	Pronunciation, stress, rhythm, and intonation are influenced by the first language or regional variation but only sometimes interfere with ease of understanding.	Basic grammatical structures and sentence patterns are used creatively and are usually well controlled. Errors may occur, particularly in unusual or unexpected circumstances, but rarely interfere with meaning.	Vocabulary range and accuracy are usually sufficient to communicate effectively on common, concrete, and work-related topics. Can often paraphrase successfully when lacking vocabulary particularly in unusual or unexpected circumstances.	Produces stretches of language at an appropriate tempo. There may be occasional loss of fluency on transition from rehearsed or formulaic speech to spontaneous interaction, but this does not prevent effective communication. Can make limited use of discourse markers and connectors. Fillers are not distracting.	Comprehension is mostly accurate on common, concrete, and work-related topics when the accent or variety used is sufficiently intelligible for an international community of users. When the speaker is confronted with a linguistic or situational complication or an unexpected turn of events, comprehension may be slower or require clarification strategies.	Responses are usually immediate, appropriate, and informative. Initiates and maintains exchanges even when dealing with an unexpected turn of events. Deals adequately with apparent misunderstandings by checking, confirming, or clarifying.

Note: The initial text of Appendix 2 has been transferred to AMC, see also the Explanatory Note.

### **Appendix 3 – Training courses for the issue of a CPL and an ATPL**

1. This appendix describes the requirements for the different types of training courses for the issue of a CPL and an ATPL, with and without an IR.
2. An applicant wishing to transfer to another ATO during a training course shall apply to the Authority for a formal assessment of the further hours of training required.

#### **A. ATP integrated course – Aeroplanes**

##### **GENERAL**

1. The aim of the ATP(A) integrated course is to train pilots to the level of proficiency necessary to enable them to operate as co-pilot on multi-pilot multi-engine aeroplanes in commercial air transport and to obtain the CPL(A)/IR.
2. An applicant wishing to undertake an ATP(A) integrated course shall complete all the instructional stages in one continuous course of training as arranged by an ATO.
3. An applicant may be admitted to training either as an ab-initio entrant, or as a holder of a PPL(A) or PPL(H) issued in accordance with Annex 1 to the Chicago Convention. In the case of a PPL(A) or PPL(H) entrant, 50% of the hours flown prior to the course shall be credited, up to a maximum of 40 hours flying experience, or 45 hours if an aeroplane night rating has been obtained, of which up to 20 hours may count towards the requirement for dual instruction flight time.
4. The course shall comprise:
  - (a) theoretical knowledge instruction to the ATPL(A) knowledge level;
  - (b) visual and instrument flying training;
  - (c) training in MCC for the operation of multi-pilot aeroplanes; and
  - (d) UPRT in accordance with FCL.745.A unless applicants have already completed this training course before starting the ATP integrated course.';
5. Applicants failing or being unable to complete the entire ATP(A) course may apply to the Authority for the theoretical knowledge examination and skill test for a licence with lower privileges and an IR if the applicable requirements are met.

##### **THEORETICAL KNOWLEDGE**

6. An ATP(A) theoretical knowledge course shall comprise at least 750 hours of instruction.
- 7.1. The MCC course shall comprise at least 25 hours of theoretical knowledge instruction and exercises.
- 7.2. The theoretical knowledge instruction in UPRT shall be conducted in accordance with FCL.745.A.

### **THEORETICAL KNOWLEDGE EXAMINATION**

8. An applicant shall demonstrate the level of knowledge appropriate to the privileges granted to the holder of an ATPL(A).

### **FLYING TRAINING**

9. The flying training, not including type rating training, shall comprise a total of at least 195 hours, including all progress tests, of which up to 55 hours for the entire course may be instrument ground time. Within the total of 195 hours, applicants shall complete at least:
  - (a) 95 hours of dual instruction, of which up to 55 hours may be instrument ground time;
  - (b) 70 hours as PIC, of which up to 55 hours may be SPIC. The instrument flight time as SPIC shall only be counted as PIC flight time up to a maximum of 20 hours;
  - (c) 50 hours of cross-country flight as PIC, including one VFR cross-country flight of at least 540 km (300 NM), in the course of which full-stop landings at two aerodromes different from the aerodrome of departure shall be made; and
  - (d) 5 hours of flight time at night, comprising 3 hours of dual instruction, which shall include at least:
    - (1) 1 hour of cross-country navigation;
    - (2) five solo take-offs; and
    - (3) five solo full-stop landings;
  - (e) UPRT flight instruction in accordance with FCL.745.A;
  - (f) 115 hours of instrument time comprising, at least:



- (1) 20 hours as SPIC;
- (2) 15 hours of MCC, for which an FFS or an FNPT II may be used;
- (3) 50 hours of instrument flight instruction, of which up to:
  - (i) 25 hours may be instrument ground time in an FNPT I; or
  - (ii) 40 hours may be instrument ground time in an FNPT II, an FTD 2 or an FFS, of which up to 10 hours may be conducted in an FNPT I.

Applicants holding a BIR or a course completion certificate for the Basic Instrument Flight Module shall be credited with up to 10 hours towards the required instrument instruction time. Hours done in a BITD shall not be credited.

- (g) 5 hours in an aeroplane which:
  - (1) is certificated for the carriage of at least 4 persons; and
  - (2) has a variable pitch propeller and retractable landing gear.

## **SKILL TEST**

- 10. Upon completion of the related flying training, the applicant shall take the CPL(A) skill test on either a single-engine or a multi-engine aeroplane and the IR skill test on a multi-engine aeroplane.

### **B. ATP modular course – Aeroplanes**

- 1. Applicants for an ATPL(A) who complete their theoretical knowledge instruction at a modular course shall:
  - (a) hold at least a PPL(A) issued in accordance with Annex 1 to the Chicago Convention; and complete at least the following hours of theoretical knowledge instruction:
    - (1) for applicants holding a PPL(A): 650 hours;
    - (2) for applicants holding a CPL(A): 400 hours;
    - (3) for applicants holding an IR(A): 500 hours;
    - (4) for applicants holding a CPL(A) and an IR(A): 250 hours.

The theoretical knowledge instruction shall be completed before the skill test for the ATPL(A) is taken.

### **C. CPL/IR integrated course – Aeroplanes**

#### **GENERAL**

1. The aim of the CPL(A) and IR(A) integrated course is to train pilots to the level of proficiency necessary to operate single-pilot single-engine or multi-engine aeroplanes in commercial air transport and to obtain the CPL(A)/IR.
2. An applicant wishing to undertake a CPL(A)/IR integrated course shall complete all the instructional stages in one continuous course of training as arranged by an ATO.
3. An applicant may be admitted to training either as an ab-initio entrant, or as a holder of a PPL(A) or PPL(H) issued in accordance with Annex 1 to the Chicago Convention. In the case of a PPL(A) or PPL(H) entrant, 50% of the hours flown prior to the course shall be credited, up to a maximum of 40 hours flying experience, or 45 hours if an aeroplane night rating has been obtained, of which up to 20 hours may count towards the requirement for dual instruction flight time.
4. The course shall comprise:
  - (a) theoretical knowledge instruction to CPL(A) and IR knowledge level; and
  - (b) visual and instrument flying training.
5. An applicant failing or unable to complete the entire CPL/IR(A) course may apply to the Authority for the theoretical knowledge examination and skill test for a licence with lower privileges and an IR if the applicable requirements are met.

#### **THEORETICAL KNOWLEDGE**

6. A CPL(A)/IR theoretical knowledge course shall comprise at least 500 hours of instruction.

#### **THEORETICAL KNOWLEDGE EXAMINATION**

7. An applicant shall demonstrate a level of knowledge appropriate to the privileges granted to the holder of a CPL(A) and an IR.

#### **FLYING TRAINING**

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8. The flying training, not including type rating training, shall comprise a total of at least 180 hours, to include all progress tests, of which up to 40 hours for the entire course may be instrument ground time. Within the total of 180 hours, applicants shall complete at least:
- (a) 80 hours of dual instruction, of which up to 40 hours may be instrument ground time;
  - (b) 70 hours as PIC, of which up to 55 hours may be SPIC. The instrument flight time as SPIC shall only be counted as PIC flight time up to a maximum of 20 hours;
  - (c) 50 hours of cross-country flight as PIC, including a VFR cross-country flight of at least 540 km (300 NM), in the course of which full stop landings at two aerodromes different from the aerodrome of departure shall be made;
  - (d) 5 hours flight time shall be completed at night, comprising 3 hours of dual instruction, which shall include at least 1 hour of cross-country navigation and 5 solo take-offs and 5 solo full stop landings; and
  - (e) 100 hours of instrument time comprising, at least:
    - (1) 20 hours as SPIC; and
    - (2) 50 hours of instrument flight instruction, of which up to:
      - (i) 25 hours may be instrument ground time in an FNPT I, or
      - (ii) 40 hours may be instrument ground time in an FNPT II, FTD 2 or FFS, of which up to 10 hours may be conducted in an FNPT I.
- Applicants holding a BIR or a course completion certificate for the Basic Instrument Flight Module shall be credited with up to 10 hours towards the required instrument instruction time. Hours done in a BITD shall not be credited; and
- (f) 5 hours to be carried out in an aeroplane certificated for the carriage of at least 4 persons that has a variable pitch propeller and retractable landing gear.

**SKILL TESTS**

10. Upon completion of the related flying training the applicant shall take the CPL(A) skill test and the IR skill test on either a multi-engine aeroplane or a single-engine aeroplane.

#### **D. CPL integrated course – Aeroplanes**

##### **GENERAL**

1. The aim of the CPL(A) integrated course is to train pilots to the level of proficiency necessary for the issue of a CPL(A).
2. An applicant wishing to undertake a CPL(A) integrated course shall complete all the instructional stages in one continuous course of training as arranged by an ATO.
3. An applicant may be admitted to training either as an ab-initio entrant, or as a holder of a PPL(A) or PPL(H) issued in accordance with Annex 1 to the Chicago Convention. In the case of a PPL(A) or PPL(H) entrant, 50% of the hours flown prior to the course shall be credited, up to a maximum of 40 hours flying experience, or 45 hours if an aeroplane night rating has been obtained, of which up to 20 hours may count towards the requirement for dual instruction flight time.
4. The course shall comprise:
  - (a) theoretical knowledge instruction to CPL(A) knowledge level; and
  - (b) visual and instrument flying training.
5. An applicant failing or unable to complete the entire CPL(A) course may apply to the Authority for the theoretical knowledge examination and skill test for a licence with lower privileges, if the applicable requirements are met.

##### **THEORETICAL KNOWLEDGE**

6. A CPL(A) theoretical knowledge course shall comprise at least 350 hours of instruction.

##### **THEORETICAL KNOWLEDGE EXAMINATION**

7. An applicant shall demonstrate a level of knowledge appropriate to the privileges granted to the holder of a CPL(A).

##### **FLYING TRAINING**

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8. The flying training, not including type rating training, shall comprise a total of at least 150 hours, to include all progress tests, of which up to 5 hours for the entire course may be instrument ground time. Within the total of 150 hours, applicants shall complete at least:
- (a) 80 hours of dual instruction, of which up to 5 hours may be instrument ground time;
  - (b) 70 hours as PIC, of which up to 55 hours may be as SPIC;
  - (c) 20 hours of cross-country flight as PIC, including a VFR cross-country flight of at least 540 km (300 NM), in the course of which full stop landings at two aerodromes different from the aerodrome of departure shall be made;
  - (d) 5 hours flight time shall be completed at night, comprising 3 hours of dual instruction, which shall include at least 1 hour of cross-country navigation and 5 solo take-offs and 5 solo full stop landings;
  - (e) 10 hours of instrument flight instruction, of which up to 5 hours may be instrument ground time in an FNPT I, FTD 2, FNPT II or FFS. Applicants holding a BIR or a course completion certificate for the Basic Instrument Flight Module shall be credited with up to 10 hours towards the required instrument instruction time. Hours done in a BITD shall not be credited;
  - (f) 5 hours to be carried out in an aeroplane certificated for the carriage of at least four persons that has a variable pitch propeller and retractable landing gear.

**SKILL TEST**

9. Upon completion of the flying training the applicant shall take the CPL(A) skill test on a single-engine or a multi-engine aeroplane.

**E. CPL modular course – Aeroplanes**

**GENERAL**

- 1. The aim of the CPL(A) modular course is to train PPL(A) holders to the level of proficiency necessary for the issue of a CPL(A).
- 2. Before commencing a CPL(A) modular course an applicant shall be the holder of a PPL(A) issued in accordance with Annex 1 to the Chicago Convention.
- 3. Before commencing the flight training the applicant shall:

- (a) have completed 150 hours flight time; including 50 hours as PIC on aeroplanes of which 10 hours shall be cross-country.

Except for the requirement of 50 hours as PIC in aeroplanes, hours as PIC in other categories of aircraft may account for the 150 hours of aeroplane flight time in any of the following cases:

- (1) 20 hours in helicopters, if applicants hold a PPL(H);
  - (2) 50 hours in helicopters, if applicants hold a CPL(H);
  - (3) 10 hours in TMGs or sailplanes;
  - (4) 20 hours in airships, if applicants hold a PPL(As);
  - (5) 50 hours in airships, if applicants hold a CPL(As).
- (b) have complied with the prerequisites for the issue of a class or type rating for multi-engine aeroplanes in accordance with Subpart H, if a multi-engine aeroplane is to be used on the skill test.
- 4. An applicant wishing to undertake a modular CPL(A) course shall complete all the flight instructional stages in one continuous course of training as arranged by an ATO. The theoretical knowledge instruction may be given at an ATO conducting theoretical knowledge instruction only.
  - 5. The course shall comprise:
    - (a) theoretical knowledge instruction to CPL(A) knowledge level; and
    - (b) visual and instrument flying training.

#### **THEORETICAL KNOWLEDGE**

- 6. An approved CPL(A) theoretical knowledge course shall comprise at least 250 hours of instruction.

#### **THEORETICAL KNOWLEDGE EXAMINATION**

- 7. An applicant shall demonstrate a level of knowledge appropriate to the privileges granted to the holder of a CPL(A).

#### **FLYING TRAINING**

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8. Applicants without an IR shall be given at least 25 hours dual flight instruction, including 10 hours of instrument instruction of which up to 5 hours may be instrument ground time in a BITD, an FNPT I or II, an FTD 2 or an FFS.
9. Applicants holding a valid IR(A) shall be credited towards the dual instrument instruction time. Applicants holding a valid IR(H) shall be credited up to 5 hours of the dual instrument instruction time, in which case at least 5 hours dual instrument instruction time shall be given in an aeroplane. Applicants holding a BIR or a Course Completion Certificate for the Basic Instrument Flight Module shall be credited with up to 10 hours towards the required instrument instruction time.
10.
  - (a) Applicants with a valid IR shall be given at least 15 hours dual visual flight instruction.
  - (b) Applicants without a night rating aeroplane shall be given additionally at least 5 hours night flight instruction, comprising 3 hours of dual instruction, which shall include at least 1 hour of cross-country navigation and 5 solo take-offs and 5 solo full stop landings.
11. At least 5 hours of the flight instruction shall be carried out in an aeroplane certificated for the carriage of at least 4 persons and have a variable pitch propeller and retractable landing gear.

**EXPERIENCE**

12. The applicant for a CPL(A) shall have completed at least 200 hours flight time, including at least:
  - (a) 100 hours as PIC, of which 20 hours of cross-country flight as PIC, which shall include a VFR cross-country flight of at least 540 km (300 NM), in the course of which full stop landings at two aerodromes different from the aerodrome of departure shall be made;
  - (b) 5 hours of flight time shall be completed at night, comprising 3 hours of dual instruction, which shall include at least 1 hour of cross-country navigation and 5 solo take-offs and 5 solo full stop landings; and
  - (c) 10 hours of instrument flight instruction, of which up to 5 hours may be instrument ground time in an FNPT I, or FNPT II or FFS. Applicants holding a BIR or a course completion certificate for the Basic Instrument Flight Module shall be credited with up to 10 hours towards the required instrument instruction time. Hours done in a BITD shall not be credited;
  - (d) 6 hours of flight time shall be completed in a multi-engine aeroplane, if a multi-engine aeroplane is used for the skill test.

- (e) Hours as PIC of other categories of aircraft may count towards the 200 hours flight time, in the following cases:
  - (i) 30 hours in helicopter, if the applicant holds a PPL(H); or
  - (ii) 100 hours in helicopters, if the applicant holds a CPL(H); or
  - (iii) 30 hours in TMGs or sailplanes; or
  - (iv) 30 hours in airships, if the applicant holds a PPL(As); or
  - (v) 60 hours in airships, if the applicant holds a CPL(As).

### **SKILL TEST**

- 13. Upon completion of the flying training and relevant experience requirements the applicant shall take the CPL(A) skill test on either a single-engine or a multi-engine aeroplane.

### **F. ATP/IR integrated course – Helicopters**

#### **GENERAL**

- 1. The aim of the ATP(H)/IR integrated course is to train pilots to the level of proficiency necessary to enable them to operate as co-pilot on multi-pilot multi-engine helicopters in commercial air transport and to obtain the CPL(H)/IR.
- 2. An applicant wishing to undertake an ATP(H)/IR integrated course shall complete all the instructional stages in one continuous course of training as arranged by an ATO.
- 3. An applicant may be admitted to training either as an ab-initio entrant, or as a holder of a PPL(H) issued in accordance with Annex 1 to the Chicago Convention. In the case of a PPL(H) entrant, 50% of the relevant experience shall be credited, up to a maximum of:
  - (a) 40 hours, of which up to 20 hours may be dual instruction; or
  - (b) 50 hours, of which up to 25 hours may be dual instruction, if a helicopter night rating has been obtained.
- 4. The course shall comprise:
  - (a) theoretical knowledge instruction to the ATPL(H) and IR knowledge level;



- (b) visual and instrument flying training; and
  - (c) training in MCC for the operation of multi-pilot helicopters.
5. An applicant failing or unable to complete the entire ATP(H) /IR course may apply to the Authority for the theoretical knowledge examination and skill test for a licence with lower privileges and an IR, if the applicable requirements are met.

### **THEORETICAL KNOWLEDGE**

6. An ATP(H)/IR theoretical knowledge course shall comprise at least 750 hours of instruction.
7. The MCC course shall comprise at least 25 hours of theoretical knowledge instruction exercises.

### **THEORETICAL KNOWLEDGE EXAMINATION**

8. An applicant shall demonstrate the level of knowledge appropriate to the privileges granted to the holder of an ATPL(H) and an IR.

### **FLYING TRAINING**

9. The flying training shall comprise a total of at least 195 hours, to include all progress tests. Within the total of 195 hours, applicants shall complete at least:
- (a) 140 hours of dual instruction, of which:
    - (1) 75 hours visual instruction may include:
      - (i) 30 hours in a helicopter FFS, level C/D, or
      - (ii) 25 hours in a FTD 2,3, or
      - (iii) 20 hours in a helicopter FNPT II/III, or
      - (iv) 20 hours in an aeroplane or TMG;
    - (2) 50 hours instrument instruction may include:
      - (i) up to 20 hours in a helicopter FFS or FTD 2,3 or FNPT II/III, or
      - (ii) 10 hours in at least a helicopter FNPT 1 or an aeroplane;

- (3) 15 hours MCC, for which a helicopter FFS or helicopter FTD 2,3(MCC) or FNPT II/III(MCC) may be used.

If the helicopter used for the flying training is of a different type from the helicopter FFS used for the visual training, the maximum credit shall be limited to that allocated for the helicopter FNPT II/III.

- (b) 55 hours as PIC, of which 40 hours may be as SPIC. At least 14 hours solo day and 1 hour solo night shall be made.
- (c) 50 hours of cross-country flight, including at least 10 hours of cross-country flight as SPIC including a VFR cross-country flight of at least 185 km (100 NM) in the course of which landings at two different aerodromes from the aerodrome of departure shall be made;
- (d) 5 hours flight time in helicopters shall be completed at night comprising 3 hours of dual instruction including at least 1 hour of cross-country navigation and 5 solo night circuits. Each circuit shall include a take-off and a landing;
- (e) 50 hours of dual instrument time comprising:
- (i) 10 hours basic instrument instruction time, and
  - (ii) 40 hours IR Training, which shall include at least 10 hours in a multi-engine IFR-certificated helicopter.

## **SKILL TESTS**

10. Upon completion of the related flying training, the applicant shall take the CPL(H) skill test on a multi-engine helicopter and the IR skill test on an IFR certificated multi-engine helicopter and shall comply with the requirements for MCC training.

### **G. ATP integrated course – Helicopters**

#### **GENERAL**

1. The aim of the ATP(H) integrated course is to train pilots to the level of proficiency necessary to enable them to operate as co-pilot on multi-pilot multi-engine helicopters limited to VFR privileges in commercial air transport and to obtain the CPL(H).
2. An applicant wishing to undertake an ATP(H) integrated course shall complete all the instructional stages in one continuous course of training as arranged by an ATO.

3. An applicant may be admitted to training either as an ab-initio entrant, or as a holder of a PPL(H) issued in accordance with Annex 1 to the Chicago Convention. In the case of a PPL(H) entrant, 50% of the relevant experience shall be credited, up to a maximum of:
  - (a) 40 hours, of which up to 20 hours may be dual instruction; or
  - (b) 50 hours, of which up to 25 hours may be dual instruction, if a helicopter night rating has been obtained.
4. The course shall comprise:
  - (a) theoretical knowledge instruction to the ATPL(H) knowledge level;
  - (b) visual and basic instrument flying training; and
  - (c) training in MCC for the operation of multi-pilot helicopters.
5. An applicant failing or unable to complete the entire ATP(H) course may apply to the Authority for the theoretical knowledge examination and skill test for a licence with lower privileges, if the applicable requirements are met.

#### **THEORETICAL KNOWLEDGE**

6. An ATP(H) theoretical knowledge course shall comprise at least 650 hours of instruction.
7. The MCC course shall comprise at least 20 hours of theoretical knowledge instruction exercises.

#### **THEORETICAL KNOWLEDGE EXAMINATION**

8. An applicant shall demonstrate the level of knowledge appropriate to the privileges granted to the holder of an ATPL (H).

#### **FLYING TRAINING**

9. The flying training shall comprise a total of at least 150 hours, to include all progress tests. Within the total of 150 hours, applicants shall complete at least:
  - (a) 95 hours of dual instruction, of which:
    - (i) 75 hours visual instruction may include:
      - (1) 30 hours in a helicopter FFS level C/D, or

- (2) 25 hours in a helicopter FTD 2,3, or
- (3) 20 hours in a helicopter FNPT II/III, or
- (4) 20 hours in an aeroplane or TMG;
- (ii) 10 hours basic instrument instruction may include 5 hours in at least a helicopter FNPT I or an aeroplane;
- (iii) 10 hours MCC, for which a helicopter: helicopter FFS or FTD 2,3(MCC) or FNPT II/III(MCC) may be used.

If the helicopter used for the flying training is of a different type from the helicopter FFS used for the visual training, the maximum credit shall be limited to that allocated for the helicopter FNPT II/III.

- (b) 55 hours as PIC, of which 40 hours may be as SPIC. At least 14 hours solo day and 1 hour solo night shall be made;
- (c) 50 hours of cross-country flight, including at least 10 hours of cross-country flight as SPIC, including a VFR cross-country flight of at least 185 km (100 NM) in the course of which landings at two different aerodromes from the aerodrome of departure shall be made;
- (d) 5 hours flight time in helicopters shall be completed at night comprising 3 hours of dual instruction including at least 1 hour of cross-country navigation and 5 solo night circuits. Each circuit shall include a take-off and a landing.

## **SKILL TESTS**

- 10. Upon completion of the related flying training the applicant shall take the CPL(H) skill test on a multi-engine helicopter and comply with MCC requirements.

### **H. ATP modular course – Helicopters**

- 1. Applicants for an ATPL(H) who complete their theoretical knowledge instruction at a modular course shall hold at least a PPL(H) and complete at least the following hours of instruction within a period of 18 months:
  - (a) for applicants holding a PPL(H) issued in accordance with Annex 1 to the Chicago Convention: 550 hours;
  - (b) for applicants holding a CPL(H): 300 hours.

2. Applicants for an ATPL(H)/IR who complete their theoretical knowledge instruction at a modular course shall hold at least a PPL(H) and complete at least the following hours of instruction:
  - (a) for applicants holding a PPL(H): 650 hours;
  - (b) for applicants holding a CPL(H): 400 hours;
  - (c) for applicants holding an IR(H): 500 hours;
  - (d) for applicants holding a CPL(H) and an IR(H): 250 hours.

**I. CPL/IR integrated course – Helicopters**

**GENERAL**

1. The aim of the CPL(H)/IR integrated course is to train pilots to the level of proficiency necessary to operate single-pilot multi-engine helicopters and to obtain the CPL(H)/IR multi-engine helicopter.
2. An applicant wishing to undertake a CPL(H)/IR integrated course shall complete all the instructional stages in one continuous course of training as arranged by an ATO.
3. An applicant may be admitted to training either as an ab-initio entrant, or as a holder of a PPL(H) issued in accordance with Annex 1 to the Chicago Convention. In the case of an entrant holding a PPL(H), 50% of the relevant experience shall be credited, up to a maximum of:
  - (a) 40 hours, of which up to 20 hours may be dual instruction; or
  - (b) 50 hours, of which up to 25 hours may be dual instruction, if a helicopter night rating has been obtained.
4. The course shall comprise:
  - (a) theoretical knowledge instruction to CPL(H) and IR knowledge level, and the initial multi-engine helicopter type rating; and
  - (b) visual and instrument flying training.
5. An applicant failing or unable to complete the entire CPL(H)/IR course may apply to the Authority for the theoretical knowledge examination and skill test for a licence with lower privileges and an IR, if the applicable requirements are met.

## **THEORETICAL KNOWLEDGE**

6. A CPL(H)/IR theoretical knowledge course shall comprise at least 500 hours of instruction.

## **THEORETICAL KNOWLEDGE EXAMINATION**

7. An applicant shall demonstrate a level of knowledge appropriate to the privileges granted to the holder of a CPL(H) and an IR.

## **FLYING TRAINING**

8. The flying training shall comprise a total of at least 180 hours including all progress tests. Within the 180 hours, applicants shall complete at least:

- (a) 125 hours of dual instruction, of which:
  - (i) 75 hours visual instruction, which may include:
    - (1) 30 hours in a helicopter FFS level C/D, or
    - (2) 25 hours in a helicopter FTD 2,3, or
    - (3) 20 hours in a helicopter FNPT II/III, or
    - (4) 20 hours in an aeroplane or TMG;
  - (ii) 50 hours instrument instruction which may include:
    - (1) up to 20 hours in a helicopter FFS or FTD 2,3, or FNPT II,III, or
    - (2) 10 hours in at least a helicopter FNPT I or an aeroplane.

If the helicopter used for the flying training is of a different type from the FFS used for the visual training, the maximum credit shall be limited to that allocated for the FNPT II/III.
- (b) 55 hours as PIC, of which 40 hours may be as SPIC. At least 14 hours solo day and 1 hour solo night shall be made;
- (c) 10 hours dual cross-country flying;
- (d) 10 hours of cross-country flight as PIC, including a VFR cross-country flight of at least 185 km (100 NM) in the course of which full stop landings at two different aerodromes from the aerodrome of departure shall be made;

- (e) 5 hours of flight time in helicopters shall be completed at night comprising 3 hours of dual instruction including at least 1 hour of cross-country navigation and 5 solo night circuits. Each circuit shall include a take-off and a landing;
- (f) 50 hours of dual instrument time comprising:
  - (i) 10 hours basic instrument instruction time; and
  - (ii) 40 hours IR Training, which shall include at least 10 hours in a multi-engine IFR-certificated helicopter.

## **SKILL TEST**

9. Upon completion of the related flying training, the applicant shall take the CPL(H) skill test on either a multi-engine or a single-engine helicopter and the IR skill test on an IFR-certificated helicopter.

### **J. CPL integrated course – Helicopters**

#### **GENERAL**

1. The aim of the CPL(H) integrated course is to train pilots to the level of proficiency necessary for the issue of a CPL(H).
2. An applicant wishing to undertake a CPL(H) integrated course shall complete all the instructional stages in one continuous course of training as arranged by an ATO.
3. An applicant may be admitted to training either as an ab-initio entrant, or as a holder of a PPL(H) issued in accordance with Annex 1 to the Chicago Convention. In the case of an entrant holding a PPL(H), 50% of the relevant experience shall be credited, up to a maximum of:
  - (a) 40 hours, of which up to 20 hours may be dual instruction; or
  - (b) 50 hours, of which up to 25 hours may be dual instruction if a helicopter night rating has been obtained.
4. The course shall comprise:
  - (a) theoretical knowledge instruction to CPL(H) knowledge level; and
  - (b) visual and instrument flying training.

5. An applicant failing or unable to complete the entire CPL(H) course may apply to the Authority for the theoretical knowledge examination and skill test for a licence with lower privileges, if the applicable requirements are met.

### **THEORETICAL KNOWLEDGE**

6. An approved CPL(H) theoretical knowledge course shall comprise at least 350 hours of instruction or 200 hours if the applicant is the holder of a PPL.

### **THEORETICAL KNOWLEDGE EXAMINATION**

7. An applicant shall demonstrate a level of knowledge appropriate to the privileges granted to the holder of a CPL(H).

### **FLYING TRAINING**

8. The flying training shall comprise a total of at least 135 hours, to include all progress tests, of which up to 5 hours may be instrument ground time. Within the 135 hours total, applicants shall complete at least:

- (a) 85 hours of dual instruction, of which:
  - (i) up to 75 hours may be visual instruction, and may include:
    - (1) 30 hours in a helicopter FFS level C/D, or
    - (2) 25 hours in a helicopter FTD 2,3, or
    - (3) 20 hours in a helicopter FNPT II/III, or
    - (4) 20 hours in an aeroplane or TMG.
  - (ii) up to 10 hours may be instrument instruction, and may include 5 hours in at least a helicopter FNPT I or an aeroplane.

If the helicopter used for the flying training is of a different type from the FFS used for the visual training, the maximum credit shall be limited to that allocated for the FNPT II/III.
- (b) 50 hours as PIC, of which 35 hours may be as SPIC. At least 14 hours solo day and 1 hour solo night shall be made;
- (c) 10 hours dual cross-country flying;



- (d) 10 hours of cross-country flight as PIC, including a VFR cross-country flight of at least 185 km (100 NM) in the course of which full stop landings at two different aerodromes from the aerodrome of departure shall be made;
- (e) 5 hours flight time in helicopters shall be completed at night comprising 3 hours of dual instruction including at least 1 hour of cross-country navigation and 5 solo night circuits. Each circuit shall include a take-off and a landing;
- (f) 10 hours of instrument dual instruction time, including at least 5 hours in a helicopter.

### **SKILL TEST**

- 9. Upon completion of the related flying training, the applicant shall take the CPL(H) skill test.

### **K. CPL modular course – Helicopters**

#### **GENERAL**

- 1. The aim of the CPL(H) modular course is to train PPL(H) holders to the level of proficiency necessary for the issue of a CPL(H).
- 2. Before commencing a CPL(H) modular course an applicant shall be the holder of a PPL(H) issued in accordance with Annex 1 to the Chicago Convention.
- 3. Before commencing the flight training the applicant shall:
  - (a) have completed 155 hours flight time, including 50 hours as PIC in helicopters of which 10 hours shall be cross- country.

Except for the requirement of 50 hours as PIC in helicopters, hours as PIC in other categories of aircraft may account for the 155 hours of helicopter flight time in any of the following cases:

- (1) 20 hours in aeroplanes if applicants hold a PPL(A);
- (2) 50 hours in aeroplanes if applicants hold a CPL(A);
- (3) 10 hours in TMGs or sailplanes;
- (4) 20 hours in airships if applicants hold a PPL(As);
- (5) 50 hours in airships if applicants hold a CPL(As);

- (b) have complied with FCL.725 and FCL.720.H if a multi-engine helicopter is to be used on the skill test.
- 4. An applicant wishing to undertake a modular CPL(H) course shall complete all the flight instructional stages in one continuous course of training as arranged by an ATO. The theoretical knowledge instruction may be given at an ATO that conducts theoretical knowledge instruction only.
- 5. The course shall comprise:
  - (a) theoretical knowledge instruction to CPL(H) knowledge level; and
  - (b) visual and instrument flying training.

### **THEORETICAL KNOWLEDGE**

- 6. An approved CPL(H) theoretical knowledge course shall comprise at least 250 hours of instruction.

### **THEORETICAL KNOWLEDGE EXAMINATION**

- 7. An applicant shall demonstrate a level of knowledge appropriate to the privileges granted to the holder of a CPL(H).

### **FLYING TRAINING**

- 8. Applicants without an IR shall be given at least 30 hours dual flight instruction, of which:
  - (a) 20 hours visual instruction, which may include 5 hours in a helicopter FFS or FTD 2,3 or FNPT II,III; and
  - (b) 10 hours instrument instruction, which may include 5 hours in at least a helicopter FTD 1 or FNPT I or aeroplane.
- 9. Applicants holding a valid IR(H) shall be fully credited towards the dual instrument instruction time. Applicants holding a valid IR(A) shall complete at least 5 hours of the dual instrument instruction time in a helicopter.
- 10. Applicants without a night rating helicopter shall be given additionally at least 5 hours night flight instruction comprising 3 hours of dual instruction including at least 1 hour of cross-country navigation and 5 solo night circuits. Each circuit shall include a take-off and a landing.

### **EXPERIENCE**

11. The applicant for a CPL(H) shall have completed at least 185 hours flight time, including 50 hours as PIC, of which 10 hours of cross-country flight as PIC, including a VFR cross-country flight of at least 185 km (100 NM), in the course of which full stop landings at two aerodromes different from the aerodrome of departure shall be made.

Hours as pilot-in-command of other categories of aircraft may count towards the 185 hours flight time, in the following cases:

- (a) 20 hours in aeroplanes, if the applicant holds a PPL(A); or
- (b) 50 hours in aeroplanes, if the applicant holds a CPL(A); or
- (c) 10 hours in TMGs or sailplanes; or
- (d) 20 hours in airships, if the applicant holds a PPL(As); or
- (e) 50 hours in airships, if the applicant holds a CPL(As).

## **SKILL TEST**

12. Upon completion of the related flying training and relevant experience, the applicant shall take the CPL(H) skill test.

### **L. CPL/IR integrated course – Airships**

- 1. The aim of the CPL(As)/IR integrated course is to train pilots to the level of proficiency necessary to operate airships and to obtain the CPL(As)/IR.
- 2. An applicant wishing to undertake a CPL(As)/IR integrated course shall complete all the instructional stages in one continuous course of training as arranged by an ATO.
- 3. An applicant may be admitted to training either as an ab-initio entrant, or as a holder of a PPL(As), PPL(A) or PPL(H) issued in accordance with Annex 1 to the Chicago Convention. In the case of an entrant holding a PPL(As), PPL(A) or PPL(H) shall be credited up to a maximum of:
  - (a) 10 hours, of which up to 5 hours may be dual instruction; or
  - (b) 15 hours, of which up to 7 hours may be dual instruction, if an airship night rating has been obtained.
- 4. The course shall comprise:

- (a) theoretical knowledge instruction to CPL(As) and IR knowledge level, and the initial airship type rating; and
  - (b) visual and instrument flying training.
5. An applicant failing or unable to complete the entire CPL/IR(As) course may apply to the Authority for the theoretical knowledge examination and skill test for a licence with lower privileges and an IR, if the applicable requirements are met.

### **THEORETICAL KNOWLEDGE**

6. A CPL(As)/IR theoretical knowledge course shall comprise at least 500 hours of instruction.

### **THEORETICAL KNOWLEDGE EXAMINATION**

7. An applicant shall demonstrate a level of knowledge appropriate to the privileges granted to the holder of a CPL(As) and an IR.

### **FLYING TRAINING**

8. The flying training shall comprise a total of at least 80 hours including all progress tests. Within the 80 hours, applicants shall complete at least:
- (a) 60 hours of dual instruction, of which:
    - (i) 30 hours visual instruction, which may include:
      - (1) 12 hours in an airship FFS, or
      - (2) 10 hours in an airship FTD, or
      - (3) 8 hours in an airship FNPT II/III, or
      - (4) 8 hours in an aeroplane, helicopter or TMG;
    - (ii) 30 hours instrument instruction which may include:
      - (1) up to 12 hours in an airship FFS or FTD or FNPT II,III, or
      - (2) 6 hours in at least a airship FTD 1 or FNPT I or aeroplane.

If the airship used for the flying training is of a different type from the FFS used for the visual training, the maximum credit shall be limited to 8 hours.

- (b) 20 hours as PIC, of which 5 hours may be as SPIC. At least 14 hours solo day and 1 hour solo night shall be made;
- (c) 5 hours of cross-country flight as PIC, including a VFR cross-country flight of at least 90 km (50 NM) in the course of which two full stop landings at the destination aerodrome shall be made;
- (d) 5 hours flight time in airships shall be completed at night comprising 3 hours of dual instruction including at least 1 hour of cross-country navigation and 5 solo night circuits. Each circuit shall include take-off and landing;
- (e) 30 hours of dual instrument time comprising:
  - (i) 10 hours basic instrument instruction time; and
  - (ii) 20 hours IR Training, which shall include at least 10 hours in a multi-engine IFR-certificated airship.

## **SKILL TEST**

9. Upon completion of the related flying training, the applicant shall take the CPL(As) skill test on either a multi-engine or a single-engine airship and the IR skill test on an IFR-certificated multi-engine airship.

## **M. CPL integrated course – Airships**

### **GENERAL**

1. The aim of the CPL(As) integrated course is to train pilots to the level of proficiency necessary for the issue of a CPL(AS).
2. An applicant wishing to undertake a CPL(As) integrated course shall complete all the instructional stages in one continuous course of training as arranged by an ATO.
3. An applicant may be admitted to training either as an ab-initio entrant, or as a holder of a PPL(As), PPL(A) or PPL(H) issued in accordance with Annex 1 to the Chicago Convention. In the case of an entrant holding a PPL(As), PPL(A) or PPL(H) shall be credited up to a maximum of:
  - (a) 10 hours, of which up to 5 hours may be dual instruction; or
  - (b) 15 hours, of which up to 7 hours may be dual instruction if a airship night rating has been obtained.

4. The course shall comprise:
  - (a) theoretical knowledge instruction to CPL(As) knowledge level; and
  - (b) visual and instrument flying training.
5. An applicant failing or unable to complete the entire CPL(As) course may apply to the Authority for the theoretical knowledge examination and skill test for a licence with lower privileges, if the applicable requirements are met.

### **THEORETICAL KNOWLEDGE**

6. An approved CPL(As) theoretical knowledge course shall comprise at least 350 hours of instruction or 200 hours if the applicant is a PPL holder.

### **THEORETICAL KNOWLEDGE EXAMINATION**

7. An applicant shall demonstrate a level of knowledge appropriate to the privileges granted to the holder of a CPL(As).

### **FLYING TRAINING**

8. The flying training shall comprise a total of at least 50 hours, to include all progress tests, of which up to 5 hours may be instrument ground time. Within the 50 hours total, applicants shall complete at least:
  - (a) 30 hours of dual instruction, of which up to 5 hours may be instrument ground time;
  - (b) 20 hours as PIC;
  - (c) 5 hours dual cross-country flying;
  - (d) 5 hours of cross-country flight as PIC, including a VFR cross-country flight of at least 90 km (50 NM) in the course of which two full stop landings at the destination aerodrome shall be made;
  - (e) 5 hours flight time in airships shall be completed at night comprising 3 hours of dual instruction including at least 1 hour of cross-country navigation and 5 solo night circuits. Each circuit shall include take-off and landing;
  - (f) 10 hours of instrument dual instruction time, including at least 5 hours in an airship.

### **SKILL TEST**

9. Upon completion of the related flying training, the applicant shall take the CPL(As) skill test.

**N. CPL modular course – Airships**

**GENERAL**

1. The aim of the CPL(As) modular course is to train PPL(As) holders to the level of proficiency necessary for the issue of a CPL(As).
2. Before commencing a CPL(As) modular course an applicant shall:
  - (a) hold a PPL(As) issued in accordance with Annex 1 to the Chicago Convention;
  - (b) have completed 200 hours flight time as a pilot on airships, including 100 hours as PIC, of which 50 hours shall be cross-country.
3. An applicant wishing to undertake a modular CPL(As) course shall complete all the flight instructional stages in one continuous course of training as arranged by an ATO. The theoretical knowledge instruction may be given at an ATO that conducts theoretical knowledge instruction only.
4. The course shall comprise:
  - (a) theoretical knowledge instruction to CPL(As) knowledge level; and
  - (b) visual and instrument flying training.

**THEORETICAL KNOWLEDGE**

5. An approved CPL(As) theoretical knowledge course shall comprise at least 250 hours of instruction.

**THEORETICAL KNOWLEDGE EXAMINATION**

6. An applicant shall demonstrate a level of knowledge appropriate to the privileges granted to the holder of a CPL(As).

**FLYING TRAINING**

7. Applicants without an IR shall be given at least 20 hours dual flight instruction, of which:

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- 10 hours visual instruction, which may include 5 hours in an airship FFS or FTD 2,3 or FNPT II,III; and
  - 10 hours instrument instruction, which may include 5 hours in at least an airship FTD 1 or FNPT I or aeroplane.
8. Applicants holding a valid IR(As) shall be fully credited towards the dual instrument instruction time. Applicants holding a valid IR in another category of aircraft shall complete at least 5 hours of the dual instrument instruction time in an airship.
9. Applicants without a night rating airship shall be given additionally at least 5 hours night flight instruction comprising 3 hours of dual instruction including at least 1 hour of cross-country navigation and 5 solo night circuits. Each circuit shall include a take-off and a landing.

**EXPERIENCE**

10. The applicant for a CPL(As) shall have completed at least 250 hours flight time in airships, including 125 hours as PIC, of which 50 hours of cross-country flight as PIC, including a VFR cross-country flight of at least 90 km (50 NM), in the course of which a full stop landing at destination aerodrome.

Hours as PIC of other categories of aircraft may count towards the 185 hours flight time, in the following cases;

- (a) 30 hours in aeroplanes or helicopters, if the applicant holds a PPL(A) or PPL(H) respectively; or
- (b) 60 hours in aeroplanes or helicopters, if the applicant holds a CPL(A) or CPL(H) respectively; or
- (c) 10 hours in TMGs or sailplanes; or
- (d) 10 hours in balloons.

**SKILL TEST**

11. Upon completion of the related flying training and relevant experience, the applicant shall take the CPL(As) skill test.

**AMC1 to Appendix 3 Training courses for the issue of a CPL and an ATPL**

**GENERAL**



- (a) When ensuring that the applicant complies with the prerequisites for the course, in accordance with ORA.ATO.145, the ATO should check that the applicant has enough knowledge of mathematics, physics and English to facilitate the understanding of the theoretical knowledge instruction content of the course.
- (b) Whenever reference is made to a certain amount of hours of training, this means a full hour. Time not directly assigned to training (such as breaks, etc.) is not to be counted towards the total amount of time that is required.
- (c) The UPRT elements and components specified in AMC2 to Appendix 3; AMC1 to Appendix 5 point (a) should be integrated into the flying training phases or modules.
- (d) The flight instruction syllabus should take into account the principles of TEM.

**A. ATP integrated course: aeroplanes**

- (a) The ATP integrated course should last between 12 and 36 months. This period may be extended where additional flying training or ground instruction is provided by the ATO.

**CREDITING**

- (b) Credit for previous experience given to an applicant who already holds a PPL should be entered into the applicant's training record. In the case of a student pilot who does not hold a pilot licence and with the approval of the Authority, an ATO may designate certain dual exercises to be flown in a helicopter or a TMG up to a maximum of 20 hours.

**THEORETICAL KNOWLEDGE**

- (c) The 750 hours of instruction, which also cover the Area 100 KSA, may include in suitable proportions:
  - (1) classroom work;
  - (2) lessons;
  - (3) tutorials;
  - (4) demonstrations, including those supported by demonstration equipment;
  - (5) exercises carried out as groups or individuals and based on pre-flight and en-route planning, communications, presentations and projects;

- (6) exercises that use demonstration equipment or training devices;
- (7) directed study including workbook exercises or assignments;
- (8) aerodrome or aviation industry field trips;
- (9) computer-based training and e-learning elements;
- (10) progress tests, Area 100 KSA assessments and mental maths test(s); and
- (11) other training methods, media and tools approved by the Authority.

The 750 hours of instruction should be divided in such a way that in each subject the minimum hours are:

(1)	Air law	35 hours
(2)	Aircraft general knowledge	100 hours
(3)	Flight performance and planning	120 hours
(4)	Human performance and limitations	35 hours
(5)	Meteorology	60 hours
(6)	Navigation	90 hours
(7)	Operational procedures	25 hours
(8)	Principles of flight	55 hours
(9)	Communications	20 hours

Other subdivisions of hours may be agreed upon between the Authority and the ATO.

## **FLYING TRAINING**

- (d) The flying instruction is divided into six phases:

- (1) Phase 1:

Exercises up to the first solo flight comprise a total of at least 10 hours dual flight instruction on an SE aeroplane including:

- (i) pre-flight operations, mass and balance determination, aeroplane inspection and servicing;
- (ii) aerodrome and traffic pattern operations, collision avoidance and precautions;
- (iii) control of the aeroplane by external visual references;
- (iv) normal take-offs and landings;
- (v) the basic UPRT exercises as specified in point (b) of AMC2 to Appendix 3; AMC1 to Appendix 5;
- (vi) simulated engine failure.

(2) Phase 2:

Exercises up to the first solo cross-country flight comprise a total of at least 10 hours of dual flight instruction and at least 10 hours solo flight including:

- (i) maximum performance (short field and obstacle clearance) takeoffs and short-field landings;
- (ii) flight by reference solely to instruments, including the completion of a 180 ° turn;
- (iii) dual cross-country flying using external visual references, DR and radio navigation aids, diversion procedures;
- (iv) aerodrome and traffic pattern operations at different aerodromes;
- (v) crosswind take-offs and landings;
- (vi) abnormal and emergency procedures and manoeuvres, including simulated aeroplane equipment malfunctions;
- (vii) operations to, from and transiting controlled aerodromes, compliance with ATS procedures, R/T procedures and phraseology;
- (viii) knowledge of meteorological briefing arrangements, evaluation of weather conditions for flight and use of AIS.

(3) Phase 3:

Exercises up to the VFR navigation progress test comprise a total of at least 5 hours of dual instruction and at least 40 hours as PIC.

The dual instruction and testing up to the VFR navigation progress test should comprise:

- (i) repetition of exercises of phases 1 and 2;
- (ii) VFR navigation progress test conducted by an FI not connected with the applicant's training;
- (iii) dual night flight instruction.

(4) Phase 4:

Exercises up to the instrument rating skill test comprise:

- (i) at least 55 hours instrument flight, which may contain up to 25 hours of instrument ground time in an FNPT I or up to 40 hours in an FNPT II or FFS which should be conducted by an FI or an authorised SFI;
- (ii) 20 hours instrument time flown as SPIC;
- (iii) pre-flight procedures for IFR flights, including the use of the flight manual and appropriate ATS documents in the preparation of an IFR flight plan;
- (iv) procedures and manoeuvres for IFR operation under normal, abnormal and emergency conditions covering at least:
  - (A) transition from visual to instrument flight on take-off;
  - (B) SIDs and arrivals;
  - (C) en-route IFR procedures;
  - (D) holding procedures;
  - (E) instrument approaches to specified minima;
  - (F) missed approach procedures;
  - (G) landings from instrument approaches, including circling;

- (v) in-flight manoeuvres and specific flight characteristics and the basic UPRT exercises as specified in Sections A, B, C and D of Table 2 in point (b) of AMC2 to Appendix 3; AMC1 to Appendix 5;
  - (vi) operation of an ME aeroplane in the exercises of (iv), including operation of the aeroplane solely by reference to instruments with one engine simulated inoperative, and engine shut-down and restart (the latter training should be conducted at a safe altitude unless carried out in an FSTD);
  - (vii) after completion of instrument training that is equivalent to the basic instrument flight module set out in AMC2 to Appendix 6, take-offs and landings as PIC at night.
- (5) Phase 5: Advanced UPRT in accordance with point FCL.745.A;
- (6) Phase 6:
- (i) instruction and testing in MCC comprising the relevant training requirements;
  - (ii) if a type rating for single-pilot aeroplanes in multi-pilot operations, or multi-pilot aeroplanes is not required on completion of this phase, the applicant should be issued with a certificate of course completion for MCC training.

**B. ATP modular theoretical knowledge course: aeroplanes**

- (a) The aim of this course is to train pilots who have not received the theoretical knowledge instruction during an integrated course to the level of theoretical knowledge required for the ATPL.
- (b) An approved course may contain in suitable proportions:
  - (1) classroom work;
  - (2) lessons;
  - (3) tutorials;
  - (4) demonstrations, including those supported by demonstration equipment;
  - (5) exercises carried out as groups or individuals and based on pre-flight and en-route planning, communications, presentations and projects;

- (6) exercises that use demonstration equipment or training devices;
- (7) directed study including workbook exercises or assignments;
- (8) aerodrome or aviation industry field trips;
- (9) computer-based training and e-learning elements;
- (10) progress tests, Area 100 KSA assessments and mental maths test(s); and
- (11) other training methods, media and tools approved by the Authority.

Approved distance-learning (correspondence) courses may also be offered as part of the course. The minimum amount of classroom instruction, as required by ORA.ATO.305, may include all of the above except item (b)(9).

- (c) The ATP modular course should be completed within 18 months. This period may be extended where additional training is provided by the ATO. The flight instruction and skill test need to be completed within the period of validity of the pass in the theoretical examinations.

**C. CPL/IR integrated course: aeroplanes**

- (a) The CPL/IR integrated course should last between 9 and 30 months. This period may be extended where additional flying training or ground instruction is provided by the ATO.

**CREDITING**

- (b) Credit for previous experience given to an applicant who already holds a PPL should be entered into the applicant's training record. In the case of a student pilot who does not hold a pilot licence and with the approval of the Authority, an ATO may designate certain dual exercises to be flown in a helicopter or a TMG up to a maximum of 20 hours.

**THEORETICAL KNOWLEDGE**

- (c) The 500 hours of instruction, which also cover the Area 100 KSA, may include in suitable proportions:
  - (1) classroom work;
  - (2) lessons;
  - (3) tutorials;

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- (4) demonstrations, including those supported by demonstration equipment;
- (5) exercises carried out as groups or individuals and based on pre-flight and en-route planning, communications, presentations and projects;
- (6) exercises that use demonstration equipment or training devices;
- (7) directed study including workbook exercises or assignments;
- (8) aerodrome or aviation industry field trips;
- (9) computer-based training and e-learning elements;
- (10) progress tests, Area 100 KSA assessments and mental maths test(s); and
- (11) other training methods, media and tools approved by the Authority.

The 500 hours of instruction should be divided in such a way that in each subject the minimum hours are:

(1)	Air law	25 hours
(2)	Aircraft general knowledge	75 hours
(3)	Flight performance and planning	80 hours
(4)	Human performance and limitations	20 hours
(5)	Meteorology	40 hours
(6)	Navigation	55 hours
(7)	Operational procedures	15 hours
(8)	Principles of flight	35 hours
(9)	Communications	15 hours

Other subdivisions of hours may be agreed upon between the Authority and the ATO.

## **FLYING TRAINING**

- (d) The flying instruction is divided into four phases:
  - (1) Phase 1:

Exercises up to the first solo flight comprise a total of at least 10 hours dual flight instruction on an SE aeroplane, including:

- (i) pre-flight operations, mass and balance determination, aeroplane inspection and servicing;
- (ii) aerodrome and traffic pattern operations, collision avoidance and precautions;
- (iii) control of the aeroplane by external visual references;
- (iv) normal take-offs and landings;
- (v) the basic UPRT exercises as specified in point (b) of AMC2 to Appendix 3; AMC1 to Appendix 5;
- (vi) simulated engine failure.

(2) Phase 2:

Exercises up to the first solo cross-country flight comprise a total of at least 10 hours of dual flight instruction and at least 10 hours solo flight including:

- (i) maximum performance (short field and obstacle clearance) take-offs and short-field landings;
- (ii) flight by reference solely to instruments, including the completion of a 180° turn;
- (iii) dual cross-country flying using external visual references, DR and radio navigation aids, diversion procedures;
- (iv) aerodrome and traffic pattern operations at different aerodromes;
- (v) crosswind take-offs and landings;
- (vi) abnormal and emergency operations and manoeuvres, including simulated aeroplane equipment malfunctions;
- (vii) operations to, from and transiting controlled aerodromes, compliance with ATS procedures, R/T procedures and phraseology;
- (viii) knowledge of meteorological briefing arrangements, evaluation of weather conditions for flight and use of AIS.



(3) Phase 3:

Exercises up to the VFR navigation progress test comprise a total of at least 5 hours of instruction and at least 40 hours as PIC.

The dual instruction and testing up to the VFR navigation progress test and the skill test should contain the following:

- (i) repetition of exercises of phases 1 and 2;
- (ii) VFR navigation progress test conducted by an FI not connected with the applicant's training;
- (iii) dual night flight instruction.

(4) Phase 4:

Exercises up to the instrument rating skill test comprise:

- (i) at least 55 hours instrument time, which may contain up to 25 hours of instrument ground time in an FNPT I or up to 40 hours in an FNPT II or FFS which should be conducted by an FI or SFI;
- (ii) 20 hours instrument time flown as SPIC;
- (iii) pre-flight procedures for IFR flights, including the use of the flight manual and appropriate ATS documents in the preparation of an IFR flight plan;
- (iv) procedures and manoeuvres for IFR operation under normal, abnormal and emergency conditions covering at least:
  - (A) transition from visual to instrument flight on take-off;
  - (B) SIDs and arrivals;
  - (C) en-route IFR procedures;
  - (D) holding procedures;
  - (E) instrument approaches to specified minima;
  - (F) missed approach procedures;
  - (G) landings from instrument approaches, including circling.

- (v) in-flight manoeuvres and particular flight characteristics and the basic UPRT exercises as specified in Sections A, B, C and D of Table 2 in paragraph (b) of AMC2 to Appendix 3; AMC1 to Appendix 5;
- (vi) operation of either an SE or an ME aeroplane in the exercises of (iv), including in the case of an ME aeroplane operation of the aeroplane solely by reference to instruments with one engine simulated inoperative and engine shut-down and restart. The latter exercise is to be conducted at a safe altitude unless carried out in an FSTD;
- (vii) after completion of instrument training that is equivalent to the basic instrument flight module set out in AMC2 to Appendix 6, take-offs and landings as PIC at night.

**D. CPL integrated course: aeroplanes**

- (a) The CPL integrated course should last between 9 and 24 months. This period may be extended where additional flying training or ground instruction is provided by the ATO.

**CREDITING**

- (b) Credit for the hours flown should be entered into the applicant's training record. In the case of a student pilot who does not hold a pilot licence and with the approval of the Authority, an ATO may designate certain dual exercises to be flown in a helicopter or a TMG up to a maximum of 20 hours.

**THEORETICAL KNOWLEDGE**

- (c) The 350 hours of instruction, which also cover the Area 100 KSA, may include in suitable proportions:
  - (1) classroom work;
  - (2) lessons;
  - (3) tutorials;
  - (4) demonstrations, including those supported by demonstration equipment;
  - (5) exercises carried out as groups or individuals and based on pre-flight and en-route planning, communications, presentations and projects;
  - (6) exercises that use demonstration equipment or training devices;

- (7) directed study including workbook exercises or assignments;
- (8) aerodrome or aviation industry field trips;
- (9) computer-based training and e-learning elements;
- (10) progress tests, Area 100 KSA assessments and mental maths test(s); and
- (11) other training methods, media and tools approved by the Authority.

## **FLYING TRAINING**

- (d) The flying instruction is divided into four phases:

(1) Phase 1:

Exercises up to the first solo flight comprise a total of at least 10 hours dual flight instruction on an SE aeroplane, including:

- (i) pre-flight operations, mass and balance determination, aeroplane inspection and servicing;
- (ii) aerodrome and traffic pattern operations, collision avoidance and precautions;
- (iii) control of the aeroplane by external visual references;
- (iv) normal take-offs and landings;
- (v) the basic UPRT exercises as specified in point (b) of AMC2 to Appendix 3; AMC1 to Appendix 5;
- (vi) simulated engine failure.

(2) Phase 2:

Exercises up to the first solo cross-country flight comprise a total of at least 10 hours of dual flight instruction and at least 10 hours solo flight including:

- (i) maximum performance (short field and obstacle clearance) take-offs and short-field landings;
- (ii) flight by reference solely to instruments, including the completion of a 180° turn;

- (iii) dual cross-country flying using external visual references, DR and radio navigation aids, diversion procedures;
- (iv) aerodrome and traffic pattern operations at different aerodromes;
- (v) crosswind take-offs and landings;
- (vi) abnormal and emergency procedures and manoeuvres, including simulated aeroplane equipment malfunctions;
- (vii) operations to, from and transiting controlled aerodromes, compliance with ATS procedures, R/T procedures and phraseology;
- (viii) knowledge of meteorological briefing arrangements, evaluation of weather conditions for flight and use of AIS.

(3) Phase 3:

Exercises up to the VFR navigation progress test comprise a total of at least 30 hours instruction and at least 58 hours as PIC, including:

- (i) at least 10 hours instrument time, which may contain 5 hours of instrument ground time in an FNPT or an FFS and should be conducted by an FI or SFI;
- (ii) repetition of exercises of phases 1 and 2, which should include at least 5 hours in an aeroplane certificated for the carriage of at least four persons and have a variable pitch propeller and retractable landing gear;
- (iii) night flight time including, g, after completion of instrument training that is equivalent to the basic instrument flight module set out in AMC2 to Appendix 6, take-offs and landings as PIC.

(4) Phase 4:

The dual instruction and testing up to the CPL(A) skill test contain the following:

- (i) up to 30 hours instruction which may be allocated to specialised aerial work training;
- (ii) repetition of exercises in Phase 3, as required;

- (iii) in-flight manoeuvres and particular flight characteristics including the basic UPRT exercises as specified in point (b) of AMC2 to Appendix 3; AMC1 to Appendix 5;
- (iv) ME training.

If required, operation of an ME aeroplane including operation of the aeroplane with one engine simulated inoperative, and engine shutdown and restart (the latter exercise at a safe altitude unless carried out in an FSTD).

**E. CPL modular course: aeroplanes**

- (a) The CPL modular course should be completed within 18 months. This period may be extended where additional training is provided by the ATO. The flight instruction and skill test need to be completed within the period of validity of the pass in the theoretical examinations.

**CREDITING**

Applicants with prior experience as PIC may be credited with an amount of hours to meet the requirement of 150 hours of flight time of Appendix 3, Part E, point (3)(a). The amount of credited hours should be decided by the ATO where the applicant takes the training course on the basis of a pre-entry flight test, but in any case, should have been completed only in one aircraft category other than aeroplane.

**THEORETICAL KNOWLEDGE**

- (b) The 250 hours of instruction, which also cover the Area 100 KSA, may include in suitable proportions:
  - (1) classroom work;
  - (2) lessons;
  - (3) tutorials;
  - (4) demonstrations, including those supported by demonstration equipment;
  - (5) exercises carried out as groups or individuals and based on pre-flight and en-route planning, communications, presentations and projects;
  - (6) exercises that use demonstration equipment or training devices;
  - (7) directed study including workbook exercises or assignments;

- (8) aerodromes or aviation industry field trips;
- (9) computer-based training and e-learning elements;
- (10) progress tests, Area 100 KSA assessments and mental maths test(s); and
- (11) other training methods, media and tools approved by the Authority.

Approved distance-learning (correspondence) courses may also be offered as part of the course. The minimum amount of classroom instruction, as required by ORA.ATO.305, may include all of the above except item (b)(9).

### **FLYING TRAINING**

(c) The following flight time is suggested for the flying training:

- |  |                       |
|--|-----------------------|
| (1) visual flight training:  | suggested flight time |
| <br>(i) Exercise 1:  |                       |
| pre-flight operations: mass and<br>balance determination, aeroplane<br>inspection and servicing. |                       |
| <br>(ii) Exercise 2:   |                       |
| take-off, traffic pattern,   | 0:45 hours            |
| approach and landing,<br>use of checklist, collision avoidance<br>and checking procedures.       |                       |
| <br>(iii) Exercise 3:  |                       |
| traffic patterns: simulated  | 0:45 hours            |
| engine failure during and after take-off.  |                       |
| <br>(iv) Exercise 4:   |                       |
| maximum performance  | 1:00 hours            |

(short field and obstacle clearance)

take-offs and short-field landings.

(v) Exercise 5:

crosswind take-offs, 1:00 hours  
landings and go-arounds.

(vi) Exercise 6:

Arresting divergence of the aeroplane 0:45 hours  
from intended flight path, Preventing flight  
at airspeeds inappropriate for the (intended flight)  
conditions, High airspeed (including flight at  
relatively high airspeed), Steep turns Nose-low  
attitudes at various bank angles (including spiral dive).

(vii) Exercise 7:

Arresting divergence of the aeroplane 0:45 hours  
from intended flight path, Preventing flight  
at airspeeds inappropriate for the (intended flight)  
conditions, slow flight, nose-high attitudes  
at various bank angles, spin avoidance, stall events  
in the following configurations:  
— take-off configuration,  
— clean configuration, and  
— landing configuration.

(viii) Exercise 8:

cross-country flying 10:00 hours

using DR and radio navigation aids; flight planning by the applicant; filing of ATC flight plan; evaluation of weather briefing documentation, NOTAM, etc.; R/T procedures and phraseology; positioning by radio navigation aids; operation to, from and transiting controlled aerodromes, compliance with ATS procedures for VFR flights, simulated radio communication failure, weather deterioration, diversion procedures; simulated engine failure during cruise flight; selection of an emergency landing strip.

(2) instrument flight training:

- (i) This module's content is identical to that of the 10-hour basic instrument flight module as set out in AMC2 to Appendix 6. This module is focused on the basics of flying by sole reference to instruments, including limited panel and basic UPRT exercises as specified in Sections A, B and C of Table 2 in point (b) of AMC2 Appendix 3; AMC1 Appendix 5.
- (ii) All exercises may be performed in an FNPT I or II or an FFS. If instrument flight training is in VMC, a suitable means of simulating IMC for the student should be used.
- (iii) A BITD may be used for the following exercises: (9), (10), (11) and (14).
- (iv) The use of the BITD is subject to the following:
  - (A) the training is complemented by exercises in an aeroplane;
  - (B) the record of the parameters of the flight is available;



(C) an FI(A) or IRI(A) conducts the instruction.

(v) Exercise 9:

Basic instrument flying without 0:30 hours  
external visual cues; horizontal flight;  
power changes for acceleration or  
deceleration, maintaining straight and  
level flight; turns in level flight with 15°  
and 25° bank, left and right; roll-out  
onto predetermined headings.

(vi) Exercise 10:

Repetition of exercise 9; 0:45 hours  
additionally climbing and descending,  
maintaining heading and speed, transition to  
horizontal flight; climbing and descending turns.

(vii) Exercise 11:

Instrument pattern: 0:45 hours

- (1) start exercise, decelerate to approach speed, flaps into approach configuration;
- (2) initiate standard turn (left or right);
- (3) roll out on opposite heading, maintain new heading for 1 minute;
- (4) standard turn, gear down, descend 500 ft/min;
- (5) roll out on initial heading, maintain descent (500 ft/min) and new heading for 1 minute;
- (6) transition to horizontal flight, 1.000 ft below initial flight level;

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- (7) initiate go-around;
- (8) climb at best rate of climb speed.
- (viii) Exercise 12:
  - Repetition of exercise 9 and steep turns with 45° bank; recovery from unusual attitudes. 0:45 hours
- (ix) Exercise 13:
  - Repetition of exercise 12 0:45 hours
- (x) Exercise 14:
  - Radio navigation using VOR, NDB or, if available, VDF; interception of predetermined QDM and QDR. 0:45 hours
- (xi) Exercise 15:
  - Repetition of exercise 9 and recovery from nose-high attitudes at various bank angles, recovery from nose-low attitudes at various bank angles 0:45 hours
- (xii) Exercise 16:
  - Repetition of exercise 9, turns and level change and recovery from nose-high attitudes at various bank angles, recovery from nose-low attitudes at various bank angles with simulated failure of the artificial horizon or directional gyro. 0:45 hours

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(xiii) Exercise 17:

Basic UPRT exercises as specified 0:45 hours  
in point (b) of AMC2 to Appendix 3;  
AMC1 to Appendix 5, excluding those  
manoeuvres which have already been  
completed during exercises 15 and 16

(xiv) Exercise 18:

Repetition of exercises (14), (16) and (17). 3:00 hours

(3) ME training

If required, operation of an ME aeroplane in the exercises 1 through 17, including operation of the aeroplane with one engine simulated inoperative, and engine shutdown and restart. Before commencing training, the applicant should have complied with the type and class ratings requirements as appropriate to the aeroplane used for the test.

(4) Applicants who need to complete night training in accordance with point 10(b) of Section E of Appendix 3 to MCAR-Part-FCL should perform take-offs and landings as PIC at night only after having completed the instrument flight training specified in point (2)(i) of 'FLYING TRAINING' of Section E of this AMC.

**F. ATP/IR integrated course: helicopters**

- (a) The ATP/IR integrated course should last between 12 and 36 months. This period may be extended where additional flying training or ground instruction is provided by the ATO.

**CREDITING**

- (b) Credit for the hours flown should be entered into the applicant's training record. In case of a student pilot who does not hold a pilot licence and with the approval of the Authority, an ATO may designate certain dual exercises to be flown in an aeroplane or a TMG up to a maximum of 20 hours.

**THEORETICAL KNOWLEDGE**

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- (c) The 750 hours of instruction, which also cover the Area 100 KSA, may include in suitable proportions:
- (1) classroom work;
  - (2) lessons;
  - (3) tutorials;
  - (4) demonstrations, including those supported by demonstration equipment;
  - (5) exercises carried out as groups or individuals and based on pre-flight and en-route planning, communications, presentations and projects;
  - (6) exercises that use demonstration equipment or training devices;
  - (7) directed study including workbook exercises or assignments;
  - (8) aerodrome or aviation industry field trips;
  - (9) computer-based training and e-learning elements;
  - (10) progress test, Area 100 KSA assessments and mental maths test(s); and
  - (11) other training methods, media and tools approved by the Authority.

The 750 hours of instruction should be divided in such a way that in each subject the minimum hours are:

(1)	Air law	35 hours
(2)	Aircraft general knowledge	100 hours
(3)	Flight performance and planning	120 hours
(4)	Human performance and limitations	35 hours
(5)	Meteorology	60 hours
(6)	Navigation	90 hours
(7)	Operational procedures	25 hours
(8)	Principles of flight	55 hours
(9)	Communications	20 hours

Other subdivisions of hours may be agreed upon between the Authority and the ATO.

(d) The flight instruction is divided into four phases:

(1) phase 1:

Flight exercises up to the first solo flight comprise a total of not less than 12 hours dual flight instruction on a helicopter, including:

- (1) pre-flight operations, mass and balance determination, helicopter inspection and servicing;
- (2) aerodrome and traffic pattern operations, collision avoidance and procedures;
- (3) control of the helicopter by external visual reference;
- (4) take-offs, landings, hovering, look-out turns and normal transitions from and to the hover;
- (5) emergency procedures, basic auto-rotations, simulated engine failure, ground resonance recovery if relevant to type.

(2) phase 2:

Flight exercises until general handling and day VFR navigation progress check, and basic instrument flying progress check. This phase comprises a total flight time of not less than 128 hours including 73 hours of dual flight instruction flight time and including at least 5 hours VFR conversion training on an ME helicopter, 15 hours of solo flight and 40 hours flown as student PIC. The instruction and testing contain the following:

- (i) sideways and backwards flight, turns on the spot;
- (ii) incipient vortex ring recovery;
- (iii) advanced/touchdown auto-rotations, simulated engine-off landings, practice forced landings. Simulated equipment malfunctions and emergency procedures relating to malfunctions of engines, controls, electrical and hydraulic circuits;
- (iv) steep turns;

- (v) transitions, quick stops, out of wind manoeuvres, sloping ground landings and take-offs;
  - (vi) limited power and confined area operations, including low level operations to and from unprepared sites;
  - (vii) flight by sole reference to basic flight instruments, including completion of a 180 ° turn and recovery from unusual attitudes to simulate inadvertent entry into cloud;
  - (viii) cross-country flying by external visual reference, DR and radio navigation aids, diversion procedures;
  - (ix) aerodrome and traffic pattern operations at different aerodromes;
  - (x) operations to, from and transiting controlled aerodromes; compliance with ATS procedures, R/T procedures and phraseology;
  - (xi) application of meteorological briefing arrangements, evaluation of weather conditions for flight and use of AIS;
  - (xii) night flight, including take-offs and landings as PIC;
  - (xiii) general handling, day VFR navigation and basic instrument flying progress checks in accordance with Appendix 4 to MCAR-Part-FCL, conducted by an FI not connected with the applicant's training.
- (3) phase 3:

Flight exercises up to IR skill test. This MCAR comprises a total of 40 hours dual instrument flight time, including 10 hours of an ME IFR certificated helicopter.

The instruction and testing should contain the following:

- (i) pre-flight procedures for IFR flights, including the use of the flight manual and appropriate ATS documents in the preparation of an IFR flight plan;
- (ii) procedures and manoeuvres for IFR operation under normal, abnormal and emergency conditions covering at least:
  - (A) transition from visual to instrument flight on take-off;
  - (B) SIDs and arrivals;

- (C) en-route IFR procedures;
  - (D) holding procedures;
  - (E) instrument approaches to specified minima;
  - (F) missed approach procedure;
  - (G) landings from instrument approaches;
  - (H) in-flight manoeuvres and particular flight characteristics;
  - (I) instrument exercises with one engine simulated inoperative.
- (4) phase 4:

Instruction in MCC should comprise the relevant training set out in FCL.735.H and AMC1 FCL.735.A, FCL.735.H and FCL.735.As.

If a type rating for MP helicopter is not required on completion of this MCAR, the applicant should be provided with a certificate of course completion for MCC training.

**G. ATP integrated course: helicopters**

- (a) The ATP integrated course should last between 12 and 36 months. This period may be extended where additional flying training or ground instruction is provided by the ATO.

**CREDITING**

- (b) Credit for the hours flown should be entered into the applicant's training record. In case of a student pilot who does not hold a pilot licence and with the approval of the Authority, an ATO may designate certain dual exercises to be flown in an aeroplane or a TMG up to a maximum of 20 hours.

**THEORETICAL KNOWLEDGE**

- (c) The 650 hours of instruction, which also cover the area 100 KSA, may include in suitable proportions:
- (1) classroom work;
  - (2) lessons;
  - (3) tutorials;

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- (4) demonstrations, including those supported by demonstration equipment;
- (5) exercises carried out as groups or individuals and based on pre-flight and en-route planning, communications, presentations and projects;
- (6) exercises that use demonstration equipment or training devices;
- (7) directed study including workbook exercises or assignments;
- (8) aerodrome or aviation industry field trips;
- (9) computer-based training and e-learning elements;
- (10) progress tests, Area 100 KSA assessments and mental maths test(s); and
- (11) other training methods, media and tools approved by the Authority.

The 650 hours of instruction should be divided in such a way that in each subject the minimum hours are:

(1)	Air law	30 hours
(2)	Aircraft general knowledge	90 hours
(3)	Flight performance and planning	90 hours
(4)	Human performance and limitations	30 hours
(5)	Meteorology	50 hours
(6)	Navigation	70 hours
(7)	Operational procedures	20 hours
(8)	Principles of flight	45 hours
(9)	Communications	15 hours

Other subdivisions of hours may be agreed upon between the Authority and the ATO.

- (d) The flight instruction is divided into three phases:
  - (1) phase 1:



Flight exercises up to the first solo flight comprise a total of not less than 12 hours dual flight instruction on a helicopter, including:

- (i) pre-flight operations, mass and balance determination, helicopter inspection and servicing;
- (ii) aerodrome and traffic pattern operations, collision avoidance and procedures;
- (iii) control of the helicopter by external visual reference;
- (iv) take-offs, landings, hovering, look-out turns and normal transitions from and to the hover;
- (v) emergency procedures, basic auto-rotations, simulated engine failure, ground resonance recovery if relevant to type.

(2) phase 2:

Flight exercises until general handling and day VFR navigation progress and basic instrument flying progress check conducted by an FI not connected with the applicant's training. This phase comprises a total flight time of not less than 128 hours, including 73 hours of dual instruction flight time and including at least 5 hours VFR conversion training on an ME helicopter, 15 hours of solo flight and 40 hours flown as student PIC. The instruction and testing contain the following:

- (i) sideways and backwards flight, turns on the spot;
- (ii) incipient vortex ring recovery;
- (iii) touchdown or advanced auto-rotations, simulated engine-off landings, practice forced landings. Simulated equipment malfunctions and emergency procedures relating to malfunctions of engines, controls, electrical and hydraulic circuits;
- (iv) steep turns;
- (v) transitions, quick stops, out of wind manoeuvres, sloping ground landings and take-offs;
- (vi) limited power and confined area operations, including low level operations to and from unprepared sites;

- (vii) 10 hours flight by sole reference to basic flight instruments, including completion of a 180 ° turn and recovery from unusual attitudes to simulate inadvertent entry into cloud;
  - (viii) cross-country flying by external visual reference, DR and radio navigation aids, diversion procedures;
  - (ix) aerodrome and traffic pattern operations at different aerodromes;
  - (x) operations to, from and transiting controlled aerodromes, compliance with ATS procedures, R/T procedures and phraseology;
  - (xi) application of meteorological briefing arrangements, evaluation of weather conditions for flight and use of AIS;
  - (xii) night flight, including take-offs and landings as PIC;
  - (xiii) general handling, day VFR navigation and basic instrument flying progress checks in accordance with Appendix 4 to MCAR-Part-FCL, conducted by an FI not connected with the applicant's training.
- (3) phase 3:

Instruction in MCC comprises the relevant training set out in FCL.735.H and AMC1 FCL.735.A, FCL.735.H and FCL.735.As.

If a type rating for MP helicopter is not required on completion of this MCAR, the applicant should be provided with a certificate of course completion for MCC training.

#### **H. ATP modular theoretical knowledge course: helicopters**

- (a) The aim of this course is to train pilots who have not received the theoretical knowledge instruction during an integrated course to the level of theoretical knowledge required for the ATPL.
- (b) An approved course, which also covers the area 100 KSA, may contain in suitable proportions:
  - (1) classroom work;
  - (2) lessons;
  - (3) tutorials;

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- (4) demonstrations, including those supported by demonstration equipment;
- (5) exercises carried out as groups or individuals and based on pre-flight and en-route planning, communications, presentations and projects;
- (6) exercises that use demonstration equipment or training devices;
- (7) directed study including workbook exercises or assignments;
- (8) aerodrome or aviation industry field trips;
- (9) computer-based training and e-learning elements;
- (10) progress tests, Area 100 KSA assessments and mental maths test(s); and
- (11) other training methods, media and tools approved by the Authority.

Approved distance-learning (correspondence) courses may also be offered as part of the course. The minimum amount of classroom instruction, as required by ORA.ATO.305 of MCAR-Part-ORA, may include all of the above except item (b)(9).

- (c) The ATP modular course should be completed within 18 months. This period may be extended where additional training is provided by the ATO. The flight instruction and skill test need to be completed within the period of validity of the pass in the theoretical examinations.

**I. CPL/IR integrated course: helicopters**

- (a) The CPL/IR integrated course should last between 9 and 30 months. This period may be extended where additional flying training or ground instruction is provided by the ATO.

**CREDITING**

- (b) Credit for the hours flown should be entered into the applicant's training record. In case of a student pilot who does not hold a pilot licence and with the approval of the Authority, an ATO may designate certain dual exercises to be flown in an aeroplane or a TMG up to a maximum of 20 hours.

**THEORETICAL KNOWLEDGE**

- (c) The 500 hours of instruction, which also cover the Area 100 KSA, may include in suitable proportions:
  - (1) classroom work;

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- (2) lessons;
- (3) tutorials;
- (4) demonstrations, including those supported by demonstration equipment;
- (5) exercises carried out as groups or individuals and based on pre-flight and en-route planning, communications, presentations and projects;
- (6) exercises that use demonstration equipment or training devices;
- (7) directed study including workbook exercises or assignments;
- (8) aerodrome or aviation industry field trips;
- (9) computer-based training and e-learning elements;
- (10) progress tests, Area 100 KSA assessments and mental maths test(s); and
- (11) other training methods, media and tools approved by the Authority.

The 500 hours of instruction should be divided in such a way that in each subject the minimum hours are:

(1)	Air law	25 hours
(2)	Aircraft general knowledge	75 hours
(3)	Flight performance and planning	80 hours
(4)	Human performance and limitations	20 hours
(5)	Meteorology	40 hours
(6)	Navigation	55 hours
(7)	Operational procedures	15 hours
(8)	Principles of flight	35 hours
(9)	Communications	15 hours

Other subdivision of hours may be agreed upon between the Authority and the ATO.

**FLYING TRAINING**

(d) The flight instruction is divided into three phases:

(1) phase 1:

Flight exercises up to the first solo flight. This MCAR comprises a total of at least 12 hours dual flight instruction on a helicopter including:

- (i) pre-flight operations: mass and balance determination, helicopter inspection and servicing;
- (ii) aerodrome and traffic pattern operations, collision avoidance and procedures;
- (iii) control of the helicopter by external visual reference;
- (iv) take-offs, landings, hovering, look-out turns and normal transitions from and to the hover;
- (v) emergency procedures, basic auto-rotation, simulated engine failure, ground resonance recovery if relevant to type.

(2) phase 2:

Flight exercises until general handling and day VFR navigation progress check conducted by an FI not connected with the applicant's training, and basic instrument progress check. This MCAR comprises a total flight time of not less than 128 hours, including 73 hours of dual instruction flight time and including at least 5 hours VFR conversion training on an ME helicopter, 15 hours of solo flight and 40 hours flown as SPIC. The instruction and testing contain the following:

- (i) sideways and backwards flight, turns on the spot;
- (ii) incipient vortex ring recovery;
- (iii) touchdown or advanced auto-rotation and simulated engine-off landings, practice forced landings. Simulated equipment malfunctions and emergency procedures relating to malfunctions of engines, controls, electrical and hydraulic circuits;
- (iv) steep turns;
- (v) transitions, quick stops, out of wind manoeuvres, sloping ground landings and take-offs;

- (vi) limited power and confined area operations, including selection of and low level operations to and from unprepared sites;
  - (vii) flight by sole reference to basic flight instruments, including completion of 180 degree turn and recovery from unusual attitudes to simulate inadvertent entry into cloud;
  - (viii) cross-country flying by external visual reference, DR and radio navigation aids and diversion procedures;
  - (ix) aerodrome and traffic pattern operations at different aerodromes;
  - (x) operations to, from and transiting controlled aerodromes, compliance with ATS procedures, R/T procedures and phraseology;
  - (xi) application of meteorological briefing arrangements, evaluation of weather conditions for flight and use of AIS;
  - (xii) night flight, including take-offs and landings as PIC;
  - (xiii) general handling, day VFR navigation and basic instrument flying progress checks in accordance with Appendix 4 to MCAR-Part-FCL, conducted by an FI not connected with the applicant's training.
- (3) phase 3:

Flight exercises up to IR skill test. This MCAR comprises a total of 40 hours dual instrument flight time, including 10 hours of an ME IFR certificated helicopter.

The instruction and testing should contain the following:

- (i) pre-flight procedures for IFR flights, including the use of the flight manual and appropriate ATS documents in the preparation of an IFR flight plan;
- (ii) procedures and manoeuvres for IFR operation under normal, abnormal and emergency conditions covering at least:
  - (A) transition from visual to instrument flight on take-off;
  - (B) SIDs and arrivals;
  - (C) en-route IFR procedures;

- (D) holding procedures;
- (E) instrument approaches to specified minima;
- (F) missed approach procedure;
- (G) landings from instrument approaches;
- (H) in-flight manoeuvres and particular flight characteristics;
- (I) instrument exercises with one engine simulated inoperative.

**J. CPL integrated course: helicopters**

- (a) The CPL integrated course should last between 9 and 24 months. This period may be extended where additional flying training or ground instruction is provided by the ATO.

**CREDITING**

- (b) Credit for the hours flown should be entered into the applicant's training record. In case of a student pilot who does not hold a pilot licence and with the approval of the Authority, an ATO may designate certain dual exercises to be flown in an aeroplane or a TMG up to a maximum of 20 hours.

**THEORETICAL KNOWLEDGE**

- (c) The 350 hours of instruction, which also cover the Area 100 KSA, may include in suitable proportions:
  - (1) classroom work;
  - (2) lessons;
  - (3) tutorials;
  - (4) demonstrations, including those supported by demonstration equipment;
  - (5) exercises carried out as groups or individuals and based on pre-flight and en-route planning, communications, presentations and projects;
  - (6) exercises that use demonstration equipment or training devices;
  - (7) directed study including workbook exercises or assignments;
  - (8) aerodrome or aviation industry field trips;

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- (9) computer-based training and e-learning elements;
- (10) progress tests, Area 100 KSA assessments and mental maths test(s); and
- (11) other training methods, media and tools approved by the Authority.

The 350 hours of instruction should be divided in such a way that in each subject the minimum hours are:

(1)	Air law	15 hours
(2)	Aircraft general knowledge	40 hours
(3)	Flight performance and planning	35 hours
(4)	Human performance and limitations	10 hours
(5)	Meteorology	30 hours
(6)	Navigation	35 hours
(7)	Operational procedures	10 hours
(8)	Principles of flight	30 hours
(9)	Communications	10 hours

Other subdivisions of hours may be agreed upon between the Authority and the ATO.

## **FLYING TRAINING**

- (d) The flight instruction is divided into two phases:

- (1) phase 1:

Flight exercises up to the first solo flight. This MCAR comprises a total of not less than 12 hours dual flight instruction on a helicopter, including:

- (1) pre-flight operations: mass and balance determination, helicopter inspection and servicing;
    - (2) aerodrome and traffic pattern operations, collision avoidance and procedures;
    - (3) control of the helicopter by external visual reference;



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- (4) take-offs, landings, hovering, look-out turns and normal transitions from and to the hover;
  - (5) emergency procedures, basic auto-rotations, simulated engine failure, ground resonance recovery if relevant to type.
- (2) phase 2:
- Flight exercises until general handling and day VFR navigation progress check conducted by an FI not connected with the applicant's training, and basic instrument progress check. This MCAR comprises a total flight time of not less than 123 hours, including 73 hours of dual instruction flight time, 15 hours of solo flight and 35 hours flown as SPIC. The instruction and testing contain the following:
- (i) sideways and backwards flight, turns on the spot;
  - (ii) incipient vortex ring recovery;
  - (iii) touchdown or advanced auto-rotations and simulated engine-off landings, practice forced landings. Simulated equipment malfunctions and emergency procedures relating to malfunctions of engines, controls, electrical and hydraulic circuits;
  - (iv) steep turns;
  - (v) transitions, quick stops, out of wind manoeuvres, sloping ground landings and take-offs;
  - (vi) limited power and confined area operations, including selection of and low level operations to and from unprepared sites;
  - (vii) flight by sole reference to basic flight instruments, including completion of a 180° turn and recovery from unusual attitudes to simulate inadvertent entry into cloud;
  - (viii) cross-country flying by external visual reference, DR and radio navigation aids, diversion procedures;
  - (ix) aerodrome and traffic pattern operations at different aerodromes;
  - (x) operations to, from and transiting controlled aerodromes, compliance with ATS procedures, R/T procedures and phraseology;

- (xi) application of meteorological briefing arrangements, evaluation of weather conditions for flight and use of AIS;
- (xii) night flight, including take-offs and landings as PIC;
- (xiii) general handling, day VFR navigation and basic instrument flying progress checks in accordance with Appendix 4 to MCAR-Part-FCL, conducted by an FI not connected with the applicant's training.

**K. CPL modular course: helicopters**

- (a) The CPL modular course should be completed within 18 months. This period may be extended where additional training is provided by the ATO. The flight instruction and skill test need to be completed within the period of validity of the pass in the theoretical examinations.

**CREDITING**

Applicants with prior experience as PIC may be credited with an amount of hours to meet the requirement of 150 hours of flight time of Appendix 3, Part K, point (3)(a).

The amount of credited hours should be decided by the ATO where the applicant takes the training course on the basis of a pre-entry flight test, but in any case, should have been completed only in one aircraft category other than helicopter, and not be a combination of hours in more than two different aircraft categories.

**THEORETICAL KNOWLEDGE**

- (b) The 250 hours of instruction, which also covers the Area 100 KSA may include in suitable proportions:
  - (1) classroom work;
  - (2) lessons;
  - (3) tutorials;
  - (4) demonstrations, including those supported by demonstration equipment;
  - (5) exercises carried out as groups or individuals and based on pre-flight and en-route planning, communications, presentations and projects;
  - (6) exercises that use demonstration equipment or training devices;
  - (7) directed study including workbook exercises or assignments;

- (8) aerodrome or aviation industry field trips;
- (9) computer-based training and e-learning elements;
- (10) progress tests, Area 100 KSA assessments and mental maths test(s); and
- (11) other training methods, media and tools approved by the Authority.

Approved distance-learning (correspondence) courses may also be offered as part of the course. The minimum amount of classroom instruction, as required by ORA.ATO.305, may include all of the above except item (b)(9).

### **FLYING TRAINING**

- (c) The flying instruction comprises the following items. The flight time allocated to each exercise is at the discretion of the FI, provided that at least 5 hours flight time is allocated to cross-country flying.

### **VISUAL INSTRUCTION**

- (d) Within the total of dual flight instruction time, the applicant may have completed during the visual phase up to 5 hours in a helicopter FFS or FTD 2, 3 or FNPT II, III.
  - (1) pre-flight operations: mass and balance calculations, helicopter inspection and servicing;
  - (2) level flight speed changes, climbing, descending, turns, basic autorotations, use of checklist, collision avoidance and checking procedures;
  - (3) take-offs and landings, traffic pattern, approach, simulated engine failures in the traffic pattern. Sideways and backwards flight and spot turns in the hover;
  - (4) recovery from incipient vortex ring condition;
  - (5) advanced auto-rotations covering the speed range from low speed to maximum range and manoeuvre in auto-rotations (180°, 360° and 'S' turns) and simulated engine-off landings;
  - (6) selection of emergency landing areas, auto-rotations following simulated emergencies to given areas and steep turns at 30° and 45° bank;
  - (7) manoeuvres at low level and quick-stops;

- (8) landings, take-offs and transitions to and from the hover when heading out of wind;
- (9) landings and take-offs from sloping or uneven ground;
- (10) landings and take-offs with limited power;
- (11) low level operations into and out of confined landing sites;
- (12) cross-country flying using dead reckoning and radio navigation aids, flight planning by the applicant, filing of ATC flight plan, evaluation of weather briefing documentation, NOTAM, etc., R/T procedures and phraseology, positioning by radio navigation aids; operation to, from and transiting controlled aerodromes, compliance with ATS procedures for VFR flights, simulated radio communication failure, weather deterioration, diversion procedures; location of an off airfield landing site and simulated approach.

## **BASIC INSTRUMENT INSTRUCTION**

- (e) A maximum of 5 hours of the following exercises may be performed in an FFS or FTD or FNPT. Flight training should be carried out in VMC using a suitable means of simulating IMC for the student.
  - (1) Exercise 1:

Instrument flying without external visual cues. Level flight performing speed changes, maintaining flight altitude (level, heading) turns in level flight at rate 1 and 30° bank, left and right; roll-out on predetermined headings;
  - (2) Exercise 2:

repetition of exercise 1; additionally climbing and descending, maintaining heading and speed, transition to horizontal flight; climbing and descending turns;
  - (3) Exercise 3:

repetition of exercise 1; and recovery from unusual attitudes;
  - (4) Exercise 4:

radio navigation;
  - (5) Exercise 5:

repetition of exercise 1; and turns using standby magnetic compass and standby artificial horizon (if fitted).

**AMC2 to Appendix 3; AMC1 to Appendix 5**

**BASIC UPRT FOR AEROPLANE ATP INTEGRATED, CPL/IR INTEGRATED, CPL INTEGRATED AND CPL MODULAR COURSES AS WELL AS MPL COURSE PHASES 1 TO 3**

(a) BASIC UPRT ELEMENTS AND COMPONENTS

In order for student pilots to develop the competencies to prevent and recover from aeroplane upsets, the basic UPRT elements and respective components in the following Table 1 should be integrated into the flying training modules and phases, such that all the elements are covered.

Table 1: Basic UPRT elements and components		Pre-flight briefing	Flying training
<b>A.</b>	<b>Aerodynamics</b>		
1.	General aerodynamic characteristics	•	•
2.	Aeroplane certification and limitations	•	•
4.	Aerodynamics (high and low altitude)	•	
5.	Aeroplane performance (high and low altitude)	•	
6.	AoA and stall awareness	•	•
7.	Aeroplane stability	•	•
8.	Control surface fundamentals	•	•
9.	Use of trim	•	•
10.	Icing and contamination effects	•	•
11.	Propeller slipstream (as applicable)	•	•
<b>B.</b>	<b>Causes of and contributing factors to upsets</b>		
1.	Environmental	•	
2.	Pilot-induced	•	
3.	Mechanical (aeroplane systems)	•	
<b>C.</b>	<b>Safety review of accidents and incidents relating to aeroplane upsets</b>		
1.	Safety review of accidents and incidents relating to aeroplane upsets	•	
<b>D.</b>	<b>G-load awareness and management</b>		
1.	Positive/negative/increasing/decreasing G-loads	•	•
2.	Lateral G awareness (sideslip)	•	•
3.	G-load management	•	•
<b>E.</b>	<b>Energy management</b>		

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Table 1: Basic UPRT elements and components		Pre-flight briefing	Flying training
1.	Kinetic energy vs potential energy vs chemical energy (power)	•	•
<b>F. Flight path management</b>			
1.	Relationship between pitch, power and performance	•	•
2.	Performance and effects of differing power plants	•	•
3.	Manual and automation inputs for guidance and control (if applicable)	•	•
4.	Class-specific characteristics of flight path management	•	•
5.	Management of go-arounds from various stages during the approach	•	•
6.	Automation management (if applicable)	•	•
7.	Proper use of rudder	•	•
<b>G. Recognition</b>			
1.	Class-specific examples of physiological, visual and instrument clues during developing and developed upset	•	•
2.	Pitch/power/roll/yaw	•	•
3.	Effective scanning (effective monitoring)	•	•
4.	Stall protection systems and cues	•	•
5.	Criteria for identifying stalls and upsets	•	•
<b>H. System malfunction</b> (including immediate handling and subsequent operational considerations, as applicable)			
1.	Flight control defects	•	•
2.	Engine failure (partial or full)	•	•
3.	Instrument failures	•	•
4.	Loss of reliable airspeed (training elements as per point (1b) of AMC2 ORA.ATO.125).	•	•
5.	Automation failures	•	•
6.	Stall protection system failures, including icing alerting systems	•	•

(b) MANOEUVRE-BASED UPRT EXERCISES

The following Table 2 contains manoeuvre-based basic UPRT exercises.

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Table 2: Manoeuvre-based basic UPRT exercises		Pre-flight briefing	Flying training
<b>A.</b>	<b>Timely and appropriate intervention</b>		
1.	Arresting divergence of the aeroplane from intended flight path	•	•
2.	Preventing flight at airspeeds inappropriate for the (intended flight) condition	•	•
3.	Avoiding spins	•	•
<b>B.</b>	<b>Flight path management</b>		
1.	Steep turns	•	•
2.	Slow flight (including flight at critically low air-speed)	•	•
3.	High airspeed (including flight at relatively high airspeed)	•	•
<b>C.</b>	<b>Application of OEM recommendations (if applicable) during developing upsets</b>		
1.	Nose-high attitudes at various bank angles	•	•
2.	Nose-low attitudes at various bank angles (including spiral dive)	•	•
<b>D.</b>	<b>Stall events in the following configurations</b>		
1.	Take-off configuration	•	•
2.	Clean configuration	•	•
3.	Landing configuration	•	•

(c) **INTEGRATION OF TEM, PILOT CORE COMPETENCIES, AND HUMAN FACTORS**

Threat and Error Management (TEM), pilot competencies and human factors, as shown in the following Table 3 below, should be integrated into the flying training modules and phases as appropriate.

Table 3: Core elements and components of TEM, pilot competencies and human factors		Pre-flight briefing	Flying training
<b>A.</b>	<b>TEM</b>		
1.	TEM framework	•	•
2.	Recognition of threats and errors	•	•
3.	Management of threats and errors	•	•
4.	Countermeasures against threats and errors to prevent undesired aircraft states, including early intervention and, when necessary to prevent upsets, timely application of countermeasures to manage undesired aircraft states	•	•
<b>B.</b>	<b>Pilot Competencies, including CRM</b>		
1.	All elements listed in Table 1 of GM2 FCL.735.A	•	•

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<b>C. Human factors</b>			
1.	Instrument interpretation, active monitoring, checking	•	•
2.	Distraction, inattention, fixation, fatigue	•	•
3.	Human information processing, cognitive effects	•	•
4.	Perceptual illusions (visual or physiological) and spatial disorientation, effects of G-loads	•	•
5.	Stress, startle and surprise effect	•	•
6.	Intuitive and counter-intuitive behaviour	•	•

**GM1 to Appendix 3; Appendix 5**

**BASIC UPRT EXERCISES**

(a) GENERAL

The training objective of the basic UPRT exercises is for the student to achieve competence in applying prevention and recovery techniques. In order to meet the training objectives, some UPRT exercises will involve operation at altitudes, speeds and g-loadings that are not required for other parts of the training course. When designing training courses, ATOs should ensure that the aircraft used for these exercises will allow the training objectives to be achieved while maintaining a margin of safety to aircraft limitations in accordance with the training envelope, as determined by the ATO (see GM1 ORA.ATO.125 point (f)).

(b) UPRT WITH REFERENCE TO INSTRUMENTS

Basic UPRT exercises completed by reference to instruments (i.e. in simulated instrument meteorological conditions (IMC)) should involve only moderate excursions from the speeds and attitudes used in normal instrument flight. Exercises conducted in IMC should not be planned to involve 'unusual attitudes'.

(c) INSTRUCTORS DELIVERING BASIC UPRT

Instructors conducting basic UPRT training during the CPL or ATP course do not require any additional qualifications. It is the responsibility of the ATO to ensure that instructors are competent to deliver effective training on all parts of the course and also that they are competent to recover the aircraft in the event that a student erroneously conducts any UPRT exercise.

(d) APPLICATION OF OEM RECOMMENDATIONS DURING DEVELOPING UPSETS



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Stall recovery training exercises as well as nose-high and nose-low prevention training exercises use the recovery strategies recommended by the OEMs contained in Tables 1, 2 and 3 below.

Note: As OEM procedures always take precedence over the general strategies as recommended by the OEMs, ATOs should consult the OEM on whether any approved specific procedures are available prior to using the templates.

Refer to revision 3 of the Airplane Upset Prevention and Recovery Training Aid (AUPRTA) for a detailed explanation and rationale of nose-high and nose-low recovery strategies as recommended by the OEMs.

**Table 1: Stall event recovery template**

<b>Pilot Flying (PF)</b>	
Immediately do the following at first indication of a stall (aerodynamic buffeting, reduced roll stability and aileron effectiveness, visual or aural cues and warnings, reduced elevator (pitch) authority, inability to maintain altitude or arrest rate of descent, stick shaker activation (if installed)) during any flight phases except at lift-off.	
1.	<b>AUTOPILOT — DISCONNECT (IF APPLICABLE)</b> (A large out-of-trim condition could be encountered when the autopilot is disconnected)
2.	<b>AUTOTHROTTLE — OFF (IF APPLICABLE)</b>
3.	<b>(a) NOSE-DOWN PITCH CONTROL</b> apply until stall warning is eliminated <b>(b) NOSE-DOWN PITCH TRIM</b> (as needed) (Reduce the AoA whilst accepting the resulting altitude loss.)
4.	<b>BANK — WINGS LEVEL</b>
5.	<b>POWER — ADJUST</b> (as needed) (Thrust reduction for aeroplanes with underwing-mounted engines may be needed)
6.	<b>SPEEDBRAKES/SPOILERS — RETRACT</b>
7.	When airspeed is sufficiently increasing — <b>RECOVER</b> to level flight (Avoid the secondary

**Table 2: Nose-high recovery strategy template**

Recognise and confirm the developing situation by announcing ‘nose high’	
<b>Pilot Flying (PF)</b>	
1.	<b>AUTOPILOT — DISCONNECT (if applicable)</b> (A large out-of-trim condition could be encountered when the autopilot is disconnected)
2.	<b>AUTOTHROTTLE — OFF</b> (if applicable)

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3.	<b>APPLY</b> as much nose-down control input as required to obtain a nose-down pitch rate	
4.	<b>POWER — ADJUST</b> (if required)	
5.	<b>ROLL — ADJUST</b> (if required) (Avoid exceeding 60-degree bank)	
6.	When airspeed is sufficiently increasing — <b>RECOVER</b> to level flight (Avoid the secondary stall due to premature recovery or excessive G-loading)	

**NOTE:**

- (1) Recovery to level flight may require use of pitch trim.
- (2) **WARNING:** Excessive use of pitch trim or rudder may aggravate the upset situation or may result in high structural loads.

**Table 3: Nose-low recovery strategy template**

Recognise and confirm the developing situation by announcing '**nose low**'  
(If the autopilot or autothrottle is responding correctly, it may not be appropriate to decrease the level of automation while assessing if the divergence is being stopped)

**Pilot Flying (PF)**

1.	<b>AUTOPILOT — DISCONNECT</b> (if applicable) (A large out-of-trim condition could be encountered when the autopilot is disconnected)	
2.	<b>AUTOTHROTTLE — OFF</b> (if applicable)	
3.	<b>RECOVERY</b> from stall (if required)	
4.	<b>ROLL</b> in the shortest direction to wings level (It may be necessary to reduce the G-loading by applying forward control pressure to improve roll effectiveness)	
5.	<b>POWER</b> and <b>DRAG — ADJUST</b> (if required)	
6.	<b>RECOVER</b> to level flight (Avoid the secondary stall due to premature recovery or excessive G-loading)	

**NOTE:**

- (1) Recovery to level flight may require use of pitch trim.
- (2) **WARNING:** Excessive use of pitch trim or rudder may aggravate the upset situation or may result in high structural loads.

**ADDITIONAL GUIDANCE**

- (e) Specific guidance on UPRT is available in the latest revision of ICAO Doc 10011 'Manual on Aeroplane Upset Prevention and Recovery Training'.

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**GM1 to Appendix 3; Appendix 6; FCL.735.H**

**OVERVIEW OF FSTD TRAINING CREDITS FOR DUAL INSTRUCTION IN HELICOPTER FLYING TRAINING COURSES**

		ATPL(H)/IR integrated			FSTD credits
	Dual	Solo	SPIC	Total	FFS; FTD; FNPT
Visual, including ME T/R training	75 hrs	15 hrs	40 hrs	130 hrs	30 hrs FFS C/D level or 25 hrs FTD 2, 3 or 20 hrs FNPT II/III
Basic instrument	10 hrs	-	-	10 hrs	20 hrs FFS or FTD 2, 3 or FNPT II/III or 10 hrs in at least an FNPT I
Instrument rating training	40 hrs	-		40 hrs	
MCC	15 hrs	-	-	15 hrs	15 hrs FFS or FTD 2, 3 (MCC) or FNPT II/III (MCC)
Total	140 hrs	55 hrs		195 hrs	Note 2

		ATPL(H)/VFR integrated			
	Dual	Solo	SPIC	Total	FFS; FTD; FNPT
Visual including ME T/R training	75 hrs	15 hrs	40 hrs	130 hrs	30 hrs FFS C/D level or 25 hrs FTD 2, 3 or 20 hrs FNPT II/III
Basic instrument	10 hrs	-	-	10 hrs	5 hrs in at least an FNPT I
MCC / VFR	10 hrs	-	-	10 hrs	10 hrs FFS or FTD 2, 3 (MCC) or FNPT II/III (MCC)
Total	95 hrs	55 hrs		150 hrs	Note 2

		CPL(H)/IR integrated			
	Dual	Solo	SPIC	Total	FFS; FTD; FNPT
Visual including ME T/R training	75 hrs	15 hrs	40hrs	130 hrs	30 hrs FFS C/D level or 25 hrs FTD 2, 3 or 20 hrs FNPT II/III
Basic instrument	10 hrs	-	-	10 hrs	20 hrs FFS or FTD 2, 3 or FNPT II/III or

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Instrument rating training	40 hrs	-		40 hrs	10 hrs in at least an FNPT I
Total	125 hrs	55 hrs		180 hrs	Note 2

		CPL(H) Integrated			
	Dual	Solo	SPIC	Total	FFS; FTD; FNPT
Visual	75 hrs	15 hrs	35 hrs	125 hrs	30 hrs FFS C/D level or 25 hrs FTD 2, 3 or 20 hrs FNPT II/III
Basic instrument	10 hrs	-	-	10 hrs	5 hrs in at least an FNPT I
Total	85 hrs	50 hrs		135 hrs	Note 2

		CPL(H) modular			
	Dual	Solo	SPIC	Total	FFS; FTD; FNPT
Visual	20 hrs	-	-	20 hrs	5 hrs FFS or FTD 2, 3 or FNPT II/III
Basic instrument	10 hrs	-	-	10 hrs	5 hrs in at least an FNPT I
Total	30 hrs	-	-	30 hrs	Note 2

		IR(H) modular			
	Dual	Solo	SPIC	Total	FFS; FTD; FNPT
SE	50 hrs	-	-	50 hrs	35 hrs FFS or FTD 2, 3 or FNPT II/III or 20 hrs FNPT I (H) or (A)
ME	55 hrs	-	-	55 hrs	40 hrs FFS; FTD 2, 3 FNPT II/III or 20 hrs FNPT I (H) or (A)

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		MCC(H)			
	Dual	Solo	SPIC	Total	FFS; FTD; FNPT
MCC / IR	20 hrs	-	-	20 hrs	20 hrs FFS or FTD 2, 3 (MCC) or FNPT II/III (MCC)
MCC / VFR	15 hrs	-	-	15 hrs	15 hrs FFS or FTD 2, 3 (MCC) or FNPT II/III (MCC)
MCC / IR for MCC/VFR holders	5 hrs	-	-	5 hrs	5 hrs FFS or FTD 2, 3 (MCC) or FNPT II/III (MCC)

Note 1: In this matrix, FSTD credits refer to helicopter FSTDs, if not mentioned otherwise.

Note 2: Total credits for the FSTDs used in the course are not provided in the tables as the FSTDs may be used in various combinations. The FSTD credits provided in the tables for the separate phases of the course are the maximum FSTD credits available for each phase.

**GM1 to Appendix 3 Example of a grading system for practical flight training during ATP, CPL and MPL courses grading system**

An ATPL/CPL/MPL grading system may be developed by using the grading system in GM3 FCL.735.A.

## **Appendix 4 – Skill test for the issue of a CPL**

### **A. General**

1. An applicant for a skill test for the CPL shall have received instruction on the same class or type of aircraft to be used in the test.
2. An applicant shall pass all the relevant sections of the skill test. If any item in a section is failed, that section is failed. Failure in more than one section will require the applicant to take the entire test again. An applicant failing only in one section shall only repeat the failed section. Failure in any section of the retest, including those sections that have been passed on a previous attempt, will require the applicant to take the entire test again. All relevant sections of the skill test shall be completed within 6 months. Failure to achieve a pass in all relevant sections of the test in two attempts will require further training.
3. Further training may be required following any failed skill test. There is no limit to the number of skill tests that may be attempted.

### **CONDUCT OF THE TEST**

4. Should the applicant choose to terminate a skill test for reasons considered inadequate by the Flight Examiner (FE), the applicant shall retake the entire skill test. If the test is terminated for reasons considered adequate by the FE, only those sections not completed shall be tested in a further flight.
5. At the discretion of the FE, any manoeuvre or procedure of the test may be repeated once by the applicant. The FE may stop the test at any stage if it is considered that the applicant's demonstration of flying skills requires a complete re-test.
6. An applicant shall be required to fly the aircraft from a position where the PIC functions can be performed and to carry out the test as if no other crew member is present. Responsibility for the flight shall be allocated in accordance with national regulations.
7. An applicant shall indicate to the FE the checks and duties carried out, including the identification of radio facilities. Checks shall be completed in accordance with the checklist for the aircraft on which the test is being taken. During pre-flight preparation for the test, the applicant is required to determine power settings and speeds. Performance data for take-off, approach and landing shall be calculated by the applicant in compliance with the operations manual or flight manual for the aircraft used.

8. The FE shall take no part in the operation of the aircraft except where intervention is necessary in the interests of safety or to avoid unacceptable delay to other traffic.

**B. Content of the skill test for the issue of a CPL – Aeroplanes**

1. The aeroplane used for the skill test shall meet the requirements for training aeroplanes, and shall be certificated for the carriage of at least four persons, have a variable pitch propeller and retractable landing gear.
2. The route to be flown shall be chosen by the FE and the destination shall be a controlled aerodrome. The applicant shall be responsible for the flight planning and shall ensure that all equipment and documentation for the execution of the flight are on board. The duration of the flight shall be at least 90 minutes.
3. The applicant shall demonstrate the ability to:
  - (a) operate the aeroplane within its limitations,
  - (b) complete all manoeuvres with smoothness and accuracy,
  - (c) exercise good judgement and airmanship;
  - (d) apply aeronautical knowledge; and
  - (e) maintain control of the aeroplane at all times in such a manner that the successful outcome of a procedure or manoeuvre is never seriously in doubt.

**FLIGHT TEST TOLERANCES**

4. The following limits shall apply, corrected to make allowance for turbulent conditions and the handling qualities and performance of the aeroplane used.

—	Height	
—	normal flight	±100 feet
—	with simulated engine failure	±150 feet
—	Tracking on radio aids	±5°
—	Heading	
—	normal flight	±10°
—	with simulated engine failure	±15°

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—	Speed	
—	take-off and approach	±5 knots
—	all other flight regimes	±10 knots

**CONTENT OF THE TEST**

5. Items in Section 2(c) and (e)(iv), Section 3(g), and the whole of Sections 5 and 6 may be performed in an FNPT II or an FFS. The examiner may decide not to perform items in Section 6(d).

Use of the aeroplane checklists, airmanship, control of the aeroplane by external visual reference, anti-icing/de-icing procedures and principles of threat and error management apply in all sections.

**SECTION 1 — PRE-FLIGHT OPERATIONS AND DEPARTURE**

- |   |   |
|---|---|
| a | Pre-flight, including:<br>Flight planning, Documentation, Mass and balance determination, Weather brief, NOTAMS |
| b | Aeroplane inspection and servicing  |
| c | Taxiing and take-off  |
| d | Performance considerations and trim   |
| e | Aerodrome and traffic pattern operations  |
| f | Departure procedure, altimeter setting, collision avoidance (lookout)   |
| g | ATC liaison – compliance, R/T procedures  |

**SECTION 2 GENERAL AIRWORK**

- |   |   |
|---|---|
| a | Control of the aeroplane by external visual reference, including straight and level, climb, descent, lookout  |
| b | Flight at critically low airspeeds including recognition of and recovery from incipient and full stalls   |
| c | Turns, including turns in landing configuration. Steep turns 45°  |
| d | Flight at critically high airspeeds, including recognition of and recovery from spiral dives  |
| e | Flight by reference solely to instruments, including:<br>(i) level flight, cruise configuration, control of heading, altitude and airspeed<br>(ii) climbing and descending turns with 10°–30° bank<br>(iii) recoveries from unusual attitudes<br>(iv) limited panel instruments |
| f | ATC liaison – compliance, R/T procedures  |

**SECTION 3 — EN-ROUTE PROCEDURES**

- |   |   |
|---|---|
| a | Control of aeroplane by external visual reference, including cruise configuration<br>Range/Endurance considerations |
| b | Orientation, map reading  |



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c	Altitude, speed, heading control, lookout
d	Altimeter setting. ATC liaison – compliance, R/T procedures
e	Monitoring of flight progress, flight log, fuel usage, assessment of track error and re-establishment of correct tracking
f	Observation of weather conditions, assessment of trends, diversion planning
g	Tracking, positioning (NDB, VOR, or track between waypoints), identification of facilities (instrument flight).
h	Implementation of diversion plan to alternate aerodrome (visual flight)

**SECTION 4 — APPROACH AND LANDING PROCEDURES**

a	Arrival procedures, altimeter setting, checks, lookout
b	ATC liaison - compliance, R/T procedures
c	Go-around action from low height
d	Normal landing, crosswind landing (if suitable conditions)
e	Short field landing
f	Approach and landing with idle power (single-engine only)
g	Landing without use of flaps
h	Post flight actions

**SECTION 5 — ABNORMAL AND EMERGENCY PROCEDURES**

This section may be combined with sections 1 through 4

a	Simulated engine failure after take-off (at a safe altitude), fire drill
b	Equipment malfunctions including alternative landing gear extension, electrical and brake failure
c	Forced landing (simulated)
d	ATC liaison - compliance, R/T procedures
e	Oral questions

**SECTION 6 — SIMULATED ASYMMETRIC FLIGHT AND RELEVANT CLASS OR TYPE ITEMS**

This section may be combined with sections 1 through 5

a	Simulated engine failure during take-off (at a safe altitude unless carried out in an FFS)
b	Asymmetric approach and go-around
c	Asymmetric approach and full stop landing
d	Engine shut-down and restart (if selected by the examiner)
e	ATC liaison – compliance, R/T procedures, Airmanship
f	As determined by the FE — any relevant items of the class or type rating skill test to include, if applicable: (i) aeroplane systems including handling of autopilot (ii) operation of pressurisation system (iii) use of de-icing and anti-icing system
g	Oral questions

**C. Content of the skill test for the issue of the CPL – Helicopters**

1. The helicopter used for the skill test shall meet the requirements for training helicopters.
2. The area and route to be flown shall be chosen by the FE and all low level and hover work shall be at an approved aerodrome/site. Routes used for section 3 may end at the aerodrome of departure or at another aerodrome and one destination shall be a controlled aerodrome. The skill test may be conducted in 2 flights. The total duration of the flight(s) shall be at least 90 minutes.
3. The applicant shall demonstrate the ability to:
  - (a) operate the helicopter within its limitations;
  - (b) complete all manoeuvres with smoothness and accuracy;
  - (c) exercise good judgement and airmanship;
  - (d) apply aeronautical knowledge; and
  - (e) maintain control of the helicopter at all times in such a manner that the successful outcome of a procedure or manoeuvre is never seriously in doubt.

**FLIGHT TEST TOLERANCES**

4. The following limits shall apply, corrected to make allowance for turbulent conditions and the handling qualities and performance of the helicopter used.

—	Height	
—	normal flight	±100 feet
—	simulated major emergency	±150 feet
—	Tracking on radio aids	±10°
—	Heading	
—	normal flight	±10°
—	simulated major emergency	±15°
—	Speed	

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—	take-off and approach multi-engine	±5 knots
—	all other flight regimes	±10 knots
—	Ground drift	
—	T.O. hover I.G.E.	±3 feet
—	landing no sideways or backwards movement	

**CONTENT OF THE TEST**

5. Items in section 4 may be performed in a helicopter FNPT or a helicopter FFS. Use of helicopter checklists, airmanship, control of helicopter by external visual reference, anti-icing procedures, and principles of threat and error management apply in all sections.

**SECTION 1 — PRE-FLIGHT/POST-FLIGHT CHECKS AND PROCEDURES**

- |   |   |
|---|---|
| a | Helicopter knowledge (e.g. technical log, fuel, mass and balance, performance), flight planning, documentation, NOTAMS, weather |
| b | Pre-flight inspection/action, location of parts and purpose   |
| c | Cockpit inspection, starting procedure  |
| d | Communication and navigation equipment checks, selecting and setting frequencies  |
| e | Pre-take-off procedure, R/T procedure, ATC liaison-compliance   |
| f | Parking, shutdown and post-flight procedure   |

**SECTION 2 — Hover manoeuvres, advanced handling and confined areas**

- |   |   |
|---|---|
| a | Take-off and landing (lift-off and touchdown)   |
| b | Taxi, hover taxi  |
| c | Stationary hover with head/cross/tail wind  |
| d | Stationary hover turns, 360° left and right (spot turns)                              |
| e | Forward, sideways and backwards hover manoeuvring                                     |
| f | Simulated engine failure from the hover   |
| g | Quick stops into and downwind   |
| h | Sloping ground/unprepared sites landings and take-offs                                |
| i | Take-offs (various profiles)  |
| j | Crosswind, downwind take-off (if practicable)   |
| k | Take-off at maximum take-off mass (actual or simulated)                               |
| l | Approaches (various profiles)   |
| m | Limited power take-off and landing  |
| n | Autorotations (FE to select two items from — Basic, range, low speed, and 360° turns) |
| o | Autorotative landing  |
| p | Practice forced landing with power recovery   |

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q Power checks, reconnaissance technique, approach and departure technique

**SECTION 3 — NAVIGATION — EN-ROUTE PROCEDURES**

a Navigation and orientation at various altitudes/heights, map reading

b Altitude/height, speed, heading control, observation of airspace, altimeter setting

c Monitoring of flight progress, flight log, fuel usage, endurance, ETA, assessment of track error and re-establishment of correct track, instrument monitoring

d Observation of weather conditions, diversion planning

e Tracking, positioning (NDB and/or VOR), identification of facilities

f ATC liaison and observance of regulations, etc.

**SECTION 4 — FLIGHT PROCEDURES AND MANOEUVRES BY SOLE REFERENCE TO INSTRUMENTS**

a Level flight, control of heading, altitude/height and speed

b Rate 1 level turns onto specified headings, 180° to 360° left and right

c Climbing and descending, including turns at rate 1 onto specified headings

d Recovery from unusual attitudes

e Turns with 30° bank, turning up to 90° left and right

**SECTION 5 — Abnormal and Emergency procedures  
(simulated where appropriate)**

Note (1): Where the test is conducted on a multi-engine helicopter a simulated engine failure drill, including a single-engine approach and landing, shall be included in the test.

Note (2): The FE shall select 4 items from the following:

a Engine malfunctions, including governor failure, carburettor/engine icing, oil system, as appropriate

b Fuel system malfunction

c Electrical system malfunction

d Hydraulic system malfunction, including approach and landing without hydraulics, as applicable

e Main rotor and/or anti-torque system malfunction (FFS or discussion only)

f Fire drills, including smoke control and removal, as applicable

g Other abnormal and emergency procedures as outlined in appropriate flight manual, including for multi-engine helicopters:  
     Simulated engine failure at take-off:  
         rejected take-off at or before TDP or safe forced landing at or before DPATO, shortly after TDP or DPATO.  
     Landing with simulated engine failure:  
         landing or go-around following engine failure before LDP or DPBL,  
         following engine failure after LDP or safe forced landing after DPBL.

**D. Content of the skill test for the issue of a CPL — Airships**

1. The airship used for the skill test shall meet the requirements for training airships.
2. The area and route to be flown shall be chosen by the FE. Routes used for section 3 may end at the aerodrome of departure or at another aerodrome and one destination shall be a controlled aerodrome. The skill test may be conducted in 2 flights. The total duration of the flight(s) shall be at least 60 minutes.
3. The applicant shall demonstrate the ability to:
  - (a) operate the airship within its limitations;
  - (b) complete all manoeuvres with smoothness and accuracy;
  - (c) exercise good judgement and airmanship;
  - (d) apply aeronautical knowledge; and
  - (e) maintain control of the airship at all times in such a manner that the successful outcome of a procedure or manoeuvre is never seriously in doubt.

**FLIGHT TEST TOLERANCES**

4. The following limits shall apply, corrected to make allowance for turbulent conditions and the handling qualities and performance of the airship used.

—	Height	
—	normal flight	±100 feet
—	simulated major emergency	±150 feet
—	Tracking on radio aids	±10°
—	Heading	
—	normal flight	±10°
—	simulated major emergency	±15°

**CONTENT OF THE TEST**

5. Items in sections 5 and 6 may be performed in an Airship FNPT or an airship FFS. Use of airship checklists, airmanship, control of airship by external visual

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reference, anti-icing procedures, and principles of threat and error management apply in all sections.

**SECTION 1 — PRE-FLIGHT OPERATIONS AND DEPARTURE**

- |   |   |
|---|---|
| a | Pre-flight, including:<br>Flight planning, Documentation, Mass and Balance determination, Weather brief, NOTAMS |
| b | Airship inspection and servicing  |
| c | Off-mast procedure, ground manoeuvring and take-off   |
| d | Performance considerations and trim   |
| e | Aerodrome and traffic pattern operations  |
| f | Departure procedure, altimeter setting, collision avoidance (lookout)   |
| g | ATC liaison – compliance, R/T procedures  |

**SECTION 2 — GENERAL AIRWORK**

- |   |   |
|---|---|
| a | Control of the airship by external visual reference, including straight and level, climb, descent, lookout  |
| b | Flight at pressure height   |
| c | Turns   |
| d | Steep descents and climbs   |
| e | Flight by reference solely to instruments, including:<br>(i) level flight, control of heading, altitude and airspeed<br>(ii) climbing and descending turns<br>(iii) recoveries from unusual attitudes<br>(iv) limited panel instruments |
| f | ATC liaison – compliance, R/T procedures  |

**SECTION 3 — EN-ROUTE PROCEDURES**

- |   |   |
|---|---|
| a | Control of airship by external visual reference, Range/Endurance considerations   |
| b | Orientation, map reading  |
| c | Altitude, speed, heading control, lookout   |
| d | Altimeter setting, ATC liaison – compliance, R/T procedures   |
| e | Monitoring of flight progress, flight log, fuel usage, assessment of track error and re-establishment of correct tracking                                     |
| f | Observation of weather conditions, assessment of trends, diversion planning   |
| g | Tracking, positioning (NDB or VOR), identification of facilities (instrument flight). Implementation of diversion plan to alternate aerodrome (visual flight) |

**SECTION 4 — APPROACH AND LANDING PROCEDURES**

- |   |   |
|---|---|
| a | Arrival procedures, altimeter setting, checks, lookout    |
| b | ATC liaison – compliance, R/T procedures                  |
| c | Go-around action from low height                          |
| d | Normal landing  |
| e | Short field landing                                       |
| f | Approach and landing with idle power (single-engine only) |

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g	Landing without use of flaps
h	Post-flight actions
<b>SECTION 5 — ABNORMAL AND EMERGENCY PROCEDURES</b>	
This section may be combined with sections 1 through 4	
a	Simulated engine failure after take-off (at a safe altitude), fire drill
b	Equipment malfunctions
c	Forced landing (simulated)
d	ATC liaison – compliance, R/T procedures
e	Oral questions
<b>SECTION 6 — RELEVANT CLASS OR TYPE ITEMS</b>	
This section may be combined with sections 1 through 5	
a	Simulated engine failure during take-off (at a safe altitude unless carried out in an FFS)
b	Approach and go-around with failed engine(s)
c	Approach and full stop landing with failed engine(s)
d	Malfunctions in the envelope pressure system
e	ATC liaison – compliance, R/T procedures, Airmanship
f	As determined by the FE – any relevant items of the class or type rating skill test to include, if applicable: (i) airship systems (ii) operation of envelope pressure system
g	Oral questions

## **Appendix 5 – Integrated MPL training course**

### **GENERAL**

1. The aim of the MPL integrated course is to train pilots to the level of proficiency necessary to enable them to operate as co-pilot of a multi-engine multi-pilot turbine-powered air transport aeroplane under VFR and IFR and to obtain an MPL.
2. Approval for an MPL training course shall only be given to an ATO that is part of a commercial air transport operator certificated in accordance with Part-ORO or having a specific arrangement with such an operator.
3. An applicant wishing to undertake an MPL integrated course shall complete all the instructional stages in one continuous course of training at an ATO. The training shall be competency based and conducted in a multi-crew operational environment.
4. Only ab-initio applicants shall be admitted to the course.
5. The course shall comprise:
  - (a) theoretical knowledge instruction to the ATPL(A) knowledge level;
  - (b) visual and instrument flying training;
  - (c) training in MCC for the operation of multi-pilot aeroplanes; and
  - (d) type rating training.
6. An applicant failing or unable to complete the entire MPL course may apply to the Authority for the theoretical knowledge examination and skill test for a licence with lower privileges and an IR, if the applicable requirements are met.

### **THEORETICAL KNOWLEDGE**

7. An approved MPL theoretical knowledge course shall comprise at least 750 hours of instruction for the ATPL(A) knowledge level, as well as the hours required for:
  - (a) theoretical knowledge instruction for the relevant type rating, in accordance with Subpart H; and
  - (b) UPRT theoretical knowledge instruction in accordance with FCL.745.A.

### **FLYING TRAINING**



8. The flying training shall comprise a total of at least 240 hours, composed of hours as PF and PM, in actual and simulated flight, and covering the following four phases of training:
- (a) Phase 1 — Core flying skills  
Specific basic single-pilot training in an aeroplane
  - (b) Phase 2 — Basic  
Introduction of multi-crew operations and instrument flight
  - (c) Phase 3 — Intermediate  
Application of multi-crew operations to a multi-engine turbine aeroplane certified as a high-performance aeroplane in accordance with MCAR-Part-21
  - (d) Phase 4 — Advanced  
Type rating training within an airline-oriented environment.
- MCC requirements shall be incorporated into the relevant phases above.
- Training in asymmetric flight shall be given either in an aeroplane or an FFS.
- 8a. Flight experience in actual flight shall include:
- (a) all the experience requirements of Subpart H;
  - (b) UPRT flight instruction in accordance with FCL.745.A;
  - (c) aeroplane UPRT exercises related to the specificities of the relevant type in accordance with FCL.725.A(c);
  - (d) night flying;
  - (e) flight solely by reference to instruments; and
  - (f) the experience required to achieve the relevant airmanship.
9. Each phase of training in the flight instruction syllabus shall be composed of both instruction in the underpinning knowledge and in practical training segments.

10. The training course shall include a continuous evaluation process of the training syllabus and a continuous assessment of the students following the syllabus. Evaluation shall ensure that:
- (a) the competencies and related assessment are relevant to the task of a co-pilot of a multi-pilot aeroplane; and
  - (b) the students acquire the necessary competencies in a progressive and satisfactory manner.
11. The training course shall include at least 12 take-offs and landings to ensure competency. Those take-offs and landings may be reduced to at least six, provided that prior to delivering the training, the ATO and the operator ensure that:
- (a) a procedure is in place to assess the required level of competency of the student pilot; and
  - (b) a process is in place to ensure that corrective action is taken if in-training evaluation indicates the need to do so.

Those take-offs and landings shall be performed under the supervision of an instructor in an aeroplane for which the type rating shall be issued.

### **ASSESSMENT LEVEL**

12. The applicant for the MPL shall have demonstrated performance in all 9 competency units specified in paragraph 13 below, at the advanced level of competency required to operate and interact as a co-pilot in a turbine-powered multi-pilot aeroplane, under visual and instrument conditions. Assessment shall confirm that control of the aeroplane or situation is maintained at all times, to ensure the successful outcome of a procedure or manoeuvre. The applicant shall consistently demonstrate the knowledge, skills and attitudes required for the safe operation of the applicable aeroplane type, in accordance with the MPL performance criteria.

### **COMPETENCY UNITS**

13. The applicant shall demonstrate competency in the following 9 competency units:
- (1) apply human performance principles, including principles of threat and error management;
  - (2) perform aeroplane ground operations;
  - (3) perform take-off;

- (4) perform climb;
- (5) perform cruise;
- (6) perform descent;
- (7) perform approach;
- (8) perform landing; and
- (9) perform after landing and aeroplane post-flight operations.

#### **SIMULATED FLIGHT**

##### **14. Minimum requirements for FSTDs:**

###### **(a) Phase 1 — Core flying skills**

E-training and part tasking devices approved by the Authority that have the following characteristics:

- involve accessories beyond those normally associated with desktop computers, such as functional replicas of a throttle quadrant, a side-stick controller, or an FMS keypad; and
- involve psychomotor activity with appropriate application of force and timing of responses.

###### **(b) Phase 2 — Basic**

An FNPT II MCC that represents a generic multi-engine turbine-powered aeroplane.

###### **(c) Phase 3 — Intermediate**

An FSTD that represents a multi-engine turbine-powered aeroplane required to be operated with a co-pilot and qualified to an equivalent standard to level B, additionally including:

- a daylight/twilight/night visual system continuous cross-cockpit minimum collimated visual field of view providing each pilot with 180° horizontal and 40° vertical field of view, and
- ATC environment simulation.

###### **(d) Phase 4 — Advanced**

An FFS which is fully equivalent to level D or level C with an enhanced daylight visual system, including ATC environment simulation.

## **GM1 to Appendix 5 Integrated MPL training course**

### **GENERAL**

- (a) In broad terms, the MPL holder is expected to be able to complete the airline operators' conversion course with a high probability of success and within the time frame normally allowed for this phase. The standard is equivalent to what is currently expected from graduates of the ATP(A) integrated course who have completed type rating training.
- (b) The general approach is to use the existing ATP(A) integrated training course as a reference and to implement progressively the MPL integrated training course and specifically the transfer from actual flight to simulated flight.
- (c) This transfer should be organised in a way that is similar to the approach used for ETOPS. Successive evolutions of the training syllabus introduce progressively a higher level of simulated flight and a reduction of actual flight. Change from one version to the next should only take place after enough experience has been gained and once its results, including those of airline operator conversion courses, have been analysed and taken into account.

### **MPL TRAINING SCHEME**

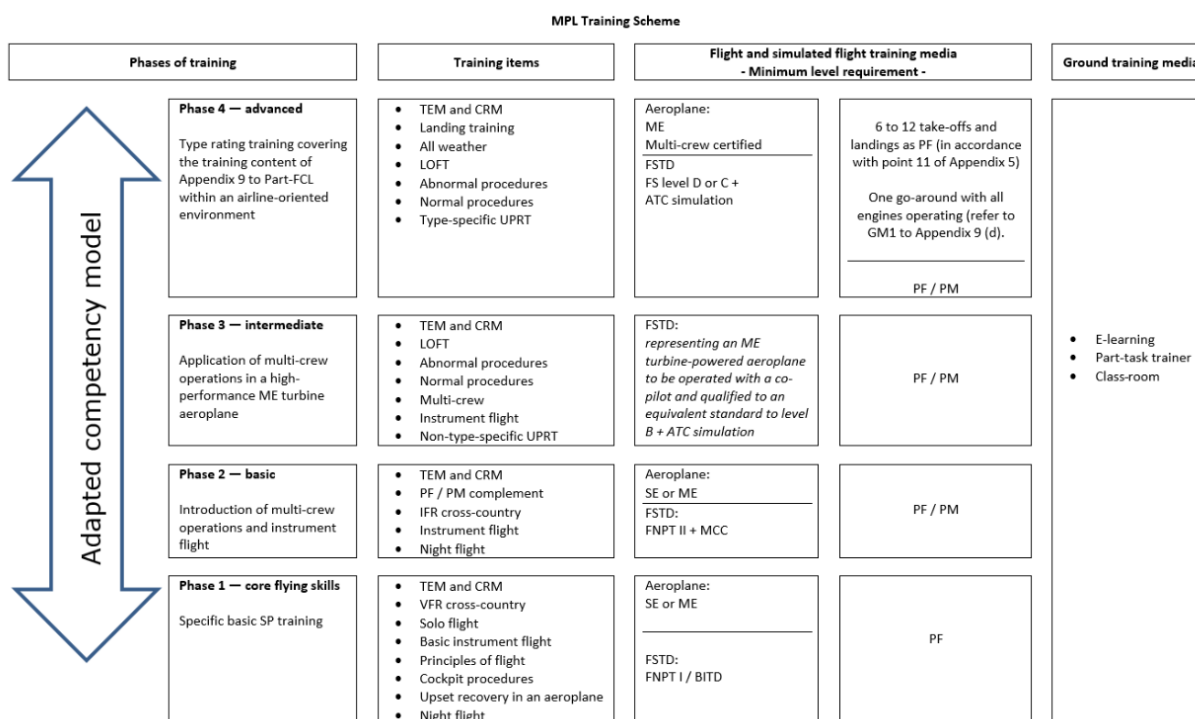
- (d) The specific arrangement, pursuant to ORA.GEN.205, between an approved training organisation (ATO) and an operator for the multi-pilot licence (MPL) training should cover at least the following points:
  - (1) pre-entry requirements (including screening and selection);
  - (2) provision of the relevant documentation (operations manuals (OMs) and training manuals);
  - (3) design of the training programme;
  - (4) content of the operator conversion course;
  - (5) training effectiveness (e.g. continuous monitoring system, progress checks, etc.);
  - (6) provision of base training;

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- (7) graduate performance data feedback from the operator to the ATO;
- (8) course evaluation and improvement; and
- (9) alignment of the grading and assessment criteria.

The ATO and operator may use their OMs and training manuals to identify additional areas to be covered by the specific arrangement.

The following scheme should be applied:



### THEORETICAL KNOWLEDGE INSTRUCTION

- (e) The 750 hours of instruction, which also cover the Area 100 KSA, may include in suitable proportions:
  - (1) classroom work;
  - (2) lessons;
  - (3) tutorials;
  - (4) demonstrations, including those supported by demonstration equipment;

- (5) exercises carried out as groups or individuals and based on pre-flight and en-route planning, communications, presentations and projects;
- (6) exercises that use demonstration equipment or training devices;
- (7) directed study including workbook exercises or assignments;
- (8) aerodrome or aviation industry field trips;
- (9) computer-based training and e-learning elements;
- (10) progress tests, Area 100 KSA assessments and mental maths test(s); and
- (11) other training methods, media and tools approved by the Authority.

**COMPETENCY UNITS, COMPETENCY ELEMENTS AND PERFORMANCE CRITERIA**

- (f) Apply human performance principles, including principles of threat and error management:
  - (1) cooperation;
  - (2) leadership and managerial skills;
  - (3) situation awareness;
  - (4) decision making.

These behaviour categories are intended to help in the effective utilisation of all available resources to achieve safe and efficient operations.

These behaviour categories may be adapted and extended to incorporate issues like communication and use of automation if it is considered to be relevant to the development of the curriculum.

- (g) Perform Aircraft Ground and Pre-Flight Operations

List of competency elements and performance criteria:

- (1) demonstrate attitudes and behaviours appropriate to the safe conduct of flight, including recognising and managing potential threats and errors;

Duty Observation and assessment

Satisfactory (S)

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- |   |                    |
|---|--------------------|
|   | Unsatisfactory (U) |
| (2) perform dispatch duties:  | (S) or (U)         |
| (i) verifies technical condition of the a/c, including adequate use of MEL;   | PF/PNF             |
| (ii) checks technical bulletins and notices;                                  | PF/PNF             |
| (iii) determines operational environment and pertinent weather;               | PF/PNF             |
| (iv) determines impact of weather on aircraft performance;                    | PF/PNF             |
| (v) applies flight planning and load procedures;                              | PF/PNF             |
| (vi) determines fuel requirement;   | PF/PNF             |
| (vii) files an ATS flight plan (if required)                                  | PF/PNF             |
| (3) provide flight crew and cabin crew briefings;                             | (S) or (U)         |
| (i) briefed flight crew in all relevant matters;                              | PF                 |
| (ii) briefed cabin crew in all relevant matters.                              | PF                 |
| (4) perform pre-flight checks and cockpit preparation:                        | (S) or (U)         |
| (i) ensures the airworthiness of the aircraft;                                | PF                 |
| (ii) performs the cockpit preparation and briefings;                          | PF/PNF             |
| (iii) performs FMS initialisation, data insertion and confirmation;           | PF/PNF             |
| (iv) optimises and checks take-off performance and take-off data calculation. | PF/PNF             |
| (5) perform engine start:   | (S) or (U)         |
| (i) asks for, receives acknowledges and checks ATC clearance;                 | PNF                |

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- (ii) performs engine start procedure; PF/PNF
  - (iii) uses standard communication procedures with ground crew and ATC. PF/PNF
- (6) perform taxi out: (S) or (U)
  - (i) receives, checks and adheres to taxi clearance; PNF
  - (ii) taxis the aircraft, including use of exterior lighting; PF
  - (iii) complies to taxi clearance; PF/PNF
  - (iv) maintains look-out for conflicting traffic and obstacles; PF/PNF
  - (v) operates thrust, brakes and steering; PF
  - (vi) conducts relevant briefings; PF
  - (vii) uses standard communication procedures with crew and ATC; PNF
  - (viii) completes standard operating procedures and checklists; PF/PNF
  - (ix) updates and confirms FMS data; PF/PNF
  - (x) manages changes in performance and departure route; PF/PNF
  - (xi) completes de or anti-ice procedures. PF/PNF
- (7) manage abnormal and emergency situations: (S) or (U)
  - (i) identifies the abnormal condition; PF/PNF
  - (ii) interprets the abnormal condition; PF/PNF
  - (iii) performs the procedure for the abnormal condition. PF/PNF
- (8) communicate with cabin crew, passengers and company: (S) or (U)
  - (i) communicates relevant information with cabin crew; PF
  - (ii) communicates relevant information with company; PF/PNF



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(iii) makes passenger announcements when appropriate. PF/PNF

(h) Perform take-off

List of competency elements and performance criteria:

(1) demonstrate attitudes and behaviours appropriate to the safe conduct of including recognising flight, and managing potential

(2) perform pre threats and errors. -take-off and predeparture preparation:  
(S) or (U)

(i) checks and acknowledges line up clearance; PF/PNF

(ii) checks correct runway selection; PF/PNF

(iii) confirms validity of performance data; PF/PNF

(iv) checks approach sector and runway are clear; PF/PNF

(v) confirms all checklists and take-off preparations completed; PF/PNF

(vi) lines up the aircraft on centreline without losing distance; PF

(vii) checks weather on departure sector; PF/PNF

(viii) checks runway status and wind. PF/PNF

(3) perform take-off roll: (S) or (U)

(i) applies take-off thrust; PF

(ii) checks engine parameters; PNF

(iii) checks air speed indicators; PF/PNF

(iv) stays on runway centreline. PF

(4) perform transition to instrument flight rules: (S) or (U)

(i) applies v1 procedures; PF/PNF

(ii) rotates at vr to initial pitch attitude; PF

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| (iii) | establishes initial wings level attitude;                         | PF         |
| (iv)  | retracts landing gear;  | PNF        |
| (v)   | maintains climb out speed.  | PF         |
| (5)   | perform initial climb to flap retraction altitude:                | (S) or (U) |
| (i)   | sets climb power;   | PF         |
| (ii)  | adjusts attitude for acceleration;                                | PF         |
| (iii) | selects flaps according flap speed schedule;                      | PF/PNF     |
| (iv)  | observes speed restrictions;                                      | PF         |
| (v)   | completes relevant checklists.                                    | PF/PNF     |
| (6)   | perform rejected take-off:  | (S) or (U) |
| (i)   | recognises the requirement to abort the take-off;                 | PF         |
| (ii)  | applies the rejected take-off procedure;                          | PF         |
| (iii) | assesses the need to evacuate the aircraft.                       | PF/PNF     |
| (7)   | perform navigation:   | (S) or (U) |
| (i)   | complies to departure clearance;                                  | PF         |
| (ii)  | complies with published departure procedures, for example speeds; | PF         |
| (iii) | monitors navigation accuracy;                                     | PF/PNF     |
| (iv)  | communicates and coordinates with ATC.                            | PNF        |
| (8)   | manage abnormal and emergency situations:                         | (S) or (U) |
| (i)   | identifies the abnormal condition;                                | PF/PNF     |
| (ii)  | interprets the abnormal condition;                                | PF/PNF     |
| (iii) | performs the procedure for the abnormal condition.                | PF/PNF     |
- (i) Perform climb

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List of competency elements and performance criteria:

- |        |  |            |
|--------|--|------------|
| (1)    | demonstrate attitudes and behaviours appropriate to the safe conduct of flight, including recognising and managing potential threats and errors; |            |
| (2)    | perform SID or en-route navigation:  | (S) or (U) |
| (i)    | complies with departure clearance and procedures;  | PF         |
| (ii)   | demonstrates terrain awareness;  | PF/PNF     |
| (iii)  | monitors navigation accuracy;  | PF/PNF     |
| (iv)   | adjusts flight to weather and traffic conditions;  | PF         |
| (v)    | communicates and coordinates with ATC;   | PNF        |
| (vi)   | observes minimum altitudes;  | PF/PNF     |
| (vii)  | selects appropriate level of automation;   | PF         |
| (viii) | complies with altimeter setting procedures.  | PF/PNF     |
| (3)    | complete climb procedures and checklists:  | (S) or (U) |
| (i)    | performs the after take-off items;   | PF/PNF     |
| (ii)   | confirms and checks according checklists.  | PF/PNF     |
| (4)    | modify climb speeds, rate of climb and cruise altitude:  | (S) or (U) |
| (i)    | recognises the need to change speed, Rate of climb or cruise altitude;   | PF         |
| (ii)   | selects and maintains the appropriate climb speed or rate of climb;  | PF         |
| (iii)  | selects optimum cruise flight level.   | PF/PNF     |
| (5)    | perform systems operations and procedures:   | (S) or (U) |
| (i)    | monitors operation of all systems;   | PF/PNF     |
| (ii)   | operates systems as required.  | PF/PNF     |
| 6)     | manage abnormal and emergency situations:  | (S) or (U) |

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|-------|--|------------|
| (i)   | identifies the abnormal condition;                   | PF/PNF     |
| (ii)  | interprets the abnormal condition;                   | PF/PNF     |
| (iii) | performs the procedure for the abnormal condition.   | PF/PNF     |
| (7)   | communicate with cabin crew, passengers and company: | (S) or (U) |
| (i)   | communicates relevant information with cabin crew;   | PF         |
| (ii)  | communicates relevant information with company;      | PF/PNF     |
| (iii) | makes passenger announcements when appropriate.      | PF         |
- (j) Perform cruise
- List of competency elements and performance criteria.
- |       |  |            |
|-------|--|------------|
| (1)   | demonstrate attitudes and behaviours appropriate to the safe conduct of flight, including recognising and managing potential threats and errors; |            |
| (2)   | monitor navigation accuracy:   | (S) or (U) |
| (i)   | demonstrates adequate area knowledge;  | PF/PNF     |
| (ii)  | demonstrates adequate route knowledge;   | PF/PNF     |
| (iii) | navigates according to flight plan and clearance;  | PF         |
| (iv)  | adjusts flight to weather and traffic conditions;  | PF         |
| (v)   | communicates and coordinates with ATC;   | PNF        |
| (vi)  | observes minimum altitudes;  | PF/PNF     |
| (vii) | uses all means of automation.  | PF         |
| (3)   | monitor flight progress:   | (S) or (U) |
| (i)   | selects optimum speed;   | PF         |
| (ii)  | selects optimum cruise flight level;   | PF         |
| (iii) | monitors and controls fuel status;   | PF/PNF     |
| (iv)  | recognises the need for a possible diversion;  | PF/PNF     |

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|-------|--|------------|
| (v)   | creates a diversion contingency plan if required.    | PF/PNF     |
| (4)   | perform descent and approach planning:               | (S) or (U) |
| (i)   | checks weather of destination and alternate airport; | PF/PNF     |
| (ii)  | checks runway in use and approach procedure;         | PF/PNF     |
| (iii) | sets the FMS accordingly;                            | PNF        |
| (iv)  | checks landing weight and landing distance required; | PNF        |
| (v)   | checks MEA, MGA and MSA;                             | PF/PNF     |
| (vi)  | identifies top of descent point.                     | PF         |
| (5)   | perform systems operations and procedures:           | (S) or (U) |
| (i)   | monitors operation of all systems;                   | PF/PNF     |
| (ii)  | operates systems as required.                        | PNF        |
| (6)   | manage abnormal and emergency situations:            | (S) or (U) |
| (i)   | identifies the abnormal condition;                   | PF/PNF     |
| (ii)  | interprets the abnormal condition;                   | PF/PNF     |
| (iii) | performs the procedure for the abnormal condition.   | PF/PNF     |
| (7)   | communicate with cabin crew, passengers and company: | (S) or (U) |
| (i)   | communicates relevant information with cabin crew;   | PF         |
| (ii)  | communicates relevant information with company;      | PF/PNF     |
| (iii) | makes passenger announcements when appropriate.      | PF         |
- (k) Perform descent
- List of competency elements and performance criteria:
- |     |  |            |
|-----|--|------------|
| (1) | Demonstrate attitudes and behaviours appropriate to the safe conduct of flight, including recognising and managing potential threats and errors; |            |
| (2) | initiate and manage descent:   | (S) or (U) |

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- (i) starts descent according to ATC clearance or optimum descent point; PF
- (ii) selects optimum speed and descent rate; PF
- (iii) adjusts speed to existing environmental conditions; PF
- (iv) recognises the need to adjust the descent path; PF
- (v) adjusts the flight path as required; PF
- (vi) utilises all means of FMS descent information. PF
- (3) monitor and perform en route and descent navigation: (S) or (U)
  - (i) complies with arrival clearance and procedures; PF
  - (ii) demonstrates terrain awareness; PF/PNF
  - (iii) monitors navigation accuracy; PF/PNF
  - (iv) adjusts flight to weather and traffic conditions; PF
  - (v) communicates and coordinates with ATC; PNF
  - (vi) observes minimum altitudes; PF/PNF
  - (vii) selects appropriate level or mode of automation; PF
  - (viii) complies with altimeter setting procedures. PF/PNF
- (4) re-planning and update of approach briefing: (S) or (U)
  - (i) re-checks destination weather and runway in use; PNF
  - (ii) briefs or re-briefs about instrument approach and landing as required; PF
  - (iii) reprograms the FMS as required; PNF
  - (iv) re-checks fuel status. PF/PNF
- (5) perform holding: (S) or (U)
  - (i) identifies holding requirement; PF/PNF

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- |       |   |            |
|-------|---|------------|
| (ii)  | programs FMS for holding pattern;                           | PNF        |
| (iii) | enters and monitors holding pattern;                        | PF         |
| (iv)  | assesses fuel requirements and determines max holding time; | PF/PNF     |
| (v)   | reviews the need for a diversion;                           | PF/PNF     |
| (vi)  | initiates diversion.  | PF         |
| (6)   | perform systems operations and procedures:                  | (S) or (U) |
| (i)   | monitors operation of all systems;                          | PF/PNF     |
| (ii)  | operates systems as required.                               | PF/PNF     |
| (7)   | manage abnormal and emergency situations:                   |            |
| (i)   | identifies the abnormal condition;                          | PF/PNF     |
| (ii)  | interprets the abnormal condition;                          | PF/PNF     |
| (iii) | performs the procedure for the abnormal condition.          | PF/PNF     |
| (8)   | communicate with cabin crew, passengers and company:        | (S) or (U) |
| (i)   | communicates relevant information with cabin crew;          | PF         |
| (ii)  | communicates relevant information with company;             | PF/PNF     |
| (iii) | makes passenger announcements when appropriate;             | PF         |
- (l) Perform approach

List of competency elements and performance criteria:

- |      |  |            |
|------|--|------------|
| (1)  | demonstrate attitudes and behaviours appropriate to the safe conduct of flight, including recognising and managing potential threats and errors; |            |
| (2)  | perform approach in general:   | (S) or (U) |
| (i)  | executes approach according to procedures and situation;   | PF         |
| (ii) | selects appropriate level or mode of automation;   | PF         |

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(iii)	selects optimum approach path;	PF
(iv)	operates controls smooth and coordinated;	PF
(v)	performs speed reduction and flap extension;	PF/PNF
(vi)	performs relevant checklists;	PF/PNF
(vii)	initiates final descent;	PF
(viii)	achieves stabilised approach criteria;	PF
(ix)	ensures adherence to minima; PF/PNF	
(x)	initiates go-around if required;	PF
(xi)	masters transition to visual segment.	PF
(3)	perform precision approach:	(S) or (U)
(i)	performs ILS approach;	PF
(ii)	performs MLS approach.	PF
(4)	perform non-precision approach:	(S) or (U)
(i)	performs VOR approach;	PF
(ii)	performs NDB approach;	PF
(iii)	performs SRE approach;	PF
(iv)	performs GNSS approach;	PF
(v)	performs ILS loc approach;	PF
(vi)	performs ILS back beam approach.	PF
(5)	perform approach with visual reference to ground:	(S) or (U)
(i)	performs standard visual approach;	PF
(ii)	performs circling approach.	PF
(6)	monitor the flight progress:	(S) or (U)



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- (i) insures navigation accuracy;  
PF/PNF
  - (ii) communicates with ATC and crew members; PNF
  - (iii) monitors fuel status. PF/PNF
- (7) perform systems operations and procedures:
  - (i) monitors operation of all systems; PF
  - (ii) operates systems as required. PF
- (8) manage abnormal and emergency situations: (S) or (U)
  - (i) identifies the abnormal condition; PF/PNF
  - (ii) interprets the abnormal condition; PF/PNF
  - (iii) performs the procedure for the abnormal condition. PF/PNF
- (9) perform missed approach and goaround: (S) or (U)
  - (i) initiates go-around procedure; PF
  - (ii) navigates according to missed approach procedure; PF
  - (iii) completes the relevant checklists; PF/PNF
  - (iv) initiates approach or diversion after the go-around; PF
  - (v) communicates with ATC and crew members. PNF
- (10) communicate with cabin crew, passengers and company: (S) or (U)
  - (i) communicates relevant information with cabin crew; PF
  - (ii) communicates relevant information with company; PF/PNF
  - (iii) makes passenger announcements when appropriate; PF
  - (iv) initiates go-around procedure. PF
- (m) Perform landing

List of competency elements and performance criteria:

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- (1) demonstrate attitudes and behaviours appropriate to the safe conduct of flight, including recognising and managing potential threats and errors;
- (2) land the aircraft; (S) or (U)
  - (i) maintains a stabilised approach path during visual segment; PF
  - (ii) recognises and acts on changing conditions for windshift or wind shear segment; PF
  - (iii) initiates flare; PF
  - (iv) controls thrust; PF
  - (v) achieves touchdown in touchdown zone on centreline; PF
  - (vi) lowers nose wheel; PF
  - (vii) maintains centreline; PF
  - (viii) performs after-touchdown procedures; PF
  - (ix) makes use of appropriate braking and reverse thrust; PF
  - (x) vacates runway with taxi speed. PF
- (3) perform systems operations and procedures: (S) or (U)
  - (i) monitors operation of all systems; PF
  - (ii) operates systems as required. PF
- (4) manage abnormal and emergency situations: (S) or (U)
  - (i) identifies the abnormal condition; PF/PNF
  - (ii) interprets the abnormal condition; PF/PNF
  - (iii) performs the procedure for the abnormal condition. PF/PNF
- (n) Perform after landing and post flight operations

List of competency elements and performance criteria:

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- (1) demonstrate attitudes and behaviours appropriate to the safe conduct of flight, including recognising and managing potential threats and errors;
- (2) perform taxiing and parking: (S) or (U)
  - (i) receives, checks and adheres to taxi clearance; PNF
  - (ii) taxies the aircraft including use of exterior lighting; PF
  - (iii) controls taxi speed; PF/PNF
  - (iv) maintains centreline; PF
  - (v) maintains look-out for conflicting traffic and obstacles; PF
  - (vi) identifies parking position; PF/PNF
  - (vii) complies with marshalling or stand guidance; PF/PNF
  - (viii) applies parking and engine shut down procedures; PF
  - (ix) completes with relevant checklists. PF/PNF
- (3) perform aircraft post-flight operations: (S) or (U)
  - (i) communicates to ground personnel and crew; PF
  - (ii) completes all required flight documentation; PF/PNF
  - (iii) ensures securing of the aircraft; PF
  - (iv) conducts the debriefings. PF
- (4) perform systems operations and procedures: (S) or (U)
  - (i) monitors operation of all systems; PF/PNF
  - (ii) operates systems as required. PF/PNF
- (5) manage abnormal and emergency situations: (S) or (U)
  - (i) identifies the abnormal condition; PF/PNF
  - (ii) interprets the abnormal condition; PF/PNF
  - (iii) performs the procedure for the abnormal condition. PF/PNF

- (6) communicate with cabin crew, passengers and company: (S) or (U)
  - (i) communicates relevant information with cabin crew; PF
  - (ii) communicates relevant information with company; PF/PNF
  - (iii) makes passenger announcements when appropriate. PF

## **PRINCIPLES OF THREAT AND ERROR MANAGEMENT**

- (o) One model that explains the principles of threat and error management is the TEM model.

- (1) The components of the TEM model:

There are three basic components in the TEM model, from the perspective of flight crews: threats, errors and undesired aircraft states. The model proposes that threats and errors are part of everyday aviation operations that must be managed by flight crews, since both threats and errors carry the potential to generate undesired aircraft states. Flight crews must also manage undesired aircraft states, since they carry the potential for unsafe outcomes. Undesired state management is an essential component of the TEM model, as important as threat and error management. Undesired aircraft state management largely represents the last opportunity to avoid an unsafe outcome and thus maintain safety margins in flight operations.

- (2) Threats:

- (i) Threats are defined as events or errors that occur beyond the influence of the flight crew, increase operational complexity, and which must be managed to maintain the margins of safety. During typical flight operations, flight crews have to manage various contextual complexities. Such complexities would include, for example, dealing with adverse meteorological conditions, airports surrounded by high mountains, congested airspace, aircraft malfunctions, errors committed by other people outside of the cockpit, such as air traffic controllers, flight attendants or maintenance workers, and so forth. The TEM model considers these complexities as threats because they all have the potential to negatively affect flight operations by reducing margins of safety;
- (ii) Some threats can be anticipated, since they are expected or known to the flight crew. For example, flight crews can anticipate the consequences of a thunderstorm by briefing their response in

advance, or prepare for a congested airport by making sure they keep a watchful eye on other aircraft as they execute the approach;

- (iii) Some threats can occur unexpectedly, such as an in-flight aircraft malfunction that happens suddenly and without warning. In this case, flight crews must apply skills and knowledge acquired through training and operational experience;
- (iv) Lastly, some threats may not be directly obvious to, or observable by, flight crews immersed in the operational context, and may need to be uncovered by safety analysis. These are considered latent threats. Examples of latent threats include equipment design issues, optical illusions, or shortened turnaround schedules;
- (v) Regardless of whether threats are expected, unexpected, or latent, one measure of the effectiveness of a flight crew's ability to manage threats is whether threats are detected with the necessary anticipation to enable the flight crew to respond to them through deployment of appropriate countermeasures;
- (vi) Threat management is a building block to error management and undesired aircraft state management. Although the threat-error linkage is not necessarily straightforward, and although it may not be always possible to establish a linear relationship, or one-to-one mapping between threats, errors and undesired states, archival data demonstrates that mismanaged threats are normally linked to flight crew errors, which in turn are often linked to undesired aircraft states. Threat management provides the most proactive option to maintain margins of safety in flight operations, by voiding safety-compromising situations at their roots. As threat managers, flight crews are the last line of defence to keep threats from impacting flight operations;
- (vii) Table 1 presents examples of threats, grouped under two basic categories derived from the TEM Model. Environmental threats occur due to the environment in which flight operations take place. Some environmental threats can be planned for and some will arise spontaneously, but they all have to be managed by flight crews in real time. Organisational threats, on the other hand, can be controlled (for example removed or, at least, minimised) at source by aviation organisations. Organisational threats are usually latent in nature. Flight crews still remain the last line of defence, but there are earlier opportunities for these threats to be mitigated by aviation organisations themselves.

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Environmental threats	Organisational threats
(A) weather: thunderstorms, turbulence, icing, wind shear, cross or tailwind, very low or high temperatures;	(A) operational pressure: delays, late arrivals or equipment changes;
(B) ATC: traffic congestion, ACAS RA/TA, ATC command, ATC error, ATC language difficulty, ATC non-standard phraseology, ATC runway change, ATIS communication or units of measurement (QFE/meters);	(B) aircraft: aircraft malfunction, automation event or anomaly, MEL/CDL;
(C) airport: contaminated or short runway; contaminated taxiway, lack of, confusing, faded signage, markings, birds, aids unserviceable, complex surface navigation procedures or airport constructions;	(C) cabin: flight attendant error, cabin event distraction, interruption, cabin door security;
(D) terrain: high ground, slope, lack of references or 'black hole';	(D) maintenance: maintenance event or error;
(E) other: similar call-signs.	(E) ground: ground-handling event, de-icing or ground crew error;
	(F) dispatch: dispatch paperwork event or error;
	(G) documentation: manual error or chart error;
	(H) other: crew scheduling event.

**Table 1. Examples of threats (list is not exhaustive)**

(3) Errors:

- (i) Errors are defined actions or inactions by the flight crew that lead to deviations from organisational or flight crew intentions or expectations. Unmanaged or mismanaged errors frequently lead to undesired aircraft states. Errors in the operational context thus tend to reduce the margins of safety and increase the probability of adverse events;
- (ii) Errors can be spontaneous (for example without direct linkage to specific, obvious threats), linked to threats, or part of an error chain. Examples of errors would include the inability to maintain stabilised approach parameters, executing a wrong automation mode, failing to give a required callout, or misinterpreting an ATC clearance;
- (iii) Regardless of the type of error, an error's effect on safety depends on whether the flight crew detects and responds to the error before it leads to an undesired aircraft state and to a potential unsafe outcome. This is why one of the objectives of TEM is to understand error management (for example detection and response), rather than to solely focus on error causality (for example causation and commission). From the safety perspective, operational errors that are timely detected and promptly responded to (for example properly

managed), errors that do not lead to undesired aircraft states, do not reduce margins of safety in flight operations, and thus become operationally inconsequential. In addition to its safety value, proper error management represents an example of successful human performance, presenting both learning and training value;

- (iv) Capturing how errors are managed is then as important, if not more, as capturing the prevalence of different types of error. It is of interest to capture if and when errors are detected and by whom, the response(s) upon detecting errors, and the outcome of errors. Some errors are quickly detected and resolved, thus becoming operationally inconsequential, while others go undetected or are mismanaged. A mismanaged error is defined as an error that is linked to or induces an additional error or undesired aircraft state;
- (v) Table 2 presents examples of errors, grouped under three basic categories derived from the TEM model. In the TEM concept, errors have to be 'observable' and therefore, the TEM model uses the 'primary interaction' as the point of reference for defining the error categories;
- (vi) The TEM model classifies errors based upon the primary interaction of the pilot or flight crew at the moment the error is committed. Thus, in order to be classified as aircraft handling error, the pilot or flight crew must be interacting with the aircraft (for example through its controls, automation or systems). In order to be classified as procedural error, the pilot or flight crew must be interacting with a procedure (for example checklists; SOPs; etc.). In order to be classified as communication error, the pilot or flight crew must be interacting with people (ATC, ground crew, other crewmembers, etc.);
- (vii) Aircraft handling errors, procedural errors and communication errors may be unintentional or involve intentional non-compliance. Similarly, proficiency considerations (for example skill or knowledge deficiencies, training system deficiencies) may underlie all three categories of error. In order to keep the approach simple and avoid confusion, the TEM model does not consider intentional noncompliance and proficiency as separate categories of error, but rather as sub-sets of the three major categories of error.

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<b>Aircraft handling errors</b>	(A) manual handling, flight controls: vertical, lateral or speed deviations, incorrect flaps or speed brakes, thrust reverser or power settings; (B) automation: incorrect altitude, speed, heading, auto throttle settings, incorrect mode executed or incorrect entries; (C) systems, radio, instruments: incorrect packs, incorrect anti-icing, incorrect altimeter, incorrect fuel switches settings, incorrect speed bug or incorrect radio frequency dialled; (D) ground navigation: attempting to turn down wrong taxiway or runway, taxi too fast, failure to hold short or missed taxiway or runway.
<b>Procedural errors</b>	(A) SOPs: failure to cross-verify automation inputs; (B) checklists: wrong challenge and response; items missed, checklist performed late or at the wrong time; (C) callouts: omitted or incorrect callouts; (D) briefings: omitted briefings; items missed; (E) documentation: wrong weight and balance, fuel information, ATIS, or clearance information recorded, misinterpreted items on paperwork; incorrect logbook entries or incorrect application of MEL procedures.
<b>Communication errors</b>	(A) crew to external: missed calls, misinterpretations of instructions, incorrect read-back, wrong clearance, taxiway, gate or runway communicated; (B) pilot to pilot: within crew miscommunication or mis-interpretation.

**Table 2. Examples of errors (list is not exhaustive)**

- (4) Undesired aircraft states:
- (i) Undesired aircraft states are flight crew-induced aircraft position or speed deviations, misapplication of flight controls, or incorrect systems configuration, associated with a reduction in margins of safety. Undesired aircraft states that result from ineffective threat or error management may lead to compromising situations and reduce margins of safety in flight operations. Often considered at the cusp of becoming an incident or accident, undesired aircraft states must be managed by flight crews;
  - (ii) Examples of undesired aircraft states would include lining up for the incorrect runway during approach to landing, exceeding ATC speed restrictions during an approach, or landing long on a short runway requiring maximum braking. Events such as equipment malfunctions or ATC controller errors can also reduce margins of safety in flight operations, but these would be considered threats;



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- (iii) Undesired states can be managed effectively, restoring margins of safety, or flight crew response(s) can induce an additional error, incident, or accident;
- (iv) Table 3 presents examples of undesired aircraft states, grouped under three basic categories derived from the TEM model;

<b>Aircraft handling</b>	(A) aircraft control (attitude); (B) vertical, lateral or speed deviations; (C) unnecessary weather penetration; (D) unauthorised airspace penetration; (E) operation outside aircraft limitations; (F) unstable approach; (G) continued landing after unstable approach; (H) long, floated, firm or off-centreline landing.
<b>Ground navigation</b>	(A) proceeding towards wrong taxiway or runway; (B) Wrong taxiway, ramp, gate or hold spot.
<b>Incorrect aircraft configurations</b>	(A) incorrect systems configuration; (B) incorrect flight controls configuration; (C) incorrect automation configuration; (D) incorrect engine configuration; (E) incorrect weight and balance configuration.

**Table 3. Examples of undesired aircraft states (list is not exhaustive)**

- (v) An important learning and training point for flight crews is the timely switching from error management to undesired aircraft state management. An example would be as follows: a flight crew selects a wrong approach in the FMC. The flight crew subsequently identifies the error during a cross-check prior to the FAF. However, instead of using a basic mode (for example heading) or manually flying the desired track, both flight crew members become involved in attempting to reprogram the correct approach prior to reaching the FAF. As a result, the aircraft ‘stitches’ through the localiser, descends late, and goes into an unstable approach. This would be an example of the flight crew getting ‘locked in’ to error management, rather than switching to undesired aircraft state management. The use of the TEM model assists in educating flight crews that, when the aircraft is in an undesired state, the basic task of the flight crew is undesired aircraft state management instead of error management. It also illustrates how easy it is to get locked in to the error management phase;
- (vi) Also from a learning and training perspective, it is important to establish a clear differentiation between undesired aircraft states and

outcomes. Undesired aircraft states are transitional states between a normal operational state (for example a stabilised approach) and an outcome. Outcomes, on the other hand, are end states, most notably, reportable occurrences (for example incidents and accidents). An example would be as follows: a stabilised approach (normal operational state) turns into an unstabilised approach (undesired aircraft state) that results in a runway excursion (outcome);

- (vii) The training and remedial implications of this differentiation are of significance. While at the undesired aircraft state stage, the flight crew has the possibility, through appropriate TEM, of recovering the situation, returning to a normal operational state, thus restoring margins of safety. Once the undesired aircraft state becomes an outcome, recovery of the situation, return to a normal operational state, and restoration of margins of safety is not possible.

(5) Countermeasures:

- (i) Flight crews must, as part of the normal discharge of their operational duties, employ countermeasures to keep threats, errors and undesired aircraft states from reducing margins of safety in flight operations. Examples of countermeasures would include checklists, briefings, call-outs and SOPs, as well as personal strategies and tactics. Flight crews dedicate significant amounts of time and energies to the application of countermeasures to ensure margins of safety during flight operations. Empirical observations during training and checking suggest that as much as 70 % of flight crew activities may be countermeasures-related activities.
- (ii) All countermeasures are necessarily flight crew actions. However, some countermeasures to threats, errors and undesired aircraft states that flight crews employ build upon 'hard' resources provided by the aviation system. These resources are already in place in the system before flight crews report for duty, and are therefore considered as systemic-based countermeasures. The following would be examples of 'hard' resources that flight crews employ as systemic-based countermeasures:
  - (A) ACAS;
  - (B) TAWS;
  - (C) SOPs;

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- (D) checklists;
  - (E) briefings;
  - (F) training;
  - (G) etc.
- (iii) Other countermeasures are more directly related to the human contribution to the safety of flight operations. These are personal strategies and tactics, individual and team countermeasures that typically include canvassed skills, knowledge and attitudes developed by human performance training, most notably, by CRM training. There are basically three categories of individual and team countermeasures:
- (A) planning countermeasures: essential for managing anticipated and unexpected threats;
  - (B) execution countermeasures: essential for error detection and error response;
  - (C) review countermeasures: essential for managing the changing conditions of a flight.
- (iv) Enhanced TEM is the product of the combined use of systemic based and individual and team countermeasures. Table 4 presents detailed examples of individual and team countermeasures. Further guidance on countermeasures can be found in the sample assessment guides for terminal training objectives (PANS-TRG, Chapter 3, Attachment B) as well as in the ICAO manual, Line Operations Safety Audit (LOSA) (Doc 9803).

Planning countermeasures		
SOP briefing	The required briefing was interactive and operationally thorough	(A) Concise, not rushed, and met SOP requirements; (B) Bottom lines were established
Plans stated	Operational plans and decisions were communicated and acknowledged	Shared understanding about plans: 'Everybody on the same page'
Workload assignment	Roles and responsibilities were defined for normal and non-normal situations	Workload assignments were communicated and acknowledged

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Contingency management	Crew members developed effective strategies to manage threats to safety	(A) Threats and their consequences were anticipated; (B) Used all available resources to manage threats
<b>Execution countermeasures</b>		
Monitor and cross-check	Crew members actively monitored and cross-checked systems and other crew members	Aircraft position, settings, and crew actions were verified
Workload management	Operational tasks were prioritised and properly managed to handle primary flight duties	(A) Avoided task fixation; (B) Did not allow work overload
Automation management	Automation was properly managed to balance situational and workload requirements	(A) Automation setup was briefed to other members (B) Effective recovery techniques from automation anomalies
<b>Review countermeasures</b>		
Evaluation and modification of plans	Existing plans were reviewed and modified when necessary	Crew decisions and actions were openly analysed to make sure the existing plan was the best plan
Inquiry	Crew members asked questions to investigate and/or clarify current plans of action	Crew members not afraid to express a lack of knowledge: 'Nothing taken for granted' attitude
Assertiveness	Crew members stated critical information or solutions with appropriate persistence	Crew members spoke up without hesitation

**Table 4. Examples of individual and team countermeasures**

**GM2 FCL.015(a) Application and issue, revalidation and renewal of licences, ratings and certificates**

The required level of competency of a student pilot is assessed by observing the following:

- (a) application of knowledge;
- (b) application of regulations and procedures;
- (c) communication;
- (d) aeroplane flight path management – automation;
- (e) aeroplane flight path management – manual control;

- (f) leadership and teamwork;
- (g) problem-solving and decision-making;
- (h) situational awareness (SA) and information management; and
- (i) workload management.

The competencies referred to in points (b) and (e) are particularly relevant during the training. This means that the focus is on observing the student pilot performing take-offs and landings in accordance with the standard operating procedures (SOPs) and recommended techniques of the original equipment manufacturer (OEM).

The competency elements and sub-elements stipulated in GM1 to Appendix 5 for take-off and landing provide additional guidance for instructors and student pilots.

Consistency and repeatability of all the competencies above is achieved if the student pilot is able to perform at least three successive take-offs and landings demonstrating the required observable behaviours.

The take-off and landing training in an aeroplane should include at least one go-around. Due consideration should be given to environmental conditions when evaluating competency.

## **Appendix 6 – Modular training courses for the IR**

### **A. IR(A) — Modular flying training course**

#### **GENERAL**

1. The aim of the IR(A) modular flying training course is to train pilots to the level of proficiency necessary to operate aeroplanes under IFR and in IMC. The course consists of two modules, which may be taken separately or combined:
  - (a) **Basic Instrument Flight Module**

This comprises 10 hours of instrument time under instruction, of which up to 5 hours can be instrument ground time in a BITD, FNPT I or II, or an FFS. Upon completion of the Basic Instrument Flight Module, the candidate shall be issued a Course Completion Certificate.
  - (b) **Procedural Instrument Flight Module**

This comprises the remainder of the training syllabus for the IR(A), 40 hours single-engine or 45 hours multi-engine instrument time under instruction, and the theoretical knowledge course for the IR(A).
2. Applicants for a modular IR(A) course shall be the holder of a PPL(A) or a CPL(A). Applicants for the Procedural Instrument Flight Module, who do not hold a CPL(A), shall be a holder of a BIR or of a Course Completion Certificate for the Basic Instrument Flight Module.

The ATO shall ensure that the applicant for a multi-engine IR(A) course who has not held a multi engine aeroplane class or type rating has received the multi-engine training specified in Subpart H prior to commencing the flight training for the IR(A) course.
3. An applicant wishing to undertake the Procedural Instrument Flight Module of a modular IR(A) course shall be required to complete all the instructional stages in one continuous approved course of training. Prior to commencing the Procedural Instrument Flight Module, the ATO shall ensure the competence of the applicant in basic instrument flying skills. Refresher training shall be given as required.
4. The course of theoretical instruction shall be completed within 18 months. The Procedural Instrument Flight Module and the skill test shall be completed within the period of validity of the pass in theoretical examinations.
5. The course shall comprise:

- (a) theoretical knowledge instruction to the IR knowledge level;
- (b) instrument flight instruction.

### **THEORETICAL KNOWLEDGE**

- 6. An approved modular IR(A) course shall comprise at least 150 hours of theoretical knowledge instruction.

### **FLYING TRAINING**

- 7. A single-engine IR(A) course shall comprise at least 50 hours instrument time under instruction of which up to 20 hours may be instrument ground time in an FNPT I, or up to 35 hours in an FFS or FNPT II. A maximum of 10 hours of FNPT II or an FFS instrument ground time may be conducted in an FNPT I.
- 8. A multi-engine IR(A) course shall comprise at least 55 hours instrument time under instruction, of which up to 25 hours may be instrument ground time in an FNPT I, or up to 40 hours in an FFS or FNPT II. A maximum of 10 hours of FNPT II or an FFS instrument ground time may be conducted in an FNPT I. The remaining instrument flight instruction shall include at least 15 hours in multi-engine aeroplanes.
- 9. The holder of a single-engine IR(A) who also holds a multi-engine class or type rating wishing to obtain a multi-engine IR(A) for the first time shall complete a course at an ATO comprising at least 5 hours instruction in instrument flying in multi-engine aeroplanes, of which 3 hours may be in an FFS or FNPT II.
- 10.1 Holders of a CPL(A), of a BIR, or of a Course Completion Certificate for the Basic Instrument Flight Module shall be credited with up to 10 hours in regard of the total amount of training required in paragraphs 7 or 8 above.
- 10.2 The holder of an IR(H) may have the total amount of training required in paragraphs 7 or 8 above reduced to 10 hours.
- 10.3 The total instrument flight instruction in aeroplane shall comply with paragraph 7 or 8, as appropriate.
- 11. The flying exercises up to the IR(A) skill test shall comprise:
  - (a) Basic Instrument Flight Module: Procedure and manoeuvre for basic instrument flight covering at least:  
  
basic instrument flight without external visual cues:

- horizontal flight,
- climbing,
- descent,
- turns in level flight, climbing, descent;

instrument pattern;

steep turn;

radio navigation;

recovery from unusual attitudes;

limited panel;

recognition and recovery from incipient and full stalls;

(b) Procedural Instrument Flight Module:

- (i) pre-flight procedures for IFR flights, including the use of the flight manual and appropriate air traffic services documents in the preparation of an IFR flight plan;
- (ii) procedure and manoeuvres for IFR operation under normal, abnormal and emergency conditions covering at least:
  - transition from visual to instrument flight on take-off,
  - standard instrument departures and arrivals,
  - en-route IFR procedures,
  - holding procedures,
  - instrument approaches to specified minima,
  - missed approach procedures,
  - landings from instrument approaches, including circling;
- (iii) in-flight manoeuvres and particular flight characteristics;



- (iv) if required, operation of a multi-engine aeroplane in the above exercises, including operation of the aeroplane solely by reference to instruments with one engine simulated inoperative and engine shutdown and restart (the latter exercise to be carried out at a safe altitude unless carried out in an FFS or FNPT II).

#### **Aa. IR(A) — Competency-based modular flying training course**

##### **GENERAL**

1. The aim of the competency-based modular flying training course is to train PPL or CPL holders for the instrument rating, taking into account prior instrument flight instruction and experience. It is designed to provide the level of proficiency needed to operate aeroplanes under IFR and in IMC. The course shall be taken within an ATO or consist of a combination of instrument flight instruction provided by an IRI(A) or an FI(A) holding the privilege to provide training for the IR and flight instruction within an ATO.
2. An applicant for such a competency-based modular IR(A) shall be the holder of a PPL(A) or CPL(A).
3. The course of theoretical instruction shall be completed within 18 months. The instrument flight instruction and the skill test shall be completed within the period of validity of the pass of the theoretical knowledge examinations.
4. The course shall comprise:
  - (a) theoretical knowledge instruction to the IR(A) knowledge level;
  - (b) instrument flight instruction.

##### **THEORETICAL KNOWLEDGE**

5. An approved competency-based modular IR(A) course shall comprise at least 80 hours of theoretical knowledge instruction. The theoretical knowledge course may contain computer-based training and e- learning elements. A minimum amount of classroom teaching as required by ORA.ATO.305 has to be provided.

##### **FLYING TRAINING**

6. The method of attaining an IR(A) following this modular course is competency-based. However, the minimum requirements below shall be completed by the applicant. Additional training may be required to reach required competencies.

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- (a) A single-engine competency-based modular IR(A) course shall include at least 40 hours of instrument time under instruction, of which up to 10 hours may be instrument ground time in an FNPT I, or up to 25 hours in an FFS or FNPT II. A maximum of 5 hours of FNPT II or FFS instrument ground time may be conducted in an FNPT I.
  - (i) When the applicant has:
    - (A) completed instrument flight instruction provided by an IRI(A) or an FI(A) holding the privilege to provide training for the IR; or
    - (B) prior experience of instrument flight time as PIC on aeroplanes, under a rating providing the privileges to fly under IFR and in IMC,these hours may be credited towards the 40 hours above up to maximum of 30 hours,
  - (ii) When the applicant has prior instrument flight time under instruction other than specified in point (a)(i), these hours may be credited towards the required 40 hours up to a maximum of 15 hours.
  - (iii) In any case, the flying training shall include at least 10 hours of instrument flight time under instruction in an aeroplane at an ATO.
  - (iv) The total amount of dual instrument instruction shall not be less than 25 hours.
- (b) A multi-engine competency-based modular IR(A) course shall include at least 45 hours instrument time under instruction, of which up to 10 hours may be instrument ground time in an FNPT I, or up to 30 hours in an FFS or FNPT II. A maximum of 5 hours of FNPT II or FFS instrument ground time may be conducted in an FNPT I.
  - (i) When the applicant has:
    - (A) completed instrument flight instruction provided by an IRI(A) or an FI(A) holding the privilege to provide training for the IR; or
    - (B) prior experience of instrument flight time as PIC on aeroplanes, under a rating giving the privileges to fly under IFR and in IMC

these hours may be credited towards the 45 hours above up to a maximum of 35 hours.

- (ii) When the applicant has prior instrument flight time under instruction other than specified in point (b)(i), these hours may be credited towards the required 45 hours up to a maximum of 15 hours.
  - (iii) In any case, the flying training shall include at least 10 hours of instrument flight time under instruction in a multi-engine aeroplane at an ATO.
  - (iv) The total amount of dual instrument instruction shall not be less than 25 hours, of which at least 15 hours shall be completed in a multi-engine aeroplane.
  - (c) To determine the amount of hours credited and to establish the training needs, the applicant shall complete a pre-entry assessment at an ATO.
  - (d) The completion of the instrument flight instruction provided by an IRI(A) or FI(A) in accordance with point (a)(i) or (b)(i) shall be documented in a specific training record and signed by the instructor.
7. The flight instruction for the competency-based modular IR(A) shall comprise:
- (a) procedures and manoeuvres for basic instrument flight covering at least:
    - (i) basic instrument flight without external visual cues;
    - (ii) horizontal flight;
    - (iii) climbing;
    - (iv) descent;
    - (v) turns in level flight, climbing and descent;
    - (vi) instrument pattern;
    - (vii) steep turn;
    - (viii) radio navigation;
    - (ix) recovery from unusual attitudes;
    - (x) limited panel; and

- (xi) recognition and recovery from incipient and full stall;
  - (b) pre-flight procedures for IFR flights, including the use of the flight manual and appropriate air traffic services documents for the preparation of an IFR flight plan;
  - (c) procedure and manoeuvres for IFR operation under normal, abnormal, and emergency conditions covering at least:
    - (i) transition from visual to instrument flight on take-off;
    - (ii) standard instrument departures and arrivals;
    - (iii) en route IFR procedures;
    - (iv) holding procedures;
    - (v) instrument approaches to specified minima;
    - (vi) missed approach procedures; and
    - (vii) landings from instrument approaches, including circling;
  - (d) in-flight manoeuvres and particular flight characteristics;
  - (e) if required, operation of a multi-engine aeroplane in the above exercises, including:
    - (i) operation of the aeroplane solely by reference to instruments with one engine simulated inoperative;
    - (ii) engine shutdown and restart (to be carried out at a safe altitude unless carried out in an FFS or FNPT II).
8. Applicants for the competency-based modular IR(A) holding a MCAR-Part-FCL PPL or CPL and a valid IR(A) issued in compliance with the requirements of Annex 1 to the Chicago Convention by a third country may be credited in full towards the training course mentioned in paragraph 4. In order to be issued the IR(A), the applicant shall:
- (a) successfully complete the skill test for the IR(A) in accordance with Appendix 7;

- (b) demonstrate to the examiner during the skill test that he/she has acquired an adequate level of theoretical knowledge of air law, meteorology and flight planning and performance (IR); and
  - (c) have a minimum experience of at least 50 hours of flight time under IFR as PIC on aeroplanes.
- 9. Applicants for the competency-based modular IR(A) who hold a BIR in accordance with point FCL.835 and who have received at least 10 hours of instrument flight time under instruction at an ATO may be credited towards the training course referred to in paragraph 4, provided that all competency-based instrument rating topics have been included in that BIR training, and assessed by the ATO that provides the competency-based modular flying training course.
- 10. Applicants for the competency-based modular IR(A) who hold a BIR and have experience of at least 50 hours of flight time under IFR as PIC on aeroplanes, shall:
  - (a) at an ATO:
    - (i) be assessed as having an acceptable standard of competency-based instrument rating theoretical knowledge;
    - (ii) receive appropriate flight training to extend IFR privileges in accordance with FCL.605.IR(a);
  - (b) after completion of (a);
    - (i) successfully complete the skill test for the IR(A) in accordance with Appendix 7;
    - (ii) demonstrate orally to the examiner during the skill test that they have acquired an adequate level of theoretical knowledge of air law, meteorology, and flight planning and performance.

## **PRE-ENTRY ASSESSMENT**

- 11. The content and duration of the pre-entry assessment shall be determined by the ATO based on the prior instrument experience of the applicant.

## **MULTI-ENGINE**

- 12. The holder of a single-engine IR(A) who also holds a multi-engine class or type rating wishing to obtain a multi-engine IR(A) for the first time shall complete a course at an ATO comprising at least 5 hours instrument time under instruction in

multi-engine aeroplanes, of which 3 hours may be in an FFS or FNPT II and shall pass a skill test.

**B. IR(H) — Modular flying training course**

1. The aim of the IR(H) modular flying training course is to train pilots to the level of proficiency necessary to operate helicopters under IFR and in IMC.
2. An applicant for a modular IR(H) course shall be the holder of a PPL(H), or a CPL(H) or an ATPL(H). Prior to commencing the aircraft instruction phase of the IR(H) course, the applicant shall be the holder of the helicopter type rating used for the IR(H) skill test, or have completed approved type rating training on that type. The applicant shall hold a certificate of satisfactory completion of MCC if the skill test is to be conducted in Multi- Pilot conditions.
3. An applicant wishing to undertake a modular IR(H) course shall be required to complete all the instructional stages in one continuous approved course of training.
4. The course of theoretical instruction shall be completed within 18 months. The flight instruction and the skill test shall be completed within the period of validity of the pass in the theoretical examinations.
5. The course shall comprise:
  - (a) theoretical knowledge instruction to the IR knowledge level;
  - (b) instrument flight instruction.

**THEORETICAL KNOWLEDGE**

6. An approved modular IR(H) course shall comprise at least 150 hours of instruction.

**FLYING TRAINING**

7. An IR(H) course shall comprise at least 55 hours instrument time under instruction, of which:
  - (a) up to 20 hours may be instrument ground time in an FNPT I (H) or (A). These 20 hours instruction time in FNPT I (H) or (A) may be substituted by 20 hours instruction time for IR(H) in an aeroplane, approved for this course; or
  - (b) up to 40 hours may be instrument ground time in a helicopter FTD 2/3, FNPT II/III or FFS.

The instrument flight instruction shall include at least 10 hours in an IFR-certificated helicopter.

- 8.1 Holders of an ATPL(H) shall have the theoretical knowledge instruction hours reduced by 50 hours.
- 8.2 The holder of an IR(A) may have the amount of training required reduced to 10 hours.
- 8.3 The holder of a PPL(H) with a helicopter night rating or a CPL(H) may have the total amount of instrument time under instruction required reduced by 5 hours.
9. The flying exercises up to the IR(H) skill test shall comprise:
  - (a) pre-flight procedures for IFR flights, including the use of the flight manual and appropriate air traffic services documents in the preparation of an IFR flight plan;
  - (b) procedure and manoeuvres for IFR operation under normal, abnormal and emergency conditions covering at least:
    - transition from visual to instrument flight on take-off,
    - standard instrument departures and arrivals,
    - en-route IFR procedures,
    - holding procedures,
    - instrument approaches to specified minima,
    - missed approach procedures,
    - landings from instrument approaches, including circling;
  - (c) in-flight manoeuvres and particular flight characteristics;
  - (d) if required, operation of a multi-engine helicopter in the above exercises, including operation of the helicopter solely by reference to instruments with one engine simulated inoperative and engine shutdown and restart (the latter exercise to be carried out in an FFS or FNPT II or FTD 2/3).

### **C. IR(As) — Modular flying training course**

#### **GENERAL**

1. The aim of the IR(As) modular flying training course is to train pilots to the level of proficiency necessary to operate airships under IFR and in IMC. The course consists of two modules, which may be taken separately or combined:
  - (a) Basic Instrument Flight Module

This comprises 10 hours of instrument time under instruction, of which up to 5 hours can be instrument ground time in a BITD, FNPT I or II, or an FFS. Upon completion of the Basic Instrument Flight Module, the candidate shall be issued a Course Completion Certificate.
  - (b) Procedural Instrument Flight Module

This comprises the remainder of the training syllabus for the IR(As), 25 hours instrument time under instruction, and the theoretical knowledge course for the IR(As).
2. An applicant for a modular IR(As) course shall be the holder of a PPL(As) including the privileges to fly at night or a CPL(As). An applicant for the Procedural Instrument Flight Module, who does not hold a CPL(As), shall be holder of a Course Completion Certificate for the Basic Instrument Flight Module.
3. An applicant wishing to undertake the Procedural Instrument Flight Module of a modular IR(As) course shall be required to complete all the instructional stages in one continuous approved course of training. Prior to commencing the Procedural Instrument Flight Module, the ATO shall ensure the competence of the applicant in basic instrument flying skills. Refresher training shall be given as required.
4. The course of theoretical instruction shall be completed within 18 months. The Procedural Instrument Flight Module and the skill test shall be completed within the period of validity of the pass in theoretical examinations.
5. The course shall comprise:
  - (a) theoretical knowledge instruction to the IR knowledge level;
  - (b) instrument flight instruction.

## **THEORETICAL KNOWLEDGE**

6. An approved modular IR(As) course shall comprise at least 150 hours of theoretical knowledge instruction.

## **FLYING TRAINING**



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7. An IR(As) course shall comprise at least 35 hours instrument time under instruction of which up to 15 hours may be instrument ground time in an FNPT I, or up to 20 hours in an FFS or FNPT II. A maximum of 5 hours of FNPT II or FFS instrument ground time may be conducted in an FNPT I.
8. The holder of a CPL(As) or of a Course Completion Certificate for the Basic Instrument Flight Module may have the total amount of training required in paragraph 7 reduced by 10 hours. The total instrument flight instruction in airship shall comply with paragraph 7.
9. If the applicant is the holder of an IR in another category of aircraft the total amount of flight instruction required may be reduced to 10 hours on airships.
10. The flying exercises up to the IR(As) skill test shall comprise:
  - (a) Basic Instrument Flight Module:

Procedure and manoeuvre for basic instrument flight covering at least:  
basic instrument flight without external visual cues:
    - horizontal flight,
    - climbing,
    - descent,
    - turns in level flight, climbing, descent;instrument pattern;  
radionavigation;  
recovery from unusual attitudes;  
limited panel;
  - (b) Procedural Instrument Flight Module:
    - (i) pre-flight procedures for IFR flights, including the use of the flight manual and appropriate air traffic services documents in the preparation of an IFR flight plan;
    - (ii) procedure and manoeuvres for IFR operation under normal, abnormal and emergency conditions covering at least:

- transition from visual to instrument flight on take-off,
  - standard instrument departures and arrivals,
  - en-route IFR procedures,
  - holding procedures,
  - instrument approaches to specified minima,
  - missed approach procedures,
  - landings from instrument approaches, including circling;
- (iii) inflight manoeuvres and particular flight characteristics;
- (iv) operation of airship in the above exercises, including operation of the airship solely by reference to instruments with one engine simulated inoperative and engine shut-down and restart (the latter exercise to be carried out at a safe altitude unless carried out in an FFS or FNPT II).

### **AMC1 to Appendix 6 ‘Modular training course for the IR’**

#### **ALL MODULAR FLYING TRAINING COURSES FOR THE IR, EXCEPT COMPETENCYBASED MODULAR FLYING TRAINING COURSE**

- (a) The theoretical knowledge instruction may be given at an ATO conducting theoretical knowledge instruction only, in which case the head of training (HT) of that organisation should supervise that part of the course.
- (b) The 150 hours of instruction, which include the application of threat and error management (TEM), may include in suitable proportions:
- (1) classroom work;
  - (2) lessons;
  - (3) tutorials;
  - (4) demonstrations, including those supported by demonstration equipment;
  - (5) exercises carried out as groups or individuals and based on pre-flight and en-route planning, communications, presentations and projects;

- (6) exercises that use demonstration equipment or training devices;
- (7) directed study including workbook exercises or assignments;
- (8) aerodrome or aviation industry field trips;
- (9) computer-based training and e-learning elements;
- (10) progress tests; and
- (11) other training methods, media and tools approved by the Authority.

Approved distance-learning (correspondence) courses may also be offered as part of the course. The minimum amount of classroom instruction, as required by ORA.ATO.305, may include all of the above except item (b)(9).

## **AMC2 to Appendix 6 Modular training course for the IR**

### **SECTION A IR(A) - MODULAR FLYING TRAINING COURSE**

#### **Basic Instrument Flight Module Training Course**

- (a) This 10 hours module is focused on the basics of flying by sole reference to instruments, including limited panel and unusual attitude recovery.
- (b) All exercises may be performed in an FNPT I or II or an FFS, for a maximum of 5 hours. If instrument flight training is in VMC, a suitable means of simulating IMC for the student should be used.
- (c) A BITD may be used for the exercises 1, 2, 3, 4, 6, and 8.
- (d) The use of the BITD is subject to the following:
  - (1) the training should be complemented by exercises on an aeroplane;
  - (2) the record of the parameters of the flight must be available;
  - (3) an FI(A) or IRI(A) should conduct the instruction.

#### **EXERCISES**

- (e) Exercise 1:
  - (1) basic instrument flying without external visual cues; 0:30 hours

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- (2) horizontal flight; power changes for acceleration or deceleration;
  - (3) maintaining straight and level flight;
  - (4) turns in level flight with 15 ° and 25 ° bank, left and right;
  - (5) roll-out onto predetermined headings.
- (f) Exercise 2:
- (1) repetition of exercise 1; 0:45 hours
  - (2) additionally climbing, descending, maintaining heading and speed, transition to horizontal flight;
  - (3) climbing and descending turns.
- (g) Exercise 3:
- Instrument pattern: 0:45 hours
- (1) start exercise, decelerate to approach speed, flaps into approach configuration;
  - (2) initiate standard turn (left or right);
  - (3) roll out on opposite heading, maintain new heading for 1 minute
  - (4) standard turn, gear down, descend 500 ft/min;
  - (5) roll out on initial heading, maintain descent (500 ft/min) and new heading for 1 minute;
  - (6) transition to horizontal flight, 1000 ft below initial flight level;
  - (7) initiate go-around;
  - (8) climb at best rate of climb speed.
- (h) Exercise 4:
- Repetition of exercise 1 and 0:45 hours
- steep turns with 45° bank;
- recovery from unusual attitudes.

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- (i) Exercise 5:  
Repetition of exercise 4. 0:45 hours
- (j) Exercise 6:  
(1) radio navigation using VOR, NDB 0:45 hours  
or, if available, VDF;  
(2) interception of predetermined QDM, QDR.
- (k) Exercise 7:  
Repetition of exercise 1 and 0:45hours  
recovery from unusual attitudes.
- (l) Exercise 8:  
(1) Repetition of exercise 1; 0:45 hours  
(2) turns, level change and recovery from unusual attitudes with simulated failure of the artificial horizon or directional gyro.
- (m) Exercise 9:  
Recognition of, and recovery from, 0:45 hours  
incipient and full stalls.
- (n) Exercise 10: Repetition of exercises 6, 8 3:30 hours and 9.

**CERTIFICATE OF COMPLETION OF BASIC INSTRUMENT FLIGHT MODULE**

CERTIFICATE OF COMPLETION OF BASIC INSTRUMENT FLIGHT MODULE			
Pilot's last name(s):		First name(s):	
Type of licence:		Number:	State:
Flight training hours performed on SE aeroplane:		OR	Flight training hours performed on ME aeroplane:

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Flight training hours performed in an FSTD (maximum 5 hours):		
	Signature of applicant:	

The satisfactory completion of basic instrument flight module according to requirements is certified below:

<b>TRAINING</b>			
Basic instrument flight module training received during period:			
from:	to:	at:	ATO
Location and date:		Signature of head of training:	
Type and number of licence and state of issue:		Name(s) in capital letters of authorised instructor:	

**AMC3 to Appendix 6 ‘Modular training courses for the IR’**

**SECTION Aa IR(A) – COMPETENCY-BASED MODULAR FLYING TRAINING COURSE**

**(a) THEORETICAL KNOWLEDGE INSTRUCTION**

- (1) The theoretical knowledge instruction may be given at an ATO conducting theoretical knowledge instruction only, in which case the HT of that ATO should supervise that part of the course.
- (2) The hours required for the theoretical knowledge instruction for the IR following the competency-based training route should be divided between the subjects and include the application of threat and error management (TEM) as based on the ATO’s systems course design and agreed upon between the Authority and the ATO.

An approved course, which includes the application of threat and error management, may contain in suitable proportions:

- (i) classroom work;
- (ii) lessons;
- (iii) tutorials;
- (iv) demonstrations, including those supported by demonstration equipment;
- (v) exercises carried out as groups or individuals and based on pre-flight and en-route planning, communications, presentations and projects;
- (vi) exercises that use demonstration equipment or training devices;
- (vii) directed study including workbook exercises or assignments;
- (viii) aerodrome or aviation industry field trips;
- (ix) computer-based training and e-learning elements;
- (x) progress tests; and
- (xi) other training methods, media and tools approved by the Authority.

Approved distance-learning (correspondence) courses may also be offered as part of the course. The minimum amount of classroom instruction, as required by ORA.ATO.305, may include all of the above except item (a)(2)(ix).'

**(b) THEORETICAL KNOWLEDGE EXAMINATION**

The applicant for the IR following the competency-based training route should pass an examination to demonstrate a level of theoretical knowledge appropriate to the privileges granted in the subjects further detailed in FCL.615(b). The number of questions per subject, the distribution of questions and the time allocated to each subject is detailed in AMC1 ARA.FCL.300(b).

**AMC4 to Appendix 6 Modular training courses for the IR**

**SECTION Aa IR(A) – COMPETENCY-BASED MODULAR FLYING TRAINING COURSE  
FLYING TRAINING**

- (a) The instrument flight instruction outside an ATO provided by an IRI(A) or an FI(A) holding the privilege to provide training for the IR in accordance with Appendix 6 Section Aa (6)(a)(i)(A) may consist of instrument flight time under instruction or instrument ground time or a combination thereof.

**TRAINING AIRCRAFT**

- (b) The aeroplane used for the instrument flight training provided outside an ATO by an IRI(A) or FI(A) should be:
- (1) fitted with primary flight controls that are instantly accessible by both the student and the instructor (for example dual flight controls or a centre control stick). Swing-over flight controls should not be used; and
  - (2) suitably equipped to simulate instrument meteorological conditions (IMC) and for the instrument flight training required.
- (c) The FSTD used for the instrument flight instruction provided outside an ATO by an IRI(A) or FI(A) should be suitably equipped to simulate instrument meteorological conditions (IMC) and for the instrument flight training required

**AMC5 to Appendix 6 Modular training courses for the IR**

**SECTION Aa IR(A) – COMPETENCY-BASED MODULAR FLYING TRAINING COURSE**

**(6)(a)(i)(B); (6)(b)(i)(B)**

**PRIOR EXPERIENCE OF FLIGHT TIME UNDER IFR AS PIC**

A rating giving privileges to fly under IFR and in IMC referred to in (6)(a)(i)(B) and (6)(b)(i)(B) may be any of the following:

- (a) an EIR rating issued by an Authority of a Contracting State; or
- (b) a national instrument rating issued by a Contracting State prior to the application of the MCAR-Part-FCL; or
- (c) an instrument rating issued in compliance with the requirements of Annex 1 to the Chicago Convention by a third country; or



- (d) an authorisation issued by a Contracting State whose requirement meets the MCAR-Part-FCL.

The amount of credit given should not exceed the amount of hours completed as instrument flight time.

### **AMC6 to Appendix 6 Modular training courses for the IR**

#### **SECTION Aa IR(A) – COMPETENCY-BASED MODULAR FLYING TRAINING COURSE**

##### **(6)(a)(ii); (6)(b)(ii)**

##### **PRIOR INSTRUMENT FLIGHT TIME UNDER INSTRUCTION**

Prior instrument flight time under instruction on aeroplanes, as referred in (6)(a)(ii) and (6)(b)(ii), may be instrument flight time completed for the issue of:

- (a) an EIR rating issued by the Authority; or
- (b) a national instrument rating prior to the application of the MCAR-Part-FCL; or
- (c) an instrument rating in compliance with the requirements of Annex 1 to the Chicago Convention by a third country; or
- (d) an authorisation issued by a Contracting State whose requirements meet the MCAR-Part-FCL.

### **AMC7 to Appendix 6 Modular training courses for the IR**

#### **SECTION Aa IR(A) – COMPETENCY-BASED MODULAR FLYING TRAINING COURSE**

##### **(6)(c); (6)(d)**

##### **PRE-ENTRY ASSESSMENT AND TRAINING RECORD**

- (a) PRE-ENTRY ASSESSMENT

The assessment to establish the amount of training to be credited and to identify the training needs should be based on the training syllabus established in Appendix 6 Aa.

- (b) TRAINING RECORD

- (1) Before initiating the assessment the applicant should provide to an ATO a training record containing the details of the previous flight instruction provided by the IRI(A) or the FI(A). This training record should at least specify the aircraft type and registration used for the training, the number of flights and the total amount of instrument time under instruction. It should also specify all the exercises completed during the training by using the syllabus contained in Appendix 6 Aa.
- (2) The instructor having provided the training should keep the training records containing all the details of the flight training given for a period of at least 5 years after the completion of the training.

### **AMC8 to Appendix 6 Modular training courses for the IR**

#### **SECTION Aa IR(A) – COMPETENCY-BASED MODULAR FLYING TRAINING COURSE**

**(8)**

In order to be credited in full towards the multi-engine IR(A) training course requirements, the applicant should

- (a) hold a multi-engine IR(A), issued in accordance with the requirements of Annex 1 to the Chicago Convention by a third country;
- (b) have the minimum experience required in Appendix 6 Aa paragraph 8(c), of which at least 15 hours should be completed in a multi-engine aeroplane.

### **AMC9 to Appendix 6 Modular training courses for the IR**

#### **AIRSHIPS**

##### **Basic Instrument Flight Module Training Course**

- (a) This 10 hours module is focused on the basics of flying by sole reference to instruments, including limited panel and unusual attitude recovery.
- (b) All exercises may be performed in an FNPT I or II or an FFS, for a maximum of 5 hours. If instrument flight training is in VMC, a suitable means of simulating IMC for the student should be used.
- (c) A BITD may be used for the exercises 1, 2, 3, 4, 6 and 8.
- (d) The use of the BITD is subject to the following:

- (1) the training should be complemented by exercises on an airship;
- (2) the record of the parameters of the flight must be available;
- (3) an FI(As) or IRI(As) should conduct the instruction.

## **EXERCISES**

(e) Exercise 1:

- (1) basic instrument flying without external visual cues; 0:30 hours
- (2) horizontal flight;
- (3) maintaining straight and level flight;
- (4) turns in level flight, left and right;
- (5) rollout onto predetermined headings.

(f) Exercise 2:

- (1) Repetition of exercise 1; additionally climbing and descending 0:45 hours
- (2) maintaining heading and speed;
- (3) transition to horizontal flight;
- (4) climbing and descending turns.

(g) Exercise 3:

- Instrument pattern: 0:45 hours
- (1) start exercise, decelerate to approach speed, approach configuration;
  - (2) initiate standard turn (left or right);
  - (3) rollout on opposite heading, maintain new heading for 1 minute;
  - (4) standard turn, descend with given rate (for example 500 ft/min);

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- (5) rollout on initial heading, maintain descent (for example 500 ft/min) and new heading for 1 minute;
- (6) transition to horizontal flight (for example 1 000 ft below initial level);
- (7) initiate go-around;
- (8) climb at best rate of climb speed.
- (h) Exercise 4:
  - (1) repetition of exercise 1; 0:45 hours
  - (2) recovery from unusual attitudes.
- (i) Exercise 5  
Repetition of exercise 4. 0:45 hours
- (j) Exercise 6
  - (1) radio navigation using VOR, NDB 0:45 hours or, if available, VDF;
  - (2) interception of predetermined QDM, QDR.
- (k) Exercise 7
  - (1) repetition of exercise 1; 0:45 hours
  - (2) recovery from unusual attitudes.
- (l) Exercise 8
  - (1) repetition of exercise 1; 0:45 hours
  - (2) turns, level change and recovery from unusual attitudes with simulated failure of the artificial horizon or directional gyro.
- (m) Exercise 9  
Repetition of exercises (6) and (8). 4:15 hours

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**CERTIFICATE OF COMPLETION OF BASIC INSTRUMENT FLIGHT MODULE**

CERTIFICATE OF COMPLETION OF BASIC INSTRUMENT FLIGHT MODULE			
Pilot's last name(s):		First name(s):	
Type of licence:		Number:	State:
Flight training hours performed on airship:			
Flight training hours performed in an FSTD (maximum 5 hours):			
	Signature of applicant:		

The satisfactory completion of basic instrument flight module according to requirements is certified below:

<b>TRAINING</b>			
Basic instrument flight module training received during period:			
from:	to:	at:	ATO
Location and date:		Signature of head of training:	
Type and number of licence and state of issue:		Name(s) in capital letters of authorised instructor:	

## **GM1 to Appendix 6 Modular training courses for the IR**

**Aa. IR(A)(8)**

The following elements may be used by the examiner for the applicant's verbal demonstration of knowledge:

**(a) AIR LAW:**

- (1) explain the requirements for plus validity and privileges of instrument ratings;
- (2) explain why a time check has to be completed before flight;
- (3) describe the necessary action when an aircraft experiences a failure in communications;
- (4) state the responsibility of the operator when unable to utilise the published departure procedures;
- (5) explain when the omnidirectional method is used for departure;
- (6) describe the solutions when omnidirectional procedures are not possible;
- (7) justify the establishment of aircraft categories for the approach;
- (8) state the minimum obstacle clearance provided by the minimum sector altitudes (MSAs) established for an aerodrome;
- (9) describe the point of origin, shape, size, and subdivisions of the area used for MSAs;
- (10) explain why a pilot should not descend below obstacle clearance altitude/height (OCA/H) without visual reference, which is established for precision approach procedures, non-precision approach procedures and visual (circling) procedures;
- (11) translate the following acronyms into plain language: decision altitude (DA), decision height (DH), obstacle clearance altitude (OCA), obstacle clearance height (OCH), minimum decision altitude (MDA), minimum decision height (MDH), minimum obstacle clearance (MOC), decision altitude/height (DA/H), obstacle clearance altitude/height (OCA/H) and minimum decision altitude/height (MDA/H);

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- (12) explain the relationship between the following: DA, DH, OCA, OCH, MDA, MDH, MOC, DA/H, OCA/H and MDA/H;
- (13) define the following terms: initial approach fix (IAF), intermediate fix (IF), final approach fix (FAF), missed approach point (MAPt) and turning point;
- (14) state the accuracy of facilities providing track (omnidirectional radio range (VOR), instrument landing system (ILS), non-directional beacon (NDB));
- (15) state the optimum descent gradient (preferred for a precision approach) in degrees and per cent;
- (16) name the five standard segments of an instrument approach procedure and state the beginning and end for each of them;
- (17) describe where an arrival (ARR) route normally ends;
- (18) state whether or not omnidirectional or sector ARR are possible to be made;
- (19) explain the main task of the initial approach segment;
- (20) describe the main task of the intermediate approach segment;
- (21) state the main task of the final approach segment;
- (22) name the two possible aims of a final approach;
- (23) explain the term 'final approach point' in case of an ILS approach;
- (24) state what happens if an ILS glide path (GP) becomes inoperative during approach;
- (25) describe the main task of a missed approach procedure;
- (26) define 'MAPt';
- (27) state the pilot's reaction if upon reaching the MAPt, the required visual reference is not established;
- (28) describe what a pilot is expected to do in the event that a missed approach is initiated prior to arriving at the MAPt (a missed approach, after an approach flown as CDFA, should be made when reaching the MAPt or DA/H, whichever occurs first);

- (29) state whether the pilot is obliged to cross the MAPt at the A/H required by the procedure or whether they are allowed to cross the MAPt at an A/H greater than that required by the procedure;
- (30) describe what is meant by 'visual manoeuvring (circling)';
- (31) state the conditions to be fulfilled before descending below MDA/H in a visual manoeuvring (circling) approach;
- (32) state how the pilot is expected to behave after initial visual contact during a visual manoeuvring (circling);
- (33) describe what the pilot is expected to do if visual reference is lost while circling to land from an instrument approach;
- (34) describe the shape and terminology associated with the holding pattern;
- (35) state the bank angle and rate of turn to be used whilst flying in a holding pattern;
- (36) explain why pilots in a holding pattern should attempt to maintain tracks and how this is achieved;
- (37) describe where outbound timing begins in a holding pattern;
- (38) state where the outbound leg in a holding pattern terminates if the outbound leg is based on distance-measuring equipment (DME);
- (39) describe the three entry headings for entries into a holding pattern;
- (40) define the terms 'parallel entry', 'offset entry', and 'direct entry';
- (41) determine the correct entry procedure for a given holding pattern;
- (42) state the still-air time for flying on the outbound entry heading with or without DME;
- (43) define the following Q codes: 'QNH' and 'QFE';
- (44) define 'flight level' (FL);
- (45) state the intervals by which consecutive FLs should be separated;
- (46) describe how FLs are numbered;
- (47) define the term 'transition altitude';



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- (48) define the term 'transition level';
- (49) state how the vertical position of the aircraft should be expressed at or below the transition altitude and transition level;
- (50) define the term 'transition layer';
- (51) state when the QNH altimeter setting should be made available to departing aircraft;
- (52) state how a QNH altimeter setting should be made available to aircraft approaching a controlled aerodrome for landing;
- (53) state where during the climb, the altimeter setting should be changed from QNH to 1013.2 hPa;
- (54) describe when a pilot of an aircraft intending to land at an aerodrome should obtain the transition level;
- (55) describe when a pilot of an aircraft intending to land at an aerodrome should obtain the actual QNH altimeter setting;
- (56) state where the altimeter settings should be changed from 1013.2 hPa to QNH during descent for landing;
- (57) state the modes and codes that the pilot should operate in the absence of any air traffic control (ATC) directions or regional air navigation agreements;
- (58) state when the pilot should 'squawk ident';
- (59) state the transponder mode and code to indicate: a state of emergency, a failure in communications, an unlawful interference;
- (60) describe the consequences of an in-flight transponder failure;
- (61) state the primary action of the pilot in the case of an unserviceable transponder before departure when no repair or replacement at that aerodrome is possible;
- (62) understand the various rules and services that apply to the various classes of airspace;
- (63) describe the aim of clearances issued by the ATC with regard to instrument flight rules (IFR), visual flight rules (VFR) or special VFR flights, and refer to the different airspaces;

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- (64) explain what is meant by the expression 'clearance limit';
- (65) explain the meaning of the phrases 'cleared via flight planned route', 'cleared via (designation) departure' and 'cleared via (designation) ARR' in an ATC clearance;
- (66) list which items of an ATC clearance should always be read back by the flight crew;
- (67) justify the speed control by the ATC;
- (68) explain how the change from IFR to VFR may be initiated by the pilot in command (PIC);
- (69) define the following terms: 'transition level', 'transition layer', and 'transition altitude';
- (70) indicate how the vertical position of an aircraft in the vicinity of an aerodrome should be expressed at or below the transition altitude, at or above the transition level, and while climbing or descending through the transition layer;
- (71) list the six items that are normally included in a voice position report;
- (72) name the item of a position report which must be forwarded to the ATC with the initial call after changing to a new frequency;
- (73) understand the difference among the types of separation within the various classes of airspace and among the various types of flight;
- (74) state who is responsible for the avoidance of collision with other aircraft when operating in visual meteorological conditions (VMC);
- (75) explain the term 'expected approach time' and the procedures for its use;
- (76) state the reasons which may probably lead to the decision to use another take-off or landing direction than the one into the wind;
- (77) define the term 'radar vectoring';
- (78) explain the procedures for the conduct of surveillance radar approaches (SRAs);

- (79) state the mode and code of secondary surveillance radar (SSR) equipment that a pilot may operate in a (general) state of emergency, or (specifically) in case the aircraft is subject to unlawful interference;
  - (80) describe the expected action of the aircraft after receiving a broadcast from air traffic services (ATS) concerning the emergency descent of another aircraft;
  - (81) name the colours used for the various markings (runway (RWY), taxiway (TWY), aircraft stands, apron safety lines);
  - (82) describe the application and characteristics of RWY centre line markings and threshold markings;
  - (83) describe the wing bars of a precision approach path indicator (PAPI) and an abbreviated precision approach path indicator (A-PAPI); and
  - (84) interpret what the pilot sees during approach, using a PAPI, an APAPI, a T visual approach slope indicating system (TVASIS), and an abbreviated T visual approach slope indicator system (ATVASIS);
- (b) FLIGHT PLANNING AND FLIGHT MONITORING:
- (1) select the preferred airway(s) or route(s) considering:
    - (i) altitudes and FLs,
    - (ii) standard routes,
    - (iii) ATC restrictions,
    - (iv) the shortest distance,
    - (v) obstacles, and
    - (vi) any other relevant data;
  - (2) determine courses and distances from en route charts;
  - (3) determine bearings and distances of waypoints based on radio navigation aids on en route charts;
  - (4) define the following altitudes:
    - (i) minimum en route altitude (MEA),

- (ii) minimum obstacle clearance altitude (MOCA),
  - (iii) minimum off-route altitude (MORA),
  - (iv) grid minimum off-route altitude (Grid MORA),
  - (v) maximum authorised altitude (MAA),
  - (vi) minimum crossing altitude (MCA), and
  - (vii) minimum holding altitude (MHA);
- (5) extract the following altitudes from the chart(s):
- (i) MEA,
  - (ii) MOCA,
  - (iii) MORA,
  - (iv) Grid MORA,
  - (v) MAA,
  - (vi) MCA, and
  - (vii) MHA;
- (6) explain the reasons for studying standard instrument departure (SID) and standard ARR (STAR) charts;
- (7) state the reasons why the SID and STAR charts show procedures only in a pictorial presentation style which is not to scale;
- (8) interpret all data and information represented on SID and STAR charts, particularly:
- (i) routings,
  - (ii) distances,
  - (iii) courses,
  - (iv) radials,
  - (v) altitudes/levels,

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- (vi) frequencies, and
  - (vii) restrictions;
- (9) identify SIDs and STARs which may be relevant to a planned flight;
- (10) state the reasons why it is imperative to be familiar with instrument approach procedures and appropriate data for departure, destination, and alternate airfields prior to departure;
- (11) select instrument approach procedures appropriate for departure, destination, and alternate airfields;
- (12) interpret all procedures, data and information represented on instrument approach charts, particularly:
  - (i) courses and radials,
  - (ii) distances,
  - (iii) altitudes, levels or heights,
  - (iv) restrictions,
  - (v) obstructions,
  - (vi) frequencies,
  - (vii) speeds and times,
  - (viii) DA/Hs and MDA/H,
  - (ix) visibility and runway visual ranges (RVRs), and
  - (x) approach light systems;
- (13) find communications (COM) frequencies and call signs for the following:
  - (i) control agencies, service facilities, and flight information services (FISs),
  - (ii) weather information stations, and
  - (iii) automatic terminal information service (ATIS);
- (14) find the frequency and/or identifiers of radio navigation aids;

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- (15) complete the navigation plan with the courses, distances, and frequencies taken from charts;
- (16) find standard instrument departure and ARR routes to be flown or to be expected;
- (17) determine the position of top of climb (TOC) and top of descent (TOD), considering appropriate data;
- (18) determine variation and calculate magnetic/true courses;
- (19) calculate true airspeed (TAS) according to given aircraft performance data, altitude, and outside air temperature (OAT);
- (20) calculate wind correction angles (WCA)/drift and ground speeds (GSs);
- (21) determine all relevant altitudes/levels, particularly MEA, MOCA, MORA, MAA, MCA, MRA, and MSA;
- (22) calculate individual and accumulated times for each leg until destination and alternate airfields;
- (23) convert between volume, mass, and density given in different units commonly used in aviation;
- (24) determine relevant data from the flight manual, such as fuel capacity, fuel flow/consumption at different power/thrust settings, altitudes, and atmospheric conditions;
- (25) calculate attainable flight time/range considering fuel flow/consumption and available amount of fuel;
- (26) calculate the required fuel considering fuel flow/consumption and required time/range to be flown;
- (27) calculate the required fuel for an IFR flight considering expected meteorological conditions and expected delays under defined conditions;
- (28) find and analyse the latest state at the departure, destination, and alternate aerodromes, in particular with regard to:
  - (i) opening hours,
  - (ii) work in progress (WIP),

- (iii) special procedures due to WIP,
  - (iv) obstructions, and
  - (v) changes of frequencies for COM, navigation aids, and facilities;
- (29) find and analyse the latest en route state with regard to:
  - (i) airway(s) or route(s),
  - (ii) restricted, dangerous, and prohibited areas, and
  - (iii) changes of frequencies for COM, navigation aids, and facilities;
- (30) state the reasons for a fixed format of an International Civil Aviation Organization (ICAO) air traffic services flight plan (ATS FPL);
- (31) determine the correct entries to complete an FPL, as well as decode and interpret the entries in a completed FPL, particularly as regards the following:
  - (i) aircraft identification (Item 7),
  - (ii) flight rules and type of flight (Item 8),
  - (iii) number and type of aircraft and wake turbulence category (Item 9),
  - (iv) equipment (Item 10),
  - (v) departure aerodrome and time (Item 13),
  - (vi) route (Item 15),
  - (vii) destination aerodrome, total estimated elapsed time, and alternate aerodrome (Item 16),
  - (viii) other information (Item 18), and
  - (ix) supplementary information (Item 19);
- (32) complete the FPL using information from the following:
  - (i) navigation plan,
  - (ii) fuel plan, and

- (iii) operator's records on basic aircraft information;
  - (33) explain the requirements for the submission of an ATS FPL;
  - (34) explain the action to be taken in case of FPL changes;
  - (35) state the action to be taken in case of inadvertent changes to track, TAS, and time estimate, affecting the current FPL; and
  - (36) explain the procedures for closing an FPL;
- (c) METEOROLOGY:
- (1) describe qualitatively and quantitatively the temperature lapse rates of the troposphere (mean value of 0.65 °C/100 m or 2 °C/1 000 ft and actual values);
  - (2) explain the characteristics of inversions and of an isothermal layer;
  - (3) explain the cooling and warming of the air on the earth or sea surfaces;
  - (4) describe qualitatively the influence of the clouds on the cooling and warming of the earth or sea surfaces as well as of the air near those surfaces;
  - (5) explain the influence of the wind on the cooling and warming of the air near the earth or sea surfaces;
  - (6) define 'atmospheric pressure';
  - (7) list the units of measurement of atmospheric pressure used in aviation (hPa, in.);
  - (8) describe isobars on the surface weather charts;
  - (9) explain the pressure variation with height;
  - (10) describe qualitatively the variation of the barometric lapse rate (note: the average value for the barometric lapse rate near mean sea level is 27 ft (8 m) per 1 hPa, whereas at about 5 500 m above mean sea level (AMSL) is 50 ft (15 m) per 1 hPa;
  - (11) describe and interpret contour lines (isohypses) on a constant pressure chart;
  - (12) describe the relationship between pressure, temperature, and density;



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- (13) describe the vertical variation of the air density in the atmosphere;
- (14) describe the effect of humidity changes on the air density;
- (15) explain the use of standardised values for the international standard atmosphere (ISA);
- (16) list the main values of ISA (mean sea level pressure, mean sea level temperature, a vertical temperature lapse rate up to 20 km, as well as height and temperature of the tropopause);
- (17) calculate the standard temperature in Celsius degrees for a given FL;
- (18) determine a standard temperature deviation based on the difference between the given OAT and the standard temperature;
- (19) define the following terms and acronyms and explain how they are related to each other: H, A, pressure A, FL, pressure level, true A, true H, elevation, QNH, QFE, and standard altimeter setting;
- (20) describe the following terms: transition A, transition level, transition layer, terrain clearance, and lowest usable FL;
- (21) calculate the different readings on the altimeter when the pilot changes the altimeter setting;
- (22) illustrate with a numbered example the changes of the altimeter setting and the associated changes in reading when the pilot climbs through the transition altitude or descends through the transition level;
- (23) derive the reading of the altimeter of an aircraft on the ground when the pilot uses different settings;
- (24) explain the influence of the air temperature on the distance between the ground and the level reading on the altimeter as well as between two FLs;
- (25) explain the influence of pressure areas on the true altitude;
- (26) determine the true A/H for a given A/H and a given ISA temperature deviation;
- (27) describe why and how the wind changes direction and speed with H in the friction layer in the northern and southern hemisphere (rule of thumb);
- (28) describe and explain the origin and formation of mountain waves;

- (29) explain how mountain waves may be identified through their associated meteorological phenomena;
- (30) describe turbulence and gustiness;
- (31) list common types of turbulence (convective, mechanical, orographic, frontal, and clear-air turbulence);
- (32) indicate the sources of atmospheric humidity;
- (33) define 'dew point';
- (34) define 'relative humidity';
- (35) describe the relationship between temperature and dew point;
- (36) estimate the relative humidity of the air based on the difference between dew point and temperature;
- (37) explain the influence of relative humidity on the H of the cloud base;
- (38) list cloud types typical for stable and unstable air conditions;
- (39) identify by shape cirriform, cumuliform, and stratiform clouds;
- (40) explain the influence of inversions on vertical movements in the atmosphere;
- (41) name the factors contributing in general to the formation of fog and mist;
- (42) name the factors contributing to the formation of haze;
- (43) describe significant characteristics of orographic fog;
- (44) summarise the conditions for the dissipation of orographic fog;
- (45) list and describe the types of precipitation given in the aerodrome forecast (TAF) and aerodrome routine meteorological report (METAR) codes (drizzle, rain, snow, snow grains, ice pellets, hail, small hail, snow pellets, ice crystals, freezing drizzle, and freezing rain);
- (46) assign typical precipitation types and intensities to different clouds;
- (47) describe the boundaries between air masses (fronts);
- (48) define 'front' and 'frontal surface' ('frontal zone');

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- (49) define 'warm front';
- (50) describe the cloud, weather, ground visibility, and aviation hazards at a warm front depending on the stability of the warm air;
- (51) explain the seasonal differences in the weather at warm fronts;
- (52) describe the structure, slope, and dimensions of a warm front;
- (53) define 'cold front';
- (54) explain the seasonal differences in the weather at cold fronts;
- (55) describe the structure, slope, and dimensions of a cold front;
- (56) describe the cloud, weather, ground visibility, and aviation hazards in a warm sector;
- (57) describe the cloud, weather, ground visibility, and aviation hazards behind the cold front;
- (58) define the term 'occlusion';
- (59) identify the typical flat pressure pattern on a surface weather chart;
- (60) describe the weather associated with a flat pressure pattern;
- (61) explain the general weather conditions under which ice accretion on airframe occurs;
- (62) indicate in which circumstances ice may form on an aircraft on the ground: air temperature, humidity, precipitation;
- (63) explain in which circumstances ice may form on an aircraft in flight: inside clouds, in precipitation, outside clouds, and in the absence of precipitation;
- (64) describe the different factors influencing the intensity of icing: air temperature, amount of supercooled water in a cloud or in precipitation, amount of ice crystals in the air, speed of the aircraft, shape (thickness) of the airframe parts (wings, antennas, etc.);
- (65) define 'clear ice';
- (66) define 'rime ice';
- (67) define 'hoar frost';

- (68) state the ICAO qualifying terms for the intensity of icing;
- (69) describe in general the hazards of icing;
- (70) assess the dangers of the different types of ice accretion;
- (71) state the ICAO qualifying terms for the intensity of turbulence;
- (72) describe the effects of turbulence on an aircraft in flight;
- (73) indicate the possibilities of avoiding turbulence
  - (i) in the flight planning: weather briefing, choice of track, and altitude, and
  - (ii) during flight: choice of appropriate track and altitude;
- (74) define 'wind shear' (vertical and horizontal);
- (75) describe the conditions in which wind shear forms and how it forms (e.g. thunderstorms, squall lines, fronts, inversions, land and sea breeze, friction layer, and relief);
- (76) describe the effects of wind shear on flight;
- (77) indicate the possibilities of avoiding wind shear in flight:
  - (i) in the flight planning, and
  - (ii) during flight;
- (78) name the cloud types which indicate the development of thunderstorms;
- (79) describe the different types of thunderstorms, their location, the conditions for and the process of their development, and list their properties (air mass thunderstorms, frontal thunderstorms, squall lines, supercell storms, orographic thunderstorms);
- (80) assess the average duration of thunderstorms and their different stages;
- (81) summarise the flight hazards of a fully developed thunderstorm;
- (82) describe and assess 'St. Elmo's fire';
- (83) describe the effect of lightning strike on aircraft and flight execution;

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- (84) describe practical examples of flight techniques used to avoid the hazards of thunderstorms;
- (85) describe the influence of a mountainous terrain on cloud and precipitation;
- (86) describe the effects of the foehn;
- (87) describe the influence of a mountainous area on a frontal passage;
- (88) indicate the turbulent zones (mountain waves, rotors) on a sketch of a mountain chain;
- (89) describe the reduction of visibility caused by precipitation (drizzle, rain, and snow);
- (90) describe the differences between ground visibility, flight visibility, slant visibility, and vertical visibility when an aircraft is above or within a layer of haze or fog;
- (91) define 'ground visibility';
- (92) list the units used for visibility (m, km);
- (93) define 'RVR';
- (94) list the units used for RVR (m);
- (95) compare visibility and RVR;
- (96) define 'ceiling';
- (97) name the unit and the reference level used for information about the cloud base (ft);
- (98) define 'vertical visibility';
- (99) name the unit used for vertical visibility (ft);
- (100) interpret ground-weather radar images;
- (101) describe the basic principle of airborne weather radars as well as the type of information they provide;
- (102) describe the limits and errors of airborne weather radar information;
- (103) interpret typical airborne weather radar images;

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- (104) decode and interpret significant weather charts (low-, medium-, and high-level charts);
- (105) describe the flight conditions at designated locations or along a defined flight route at a given FL, based on a significant weather chart;
- (106) describe, decode (by using a code table), and interpret the following aviation weather messages (given in written or graphical format):
  - (i) METAR;
  - (ii) aerodrome special meteorological reports (SPECI);
  - (iii) trend forecast (TREND);
  - (iv) TAF;
  - (v) information concerning en route weather phenomena which may affect the safety of aircraft operations (SIGMET);
  - (vi) information concerning en route weather phenomena which may affect the safety of low level aircraft operations (AIRMET);
  - (vii) area forecast for low-level flights (GAMET);
  - (viii) automatic terminal information service (ATIS);
  - (ix) meteorological information for aircraft in flight (VOLMET);
  - (x) special air-report, and
  - (xi) volcanic-ash advisory information;
- (107) list in general the cases where a SIGMET and an AIRMET are issued; and
- (108) describe, decode (by using a code table), and interpret the following messages: runway state message (as written in a METAR) and general aviation forecast (GAFOR).

## **Appendix 7 – BIR and IR skill test**

1. Applicants shall have received instruction on the same class or type of aircraft to be used in the test which shall be appropriately equipped for the training and testing purposes.
2. An applicant shall pass all the relevant sections of the skill test. If any item in a section is failed, that section is failed. Failure in more than one section will require the applicant to take the entire test again. An applicant failing only one section shall only repeat the failed section. Failure in any section of the retest, including those sections that have been passed on a previous attempt, will require the applicant to take the entire test again. All relevant sections of the skill test shall be completed within 6 months. Failure to achieve a pass in all relevant sections of the test in two attempts will require further training.
3. Further training may be required following a failed skill test. There is no limit to the number of skill tests that may be attempted.

### **CONDUCT OF THE TEST**

4. The test is intended to simulate a practical flight. The route to be flown shall be chosen by the examiner. An essential element is the ability of the applicant to plan and conduct the flight from routine briefing material. The applicant shall undertake the flight planning and shall ensure that all equipment and documentation for the execution of the flight are on board. The duration of the flight shall be at least 1 hour.
5. Should the applicant choose to terminate a skill test for reasons considered inadequate by the examiner, the applicant shall retake the entire skill test. If the test is terminated for reasons considered adequate by the examiner, only those sections not completed shall be tested in a further flight.
6. At the discretion of the examiner, any manoeuvre or procedure of the test may be repeated once by the applicant. The examiner may stop the test at any stage if it is considered that the applicant's demonstration of flying skill requires a complete retest.
7. An applicant shall fly the aircraft from a position where the PIC functions can be performed and to carry out the test as if there is no other crew member. The examiner shall take no part in the operation of the aircraft, except when intervention is necessary in the interests of safety or to avoid unacceptable delay to other traffic. Responsibility for the flight shall be allocated in accordance with national regulations.

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8. Decision heights/altitude, minimum descent heights/altitudes and missed approach point shall be determined by the applicant and agreed by the examiner.
9. Applicants shall indicate to the examiner the checks and duties carried out, including the identification of radio facilities. Checks shall be completed in accordance with the authorised checklist for the aircraft on which the test is being taken. During pre-flight preparation for the test applicants shall determine power settings and speeds. The applicants shall calculate performance data for take-off, approach and landing in compliance with the operations manual or flight manual for the aircraft used.

**FLIGHT TEST TOLERANCES**

10. The applicant shall demonstrate the ability to:
  - operate the aircraft within its limitations;
  - complete all manoeuvres with smoothness and accuracy;
  - exercise good judgment and airmanship;
  - apply aeronautical knowledge; and
  - maintain control of the aircraft at all times in such a manner that the successful outcome of a procedure or manoeuvre is never seriously in doubt.
11. The following limits shall apply, corrected to make allowance for turbulent conditions and the handling qualities and performance of the aircraft used.

**Height**

Generally	±100 feet
Starting a go-around at decision height/altitude	+50 feet/–0 feet
Minimum descent height/MAP/altitude	+50 feet/–0 feet

**Tracking**

On radio aids	±5°
For angular deviations	Half scale deflection, azimuth and glide path (e.g. LPV, ILS, MLS, GLS)
2D (LNAV) and 3D (LNAV/VNAV) “linear” lateral deviations	cross-track error/deviation shall normally be limited to ± ½ the RNP value associated with the procedure. Brief deviations from this



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	standard up to a maximum of 1 time the RNP value are allowable.
3D linear vertical deviations (e.g. RNP APCH (LNAV/VNAV) using BaroVNAV)	not more than – 75 feet below the vertical profile at any time, and not more than + 75 feet above the vertical profile at or below 1 000 feet above aerodrome level.

### Heading

all engines operating	±5°
with simulated engine failure	±10°

### Speed

all engines operating	±5 knots
with simulated engine failure	+10 knots/–5 knots

## CONTENT OF THE TEST

### Aeroplanes

<b>SECTION 1 — PRE-FLIGHT OPERATIONS AND DEPARTURE</b>	
Use of checklist, airmanship, anti-icing/de-icing procedures, etc., apply in all sections	
a	Use of flight manual (or equivalent) especially a/c performance calculation, mass and balance
b	Use of Air Traffic Services document, weather document
c	Preparation of ATC flight plan, IFR flight plan/log
d	Identification of the required nav aids for departure, arrival and approach procedures
e	Pre-flight inspection
f	Weather Minima
g	Taxiing
h	PBN departure (if applicable): — Check that the correct procedure has been loaded in the navigation system; and — Cross-check between the navigation system display and the departure chart.
i	Pre-take-off briefing, Take-off
J <sup>(°)</sup>	Transition to instrument flight
k <sup>(°)</sup>	Instrument departure procedures, including PBN departures, and altimeter setting
l <sup>(°)</sup>	ATC liaison — compliance, R/T procedures
<b>SECTION 2 — GENERAL HANDLING<sup>(°)</sup></b>	
a	Control of the aeroplane by reference solely to instruments, including: level flight at various speeds, trim
b	Climbing and descending turns with sustained Rate 1 turn
c	Recoveries from unusual attitudes, including sustained 45° bank turns and steep descending turns

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d <sup>(*)</sup>	Recovery from approach to stall in level flight, climbing/descending turns and in landing configuration
e	Limited panel: stabilised climb or descent, level turns at Rate 1 onto given headings, recovery from unusual attitudes
<b>SECTION 3 — EN-ROUTE IFR PROCEDURES<sup>(*)</sup></b>	
a	Tracking, including interception, e.g. NDB, VOR, or track between waypoints
b	Use of navigation system and radio aids
c	Level flight, control of heading, altitude and airspeed, power setting, trim technique
d	Altimeter settings
e	Timing and revision of ETAs (en-route hold, if required)
f	Monitoring of flight progress, flight log, fuel usage, systems' management
g	Ice protection procedures, simulated if necessary
h	ATC liaison - compliance, R/T procedures
<b>SECTION 3a — ARRIVAL PROCEDURES</b>	
a	Setting and checking of navigational aids, and identification of facilities, if applicable
b	Arrival procedures, altimeter checks
c	Altitude and speed constraints, if applicable
d	PBN arrival (if applicable): — Check that the correct procedure has been loaded in the navigation system; and — Cross-check between the navigation system display and the arrival chart.
<b>SECTION 4<sup>(*)</sup> — 3D Operations<sup>(+)</sup></b>	
a	Setting and checking of navigational aids Check Vertical Path angle For RNP APCH: — Check that the correct procedure has been loaded in the navigation system; and — Cross-check between the navigation system display and the approach chart.
b	Approach and landing briefing, including descent/approach/landing checks, including identification of facilities
c <sup>(+)</sup>	Holding procedure
d	Compliance with published approach procedure
e	Approach timing
f	Altitude, speed heading control (stabilised approach)
g <sup>(+)</sup>	Go-around action
h <sup>(+)</sup>	Missed approach procedure/landing
i	ATC liaison – compliance, R/T procedures
<b>SECTION 5<sup>(*)</sup> – 2D OPERATIONS<sup>(++)</sup></b>	
a	Setting and checking of navigational aids For RNP APCH: — Check that the correct procedure has been loaded in the navigation system; and

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	— Cross-check between the navigation system display and the approach chart.
b	Approach and landing briefing, including descent/approach/landing checks, including identification of facilities
c <sup>(+)</sup>	Holding procedure
d	Compliance with published approach procedure
e	Approach timing
f	Altitude/Distance to MAPT, speed, heading control (stabilised approach), Stop Down Fixes (SDF(s)), if applicable
g <sup>(+)</sup>	Go-around action
h <sup>(+)</sup>	Missed approach procedure/landing
i	ATC liaison – compliance, R/T procedures
<b>SECTION 6 — FLIGHT WITH ONE ENGINE INOPERATIVE (multi-engine aeroplanes only) (°)</b>	
a	Simulated engine failure after take-off or on go-around
b	Approach, go-around and procedural missed approach with one engine inoperative
c	Approach and landing with one engine inoperative
d	ATC liaison – compliance, R/T procedures

(°) Must be performed by sole reference to instruments.

(\*) May be performed in an FFS, FTD 2/3 or FNPT II.

(+) May be performed in either Section 4 or Section 5.

(++) To establish PBN privileges, one approach in either Section 4 or Section 5 shall be an RNP APCH. Where an RNP APCH is not practicable, it shall be performed in an appropriately equipped FSTD.

## Helicopters

<b>SECTION 1 — DEPARTURE</b>	
Use of checklist, airmanship, anti-icing/de-icing procedures, etc., apply in all sections	
a	Use of flight manual (or equivalent) especially aircraft performance calculation; mass and balance
b	Use of Air Traffic Services document, weather document
c	Preparation of ATC flight plan, IFR flight plan/log
d	Identification of the required nav aids for departure, arrival and approach procedures
e	Pre-flight inspection
f	Weather minima
g	Taxiing/Air taxi in compliance with ATC or instructions of instructor
h	PBN departure (if applicable): — Check that the correct procedure has been loaded in the navigation system; and — Cross-check between the navigation system display and the departure chart.

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i	Pre-take-off briefing, procedures and checks
j	Transition to instrument flight
k	Instrument departure procedures, including PBN procedures
<b>SECTION 2 — GENERAL HANDLING</b>	
a	Control of the helicopter by reference solely to instruments, including:
b	Climbing and descending turns with sustained Rate 1 turn
c	Recoveries from unusual attitudes, including sustained 30° bank turns and steep descending turns
<b>SECTION 3 — EN-ROUTE IFR PROCEDURES</b>	
a	Tracking, including interception, e.g. NDB, VOR, RNAV
b	Use of radio aids
c	Level flight, control of heading, altitude and airspeed, power setting
d	Altimeter settings
e	Timing and revision of ETAs
f	Monitoring of flight progress, flight log, fuel usage, systems management
g	Ice protection procedures, simulated if necessary and if applicable
h	ATC liaison – compliance, R/T procedures
<b>SECTION 3a — ARRIVAL PROCEDURES</b>	
a	Setting and checking of navigational aids, if applicable
b	Arrival procedures, altimeter checks
c	Altitude and speed constraints, if applicable
d	PBN arrival (if applicable) — Check that the correct procedure has been loaded in the navigation system; and — Cross-check between the navigation system display and the arrival chart.
<b>SECTION 4 — 3D OPERATIONS<sup>(+)</sup></b>	
a	Setting and checking of navigational aids Check Vertical Path angle For RNP APCH: (a) Check that the correct procedure has been loaded in the navigation system; and (b) Cross-check between the navigation system display and the approach chart.
b	Approach and landing briefing, including descent/approach/landing checks
c <sup>(*)</sup>	Holding procedure
d	Compliance with published approach procedure
e	Approach timing
f	Altitude, speed, heading control (stabilised approach)
g <sup>(*)</sup>	Go-around action
h <sup>(*)</sup>	Missed approach procedure/landing
i	ATC liaison – compliance, R/T procedures
<b>SECTION 5 — 2D OPERATIONS<sup>(+)</sup></b>	
a	Setting and checking of navigational aids For RNP APCH: — Check that the correct procedure has been loaded in the navigation system; and

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	— Cross-check between the navigation system display and the approach chart.
b	Approach and landing briefing, including descent/approach/landing checks and identification of facilities
c <sup>(*)</sup>	Holding procedure
d	Compliance with published approach procedure
e	Approach timing
f	Altitude, speed, heading control (stabilised approach)
g <sup>(*)</sup>	Go-around action
h <sup>(*)</sup>	Missed approach procedure <sup>(*)</sup> /landing
i	ATC liaison – compliance, R/T procedures
<b>SECTION 6 — ABNORMAL AND EMERGENCY PROCEDURES</b>	
This section may be combined with sections 1 through 5. The test shall have regard to control of the helicopter, identification of the failed engine, immediate actions (touch drills), follow-up actions and checks and flying accuracy, in the following situations:	
a	Simulated engine failure after take-off and on/during approach <sup>(**)</sup> (at a safe altitude unless carried out in an FFS or FNPT II/III, FTD 2,3)
b	Failure of stability augmentation devices/hydraulic system (if applicable)
c	Limited panel
d	Autorotation and recovery to a pre-set altitude
e	3D operations manually without flight director <sup>(***)</sup> 3D operations manually with flight director <sup>(***)</sup>

(+) To establish PBN privileges, one approach in either Section 4 or Section 5 shall be an RNP APCH. Where an RNP APCH is not practicable, it shall be performed in an appropriately equipped FSTD.

(\*) To be performed in Section 4 or Section 5.

(\*\*) Multi-engine helicopter only.

(\*\*\*) Only one item to be tested

## **Airships**

<b>SECTION 1 — PRE-FLIGHT OPERATIONS AND DEPARTURE</b>	
Use of checklist, airmanship, ATC liaison compliance, R/T procedures, apply in all sections	
a	Use of flight manual (or equivalent) especially a/c performance calculation, mass and balance
b	Use of Air Traffic Services document, weather document
c	Preparation of ATC flight plan, IFR flight plan/log
d	Pre-flight inspection
e	Weather minima

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f	Pre-take-off briefing, off mast procedure, manoeuvring on ground
g	Take-off
h	Transition to instrument flight
i	Instrument departure procedures, altimeter setting
j	ATC liaison - compliance, R/T procedures
SECTION 2 — GENERAL HANDLING	
a	Control of the airship by reference solely to instruments
b	Climbing and descending turns with sustained rate of turn
c	Recoveries from unusual attitudes
d	Limited panel
SECTION 3 — EN-ROUTE IFR PROCEDURES	
a	Tracking, including interception, e.g. NDB, VOR, RNAV
b	Use of radio aids
c	Level flight, control of heading, altitude and airspeed, power setting, trim technique
d	Altimeter settings
e	Timing and revision of ETAs
f	Monitoring of flight progress, flight log, fuel usage, systems' management
g	ATC liaison – compliance, R/T procedures
SECTION 4 — PRECISION APPROACH PROCEDURES	
a	Setting and checking of navigational aids, identification of facilities
b	Arrival procedures, altimeter checks
c	Approach and landing briefing, including descent/approach/landing checks
d(+)	Holding procedure
e	Compliance with published approach procedure
f	Approach timing
g	Stabilised approach (altitude, speed and heading control)
h(+)	Go-around action
i(+)	Missed approach procedure/landing
j	ATC liaison – compliance, R/T procedures
SECTION 5 — NON-PRECISION APPROACH PROCEDURES	
a	Setting and checking of navigational aids, identification of facilities
b	Arrival procedures, altimeter settings
c	Approach and landing briefing, including descent/approach/landing checks
d(+)	Holding procedure
e	Compliance with published approach procedure
f	Approach timing
g	Stabilised approach (altitude, speed and heading control)
h(+)	Go-around action
i(+)	Missed approach procedure/landing
j	ATC liaison – compliance, R/T procedures

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**SECTION 6 — FLIGHT WITH ONE ENGINE INOPERATIVE**

This section may be combined with sections 1 through 5. The test shall have regard to control of the airship, identification of the failed engine, immediate actions, follow-up actions, checks and flying accuracy in the following situations:

- |   |  |
|---|--|
| a | Simulated engine failure after take-off or on go-around                      |
| b | Approach and procedural go-around with one engine inoperative                |
| c | Approach and landing, missed approach procedure, with one engine inoperative |
| d | ATC liaison – compliance, R/T procedures                                     |

(+) May be performed in either section 4 or section 5.

**AMC1 to Appendix 7 IR skill test**

**LAPL, BPL, SPL, PPL, CPL, IR SKILL TEST AND PROFICIENCY CHECK  
APPLICATION AND REPORT FORM**

<b>APPLICATION AND REPORT FORM</b>			
<b>LAPL, BPL, SPL, PPL, CPL, IR SKILL TEST AND PROFICIENCY CHECK</b>			
Applicant's last name(s):			
Applicant's first name(s):		LAPL: <input checked="" type="checkbox"/> A <input type="checkbox"/> H <input type="checkbox"/> B <input type="checkbox"/> S	
Signature of applicant:		BPL: <input type="checkbox"/> SPL: <input type="checkbox"/>	
Type of licence*:		PPL: <input checked="" type="checkbox"/> <input type="checkbox"/> H As <input type="checkbox"/>	
Licence number*:		CPL: <input checked="" type="checkbox"/> <input type="checkbox"/> H As <input type="checkbox"/>	
State:		IR: <input checked="" type="checkbox"/> A <input type="checkbox"/> H As <input type="checkbox"/>	
<b>1</b>	<b>Details of the flight</b>		
Group, class, type of aircraft:		Registration:	
<u>Aerodrome or site:</u>	<u>Take-off time:</u>	<u>Landing time:</u>	<u>Flight time:</u>
			Total flight time:
<b>2</b>	<b>Result of the test</b>		
Skill test details:			
Pass <input type="checkbox"/>	Fail <input type="checkbox"/>	Partial pass <input type="checkbox"/>	

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<b>3</b>	<b>Remarks</b>
Location and date:	
Examiner's certificate number *:	Type and number of licence:
Signature of examiner:	Name(s) in capital letters:

\* if applicable



## **Appendix 8 – Cross-crediting of the IR part of a class or type rating proficiency check or EBT practical assessment**

### **A. Aeroplanes**

If a skill test, proficiency check or EBT practical assessment including IR is performed, and holders have a valid:	Credit is valid towards the IR part in proficiency check for:
MPA type rating; single-pilot high-performance complex aeroplane type rating	SE class rating (*), and SE type rating (*), and SP ME class or type rating except for high-performance complex type ratings, only credits for Section 3B of the proficiency check in point B.5 of Appendix 9 (*)
SP ME aeroplane class or type rating except for high- performance complex aeroplane type ratings, operated as single-pilot	SE class rating, and SE type rating, and SP ME class or type rating except for high-performance complex aeroplane type ratings
SP ME aeroplane class or type rating except for high- performance complex aeroplane type ratings, restricted to MP operations	SE class rating (*) , and SE type rating (*) , and SP ME class or type rating except for high-performance complex aeroplane type ratings (*)
SP SE aeroplane class or type rating	SE class rating, and SE type rating

\* Provided that within the preceding 12 months the applicants have flown at least three IFR departures and approaches exercising PBN privileges, including at least one RNP APCH approach on an SP class or type of aeroplane in SP operations, or, for multi-engine, other than HP complex aeroplanes, the applicants have passed Section 6 of the skill test for SP, other than HP complex aeroplanes flown solely by reference to instruments in SP operations.

### **B. Helicopters**

Credits shall be granted only if holders are revalidating or renewing IR privileges for single-pilot helicopters, as appropriate.

If a skill test or a proficiency check, including IR, is performed and the holders have a valid:	Credit is valid towards the IR part in a proficiency check for:
Multi-pilot helicopter (MPH) type rating	Single-pilot helicopter (SPH) of the same type, including privileges for single-pilot operations (* <sup>1</sup> )

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Single-pilot helicopter (SPH) type rating, in multi-pilot operations

Privileges for single-pilot operations in the same type (\*1)

\*1 Provided that within the preceding 12 months at least three IFR departures and approaches exercising PBN privileges, including one RNP APCH approach (which may be a Point in Space (PinS) approach), have been performed on a SP type of helicopter in SP operations.

**Appendix 9 – Training, skill test and proficiency check for the MPL, and the ATPL, and for type and class ratings, and proficiency checks for the BIR and the IR**

**A. General**

1. Applicants for a skill test shall have received instruction in the same class or type of aircraft to be used in the test.
- 1a. Training in FFS in accordance with points 1b and 1c of this Section shall be complemented with take-off and landing training in a single-pilot aircraft operated in single-pilot or multi-pilot operations, or in a multi-pilot aircraft, as applicable, in accordance with point 17 of this Section, unless the training is completed in accordance with point FCL.730.A or constitutes training for cruise relief co-pilots in accordance with Section B, point 6(i), of this Appendix.
- 1b. The training for MPA and PL type ratings shall be conducted in an FFS or in a combination of FSTD(s) and FFS. The skill test or proficiency check for MPA and PL type ratings and the issue of an ATPL and an MPL, shall be conducted in an FFS, if available.
- 1c. The training, skill test or proficiency check for class or type ratings for SPA and helicopters shall be conducted in either of the following:
  - (a) an available and accessible FFS, or in a combination of such FFS and FSTD(s);
  - (b) a combination of FSTD(s) and the aircraft if an FFS is not available or accessible;
  - (c) the aircraft if no FSTD is available or accessible.
- 1d. By way of derogation from point 1c, the training, skill test or proficiency check for class or type ratings for non-complex SPA and for non-complex helicopters may be conducted in a combination of FSTD(s) and the aircraft even if an FFS is available and accessible.
- 1e. By way of derogation from point 1c, the training, skill test or proficiency check for any of the following may be conducted in accordance with points 1c(a), (b) or (c), irrespective of the availability and accessibility of FFS or FSTD:
  - (a) non-complex non-high-performance single-pilot aeroplanes;

- (b) TMGs;
  - (c) non-complex helicopters for which the maximum certified seat configuration does not exceed five seats.
- 1f. If FSTDs are used during training, testing or checking, the suitability of the FSTDs used shall be verified against the applicable 'Table of functions and subjective tests' and the applicable 'Table of FSTD validation tests' contained in the primary reference document applicable for the device used. All restrictions and limitations indicated on the device's qualification certificate shall be considered.
2. Failure to achieve a pass in all sections of the test in two attempts will require further training.
3. There is no limit to the number of skill tests that may be attempted.

#### **CONTENT OF THE TRAINING/SKILL TEST/PROFICIENCY CHECK**

4. Unless otherwise determined in the operational suitability data established in accordance with MCAR-Part-21, the syllabus of flight instruction, the skill test and the proficiency check shall comply with this Appendix. The syllabus, skill test and proficiency check may be reduced to give credit for previous experience on similar aircraft types, as determined in the OSD.
5. Except in the case of skill tests for the issue of an ATPL, when so defined in the OSD for the specific aircraft, credit may be given for skill test items common to other types or variants where the pilots are qualified.

#### **CONDUCT OF THE TEST/CHECK**

6. The examiner may choose between different skill test or proficiency check scenarios containing simulated relevant operations. Full-flight simulators and other training devices shall be used, as established in this MCAR-Part-FCL.
7. During the proficiency check, the examiner shall verify that holders of the class or type rating maintain an adequate level of theoretical knowledge.
8. Should applicants choose to terminate a skill test for reasons considered inadequate by the examiner, they shall retake the entire skill test. If the test is terminated for reasons considered adequate by the examiner, only those sections not completed shall be tested in a further flight.
9. At the discretion of the examiner, any manoeuvre or procedure of the test may be repeated once by the applicants. The examiner may stop the test at any stage if it

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is considered that the applicants' demonstration of flying skill requires a complete retest.

10. Applicants shall be required to fly the aircraft from a position where the PIC or co-pilot functions, as relevant, can be performed. Under single-pilot conditions, the test shall be performed as if there was no other crew member present.
11. During preflight preparation for the test, applicants are required to determine power settings and speeds. Applicants shall indicate to the examiner the checks and duties carried out, including the identification of radio facilities. Checks shall be completed in accordance with the checklist for the aircraft on which the test is being taken and, if applicable, with the MCC concept. Performance data for take-off, approach and landing shall be calculated by applicants in compliance with the operations manual or flight manual for the aircraft used. Decision heights/altitudes, minimum descent heights/altitudes and missed approach point shall be agreed upon with the examiner.
12. The examiner shall take no part in the operation of the aircraft except where intervention is necessary in the interests of safety or to avoid unacceptable delay to other traffic.

**SPECIFIC REQUIREMENTS FOR THE TRAINING, SKILL TEST AND PROFICIENCY CHECK FOR TYPE RATINGS FOR MULTI-PILOT AIRCRAFT, FOR SINGLE-PILOT AIRCRAFT WHEN OPERATED IN MULTI- PILOT OPERATIONS, FOR THE MPL AND FOR THE ATPL**

13. The skill test for a multi-pilot aircraft or a single-pilot aircraft when operated in multi-pilot operations shall be performed in a multi-crew environment. Another applicant or another type rated qualified pilot may function as the second pilot. If an aircraft is used, the second pilot shall be the examiner or an instructor.
14. Applicants shall operate as PF during all sections of the skill test, except for abnormal and emergency procedures, which may be conducted as PF or PM in accordance with MCC. Applicants for the initial issue of a multi-pilot aircraft type rating or ATPL shall also demonstrate the ability to act as PM. Applicants may choose either the left-hand or the right-hand seat for the skill test if all items can be executed from the selected seat.
15. The following matters shall be specifically checked by the examiner for applicants for the ATPL or a type rating for multi-pilot aircraft or for multi-pilot operations in a single-pilot aircraft extending to the duties of a PIC, irrespective of whether the applicants act as PF or PM:
  - (a) managing crew cooperation;

- (b) maintaining a general survey of the aircraft operation by appropriate supervision; and
  - (c) setting priorities and making decisions in accordance with safety aspects and relevant rules and regulations appropriate to the operational situation, including emergencies.
16. The test or check should be accomplished under IFR, if the IR rating is included, and as far as possible be accomplished in a simulated commercial air transport environment. An essential element to be checked is the ability to plan and conduct the flight from routine briefing material.
17. When their type rating course has included less than 2 hours of flight training in the aircraft, applicants shall, before or after the skill test, complete flight training in the aircraft.

Such approved flight training shall include take-off and landing manoeuvres and shall be performed by a qualified instructor under the responsibility of:

- (a) an ATO; or
- (b) an organisation holding an AOC issued in accordance with MCAR-Part-ORO and specifically approved for such training; or
- (c) the instructor, in cases where no aircraft flight training for SP aircraft at an ATO or AOC holder is approved, and the aircraft flight training was approved by the applicants' Authority.

A certificate of completion of the type rating course including the flight training in the aircraft shall be forwarded to the Authority before the new type rating is entered in the applicants' licence.

18. For the upset recovery training, 'stall event' means either an approach-to-stall or a stall. An FFS can be used by the ATO to either train recovery from a stall or demonstrate the type-specific characteristics of a stall, or both, provided that:
- (a) the FFS has been qualified in accordance with the special evaluation requirements in CS-FSTD(A); and
  - (b) the ATO has successfully demonstrated to the Authority that any negative transfer of training is mitigated.

### **B. Specific requirements for the aeroplane category**

#### **PASS MARKS**

1. In the case of single-pilot aeroplanes, with the exception of single-pilot high-performance complex aeroplanes, applicants shall pass all sections of the skill test or proficiency check. Failure in any item of a section will cause applicants to fail the entire section. If they fail only one section, they shall repeat only that section. Failure in more than one section will require applicants to repeat the entire test or check. Failure in any section in the case of a retest or recheck, including those sections that have been passed on a previous attempt, will require applicants to repeat the entire test or check again. For single-pilot multi-engine aeroplanes, Section 6 of the relevant test or check, addressing asymmetric flight, shall be passed.
2. In the case of multi-pilot and single-pilot high-performance complex aeroplanes, applicants shall pass all sections of the skill test or proficiency check. Failure in more than five items will require applicants to take the entire test or check again. Applicants failing five or fewer items shall take the failed items again. Failure in any item on the retest or recheck, including those items that have been passed on a previous attempt, will require applicants to repeat the entire check or test again.

### **FLIGHT TEST TOLERANCE**

3. Applicants shall demonstrate the ability to:
  - (a) operate the aeroplane within its limitations;
  - (b) complete all manoeuvres with smoothness and accuracy;
  - (c) exercise good judgement and airmanship;
  - (d) apply aeronautical knowledge;
  - (e) maintain control of the aeroplane at all times in such a manner that the successful outcome of a procedure or manoeuvre is never in doubt;
  - (f) understand and apply crew coordination and incapacitation procedures, if applicable; and
  - (g) communicate effectively with the other crew members, if applicable.
4. The following limits shall apply, corrected to make allowance for turbulent conditions and the handling qualities and performance of the aeroplane used:

Height

Generally

± 100 ft

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Starting a go-around at decision height/altitude	+ 50 ft/– 0 ft
Minimum descent height/MAPt/altitude	+ 50 ft/– 0 ft
Tracking	
On radio aids	±5°
For ‘angular’ deviations	Half-scale deflection, azimuth and glide path (e.g. LPV, ILS, MLS, GLS)
2D (LNAV) and 3D (LNAV/VNAV) ‘linear’ lateral deviations	cross-track error/deviation shall normally be limited to ± ½ of the RNP value associated with the procedure. Brief deviations from this standard up to a maximum of one time the RNP value are allowable.
3D linear vertical deviations (e.g. RNP APCH (LNAV/VNAV) using BaroVNAV)	not more than – 75 ft below the vertical profile at any time, and not more than + 75 ft above the vertical profile at or below 1 000 ft above aerodrome level.
Heading	
all engines operating	± 5°
with simulated engine failure	± 10°
Speed	
all engines operating	± 5 knots
with simulated engine failure	+ 10 knots/– 5 knots



## **CONTENT OF THE TRAINING/SKILL TEST/PROFICIENCY CHECK**

5. Single-pilot aeroplanes, except for high performance complex aeroplanes

(a) The following symbols mean:

P = Trained as PIC or co-pilot and as PF and PM

OTD = Other training devices may be used for this exercise

X = An FFS shall be used for this exercise; otherwise, an aeroplane shall be used if appropriate for the manoeuvre or procedure

P# = The training shall be complemented by supervised aeroplane inspection

(b) The practical training shall be conducted at least at the training equipment level shown as (P), or may be conducted on any higher level of equipment shown by the arrow (---->).

The following abbreviations are used to indicate the training equipment used:

A = aeroplane

FFS = full-flight simulator

FSTD = flight simulation training device

(c) The starred (\*) items of Section 3B and, for multi-engine, Section 6, shall be flown solely by reference to instruments if revalidation/renewal of an IR is included in the skill test or proficiency check. If the starred (\*) items are not flown solely by reference to instruments during the skill test or proficiency check, and when there is no crediting of IR privileges, the class or type rating will be restricted to VFR only.

(d) Section 3A shall be completed to revalidate a type or multi-engine class rating, VFR only, where the required experience of 10 route sectors within the previous 12 months has not been completed. Section 3A is not required if Section 3B is completed.

(e) Where the letter 'M' appears in the skill test or proficiency check column, this will indicate a mandatory exercise or a choice where more than one exercise appears.

- (f) An FSTD shall be used for practical training for type or ME class ratings if they form part of an approved class or type rating course. The following considerations will apply to the approval of the course:
  - (i) the qualification of the FSTD as set out in the relevant requirements of MCAR-Part-ARA and MCAR-Part-ORA;
  - (ii) the qualifications of the instructors;
  - (iii) the amount of FSTD training provided on the course; and
  - (iv) the qualifications and previous experience on similar types of the pilots under training.
- (g) To exercise the privileges of a class or type rating in multi-pilot operations in accordance with point FCL.725(d) or (da), pilots that are already entitled to operate the relevant class or type of aeroplane in single-pilot operations shall meet the following conditions:
  - (1) complete a bridge course containing manoeuvres and procedures including MCC as well as the exercises of Section 7 using threat and error management (TEM), CRM and human factors at an organisation that is specified in point FCL.725(d)(1)(i);
  - (2) pass a proficiency check in multi-pilot operations.
- (h) To exercise the privileges of a type rating in single-pilot operations in accordance with point FCL.725(d), pilots that are already entitled to operate the relevant type of aeroplane in multi-pilot operations shall be trained at an organisation that is specified in point FCL.725(d) (1)(i) and checked for the following additional manoeuvres and procedures in single-pilot operations:
  - (i) for SE aeroplanes, 1.6, 4.5, 4.6, 5.2 and, if applicable, one approach from Section 3.B;
  - (ii) for ME aeroplanes, 1.6, Section 6 and, if applicable, one approach from Section 3.B.
- (i) Pilots that are entitled to exercise the privileges of a class or type rating in both single-pilot and multi-pilot operations in accordance with points (g) and (h) may maintain privileges for both forms of operation by completing either of the following:
  - (i) two proficiency checks, one in single-pilot operations and one in multi-pilot operations;

- (ii) a proficiency check in multi-pilot operations in addition to the exercises referred to in points (h)(i) or (h)(ii), as applicable, in single-pilot operations.

Proficiency checks for the revalidation or renewal of class ratings shall always include the exercises referred to in points (h)(i) or (h)(ii), as applicable, in single-pilot operations.

- (j) To remove a restriction to multi-pilot operations from a single-pilot aeroplane type rating in accordance with point FCL.725(d)(2), pilots shall comply with point (h).
- (k) The training, testing and checking shall follow the table mentioned below.
  - (1) Training at an ATO, testing and checking requirements for single-pilot privileges
  - (2) Training at an ATO, testing and checking requirements for multi-pilot privileges
  - (3) Training at an ATO, testing and checking requirements for pilots holding single-pilot privileges seeking multi-pilot privileges for the first time (bridge course)
  - (4) Training at an ATO, testing and checking requirements for pilots holding multi-pilot privileges seeking single-pilot privileges for the first time (bridge course)
  - (5) Training at an ATO and checking requirements for combined revalidation and renewal of single and multi-pilot privileges

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	(1)		(2)		(3)		(4)		(5)	
	Type of operation									
Type of aircraft	SP		MP		SP → MP (initial)		MP → SP (initial)		SP + MP	
	Training	Testing/ checking	Training	Testing/ checking	Training	Testing/ checking	Training, testing and checking (SE aeroplanes)	Train- ing, test- ing and check- ing (ME aeroplanes)	SE aeroplanes	ME aeroplanes
Initial issue										
All (except SP complex)	Sections 1-6	Sections 1-6	MCC CRM Human factors TEM Sections 1-7	Sections 1-6	MCC CRM Human factors TEM Section 7	Sections 1-6	1.6, 4.5, 4.6, 5.2 and, if applicable, one approach from Section 3.B	1.6, Section 6 and, if applicable, one approach from Section 3.B		
SP complex	1-7	1-6								
Revalidation										
All	n/a	Sections 1-6	n/a	Sections 1-6	n/a	n/a	n/a	n/a	MPO: Sections 1-7 (training) Section 1-6	MPO: Sections 1-7 (training) Sections 1-6

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									(checkin g) SPO: 1.6, 4.5, 4.6, 5.2 and, if applica- ble, one approach from Section 3.B	(checkin g) SPO: 1.6, Sec- tion 6 and, if applica- ble, one approach from Section 3.B
<b>Renewal</b>										
All	FCL.740	Sections 1-6	FCL.740	Sections 1-6	n/a	n/a	n/a	n/a	Training: FCL.740 Check: as for the revalida- tion	Training: FCL.740 Check: as for the revalida- tion

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- (I) To establish or maintain PBN privileges, one approach shall be an RNP APCH. Where an RNP APCH is not practicable, it shall be performed in an appropriately equipped FSTD.

By way of derogation from the first paragraph, in cases where a proficiency check for revalidation of PBN privileges is performed in an aircraft or an FSTD representing that aircraft, which are not equipped for RNP APCH manoeuvres, the proficiency check may not include RNP APCH exercises. In such cases, the PBN privileges of the pilot shall not include RNP APCH. The restriction shall be lifted if the pilot has completed a proficiency check including an RNP APCH exercise for the relevant class or type.

TMGs AND SINGLE-PILOT AEROPLANES, EXCEPT FOR HIGH-PERFORMANCE COMPLEX AEROPLANES		PRACTICAL TRAINING			CLASS OR TYPE RATING SKILL TEST/PROF. CHECK	
Manoeuvres/Procedures		FSTD	A	Instructor initials when training completed	Tested or checked in FSTD or A	Examiner initials when test or check completed
<b>SECTION 1</b>						
1	Departure	OTD				
1.1	Preflight including: – documentation; – mass and balance; – weather briefing; and – NOTAM.					
1.2	Pre-start checks					
1.2.1	External	OTD P#	P		M	
1.2.2	Internal	OTD P#	P		M	
1.3	Engine starting: normal malfunctions	P---->	---->		M	
1.4	Taxiing	P---->	---->		M	
1.5	Pre-departure checks: engine run-up (if applicable)	P---->	---->		M	
1.6	Take-off procedure: – normal with flight manual flap settings; and	P---->	---->		M	

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TMGs AND SINGLE-PILOT AEROPLANES, EXCEPT FOR HIGH-PERFORMANCE COMPLEX AEROPLANES		PRACTICAL TRAINING			CLASS OR TYPE RATING SKILL TEST/PROF. CHECK	
Manoeuvres/Procedures		FSTD	A	Instructor initials when training completed	Tested or checked in FSTD or A	Examiner initials when test or check completed
	– crosswind (if conditions are available).					
1.7	Climbing: – V <sub>x</sub> /V <sub>y</sub> – turns onto headings; and – level off.	P---->	---->		M	
1.8	ATC liaison – compliance, R/T procedures	P---->			M	
<b>SECTION 2</b>						
2	Airwork (visual meteorological conditions (VMC))	P---->	---->			
2.1	Straight and level flight at various airspeeds including flight at critically low air-speed with and without flaps (including approach to V <sub>mca</sub> when applicable)					
2.2	Steep turns (360° left and right at 45° bank)	P---->	---->		M	
2.3	Stalls and recovery: (i) clean stall; (ii) approach to stall in descending turn with bank with approach configuration and power; (iii) approach to stall in landing configuration and power; and (iv) approach to stall, climbing turn with take-off flap and climb power (single-engine aeroplanes only)	P---->	---->		M	

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TMGs AND SINGLE-PILOT AEROPLANES, EXCEPT FOR HIGH-PERFORMANCE COMPLEX AEROPLANES		PRACTICAL TRAINING			CLASS OR TYPE RATING SKILL TEST/PROF. CHECK	
Manoeuvres/Procedures		FSTD	A	Instructor initials when training completed	Tested or checked in FSTD or A	Examiner initials when test or check completed
2.4	Handling using autopilot and flight director (may be conducted in Section 3), if applicable	P---->	---->		M	
2.5	ATC liaison – Compliance, R/T procedures	P---->	---->		M	
<b>SECTION 3A</b>						
3A 3A.1	En route procedures VFR (see B.5 (c) and (d)) Flight plan, dead reckoning and map reading	P---->	---->			
3A.2	Maintenance of altitude, heading and speed	P---->	---->			
3A.3	Orientation, timing and revision of ETAs	P---->	---->			
3A.4	Use of radio navigation aids (if applicable)	P---->	---->			
3A.5	Flight management (flight log, routine checks including fuel, systems and icing)	P---->	---->			
3A.6	ATC liaison – compliance, R/T procedure	P---->	---->			
<b>SECTION 3B</b>						
3B 3B.1*	Instrument flight Departure IFR	P---->	---->		M	
3B.2*	En route IFR	P---->	---->		M	
3B.3*	Holding procedures	P---->	---->		M	
3B.4*	3D operations to decision height/altitude (DH/A) of 200 ft (60 m) or to higher minima if required by the	P---->	---->		M	



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TMGs AND SINGLE-PILOT AEROPLANES, EXCEPT FOR HIGH-PERFORMANCE COMPLEX AEROPLANES		PRACTICAL TRAINING			CLASS OR TYPE RATING SKILL TEST/PROF. CHECK	
Manoeuvres/Procedures		FSTD	A	Instructor initials when training completed	Tested or checked in FSTD or A	Examiner initials when test or check completed
	approach procedure (auto-pilot may be used to the final approach segment vertical path intercept)					
3B.5*	2D operations to minimum descent height/altitude (MDH/A)	P---->	---->		M	
3B.6*	Flight exercises including simulated failure of the compass and attitude indicator: – rate 1 turns; and – recoveries from unusual attitudes.	P---->	---->		M	
3B.7*	Failure of localiser or glideslope	P---->	---->			
3B.8*	ATC liaison – compliance, R/T procedures	P---->	---->		M	
	Intentionally left blank					
<b>SECTION 4</b>						
4	Arrival and landings	P---->	---->		M	
4.1	Aerodrome arrival procedure					
4.2	Normal landing	P---->	---->		M	
4.3	Flapless landing	P---->	---->		M	
4.4	Crosswind landing (if suitable conditions)	P---->	---->			
4.5	Approach and landing with idle power from up to 2 000 ft above the runway (single-engine aeroplanes only)	P---->	---->			
4.6	Go-around from minimum height	P---->	---->		M	

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TMGs AND SINGLE-PILOT AEROPLANES, EXCEPT FOR HIGH-PERFORMANCE COMPLEX AEROPLANES		PRACTICAL TRAINING			CLASS OR TYPE RATING SKILL TEST/PROF. CHECK	
Manoeuvres/Procedures		FSTD	A	Instructor initials when training completed	Tested or checked in FSTD or A	Examiner initials when test or check completed
4.7	Night go-around and landing (if applicable)	P---->	---->			
4.8	ATC liaison – compliance, R/T procedures	P---->	---->		M	
<b>SECTION 5</b>						
5	Abnormal and emergency procedures (This section may be combined with Sections 1 through 4.)					
5.1	Rejected take-off at a reasonable speed	P---->	---->		M	
5.2	Simulated engine failure after take-off (single-engine aeroplanes only)		P		M	
5.3	Simulated forced landing without power (single-engine aeroplanes only)		P		M	
5.4	Simulated emergencies: (i) fire or smoke in flight; and (ii) systems' malfunctions as appropriate	P---->	---->			
5.5	ME aeroplanes and TMG training only: engine shut-down and restart (at a safe altitude if performed in the aircraft)	P---->	---->			
5.6	ATC liaison – compliance, R/T procedure					
<b>SECTION 6</b>						
6 6.1*	Simulated asymmetric flight	P---->	---->X		M	

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TMGs AND SINGLE-PILOT AEROPLANES, EXCEPT FOR HIGH-PERFORMANCE COMPLEX AEROPLANES		PRACTICAL TRAINING			CLASS OR TYPE RATING SKILL TEST/PROF. CHECK	
Manoeuvres/Procedures		FSTD	A	Instructor initials when training completed	Tested or checked in FSTD or A	Examiner initials when test or check completed
	(This section may be combined with Sections 1 through 5.) Simulated engine failure during take-off (at a safe altitude unless carried out in an FFS or an FNPT II)					
6.2*	Asymmetric approach and go-around	P---->	---->		M	
6.3*	Asymmetric approach and full-stop landing	P---->	---->		M	
6.4	ATC liaison – compliance, R/T procedures	P---->	---->		M	
<b>SECTION 7</b>						
7	UPRT					
7.1	Flight manoeuvres and procedures					
7.1.1	Manual flight with and without flight directors (no autopilot, no autothrust/autothrottle, and at different control laws, where applicable)	P---->	---->			
7.1.1.1	At different speeds (including slow flight) and altitudes within the FSTD training envelope.	P---->	---->			
7.1.1.2	Steep turns using 45° bank, 180° to 360° left and right	P---->	---->			
7.1.1.3	Turns with and without spoilers	P---->	---->			
7.1.1.4	Procedural instrument flying and manoeuvring including	P---->	---->			

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TMGs AND SINGLE-PILOT AEROPLANES, EXCEPT FOR HIGH-PERFORMANCE COMPLEX AEROPLANES		PRACTICAL TRAINING			CLASS OR TYPE RATING SKILL TEST/PROF. CHECK	
Manoeuvres/Procedures		FSTD	A	Instructor initials when training completed	Tested or checked in FSTD or A	Examiner initials when test or check completed
	instrument departure and arrival, and visual approach					
7.2 7.2.1	Upset recovery training Recovery from stall events in: – take-off configuration; – clean configuration at low altitude; – clean configuration near maximum operating altitude; and – landing configuration	P---->	---->			
7.2.2	The following upset exercises: – recovery from nose-high at various bank angles; and – recovery from nose-low at various bank angles.	P	X An aeroplane shall not be used for this exercise			
7.3	Go-around with all engines operating* from various stages during an instrument approach	P---->	---->			
7.4	Rejected landing with all engines operating: – from various heights below DH/MDH 15 m (50 ft) above the runway threshold – after touchdown (balked landing) – In aeroplanes which are not certificated as transport category aeroplanes	P---->	---->			

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TMGs AND SINGLE-PILOT AEROPLANES, EXCEPT FOR HIGH-PERFORMANCE COMPLEX AEROPLANES		PRACTICAL TRAINING			CLASS OR TYPE RATING SKILL TEST/PROF. CHECK	
Manoeuvres/Procedures		FSTD	A	Instructor initials when training completed	Tested or checked in FSTD or A	Examiner initials when test or check completed
	(JAR/FAR 25) or as commuter category aeroplanes (SFAR 23), the rejected landing with all engines operating shall be initiated below MDH/A or after touchdown.					

6. Multi-pilot aeroplanes and single-pilot high-performance complex aeroplanes

(a) The following symbols mean:

P = Trained as PIC or co-pilot and as PF and PM for the issue of a type rating as applicable.

OTD = Other training devices may be used for this exercise.

X = An FFS shall be used for this exercise; otherwise an aeroplane shall be used if appropriate for the manoeuvre or procedure.

P# = The training shall be complemented by supervised aeroplane inspection.

(b) The practical training shall be conducted at least at the training equipment level shown as (P), or may be conducted up to any higher equipment level shown by the arrow (---->).

The following abbreviations are used to indicate the training equipment used:

A = aeroplane

FFS = full-flight simulator

FSTD = flight simulator training device

- (c) The starred items (\*) shall be flown solely by reference to instruments.
- (d) Where the letter 'M' appears in the skill test or proficiency check column, this will indicate a mandatory exercise or a choice where more than one exercise appears.
- (e) An FFS shall be used for practical training and testing if the FFS forms part of an approved type rating course. The following considerations will apply to the approval of the course:
  - (i) the qualifications of the instructors;
  - (ii) the qualification and the amount of training provided on the course in an FSTD; and
  - (iii) the qualifications and previous experience on similar types of the pilots under training.
- (f) Manoeuvres and procedures shall include MCC for multi-pilot aeroplane and for single-pilot high-performance complex aeroplanes in multi-pilot operations.
- (g) Manoeuvres and procedures shall be conducted in single-pilot role for single-pilot high-performance complex aeroplanes in single-pilot operations.
- (h) To remove a restriction to multi-pilot operations in accordance with point FCL.725(d)(2) from a single-pilot high-performance complex aeroplane type rating, pilots shall complete the manoeuvres/procedures in 2.5, 3.8.3.4, 4.4, 5.5 and at least one manoeuvre/procedure from Section 3.4 in single-pilot operation.
- (i) Applicants for and holders of a restricted type rating issued in accordance with point FCL.720.A(c) shall complete training, skill tests and proficiency checks in accordance with this Appendix. However, unless they undergo a skill test in accordance with point FCL.720.A(c)(3), they shall, during a skill test or a proficiency check, perform at least the landing manoeuvres in the role of the pilot monitoring but shall not be required to perform the following:
  - (i) take-off manoeuvres;
  - (ii) landing manoeuvres in the role of the pilot flying.

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- (j) To establish or maintain PBN privileges, one approach shall be an RNP APCH. Where an RNP APCH is not practicable, it shall be performed in an appropriately equipped FSTD.

By way of derogation from the first paragraph, in cases where a proficiency check for revalidation of PBN privileges is performed in an aircraft or an FSTD representing that aircraft, which are not equipped for RNP APCH manoeuvres, the proficiency check may not include RNP APCH exercises. In such cases, the PBN privileges of the pilot shall not include RNP APCH. The restriction shall be lifted if the pilot has completed a proficiency check including an RNP APCH exercise for the relevant class or type.

MULTI-PILOT AEROPLANES AND SINGLE-PILOT HIGH-PERFORMANCE COMPLEX AEROPLANES		PRACTICAL TRAINING			ATPL/MPL/TYPE RATING SKILL TEST OR PROF. CHECK	
Manoeuvres/Procedures		FSTD	A	Instructor initials when training completed	Tested or checked in FSTD or A	Examiner initials when test or check completed
<b>SECTION 1</b>						
1	Flight preparation	OTD				
1.1	Performance calculation	P				
1.2	Aeroplane external visual inspection; location of each item and purpose of inspection	OTD P#	P			
1.3	Cockpit inspection	P---->	---->			
1.4	Use of checklist prior to starting engines, starting procedures, radio and navigation equipment check, selection and setting of navigation and communication frequencies	P---->	---->		M	
1.5	Taxiing in compliance with ATC instructions or instructions of instructor	P---->	---->			
1.6	Before take-off checks	P---->	---->		M	
<b>SECTION 2</b>						
2	Take-offs	P---->	---->			
2.1						

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MULTI-PILOT AEROPLANES AND SINGLE-PILOT HIGH-PERFORMANCE COMPLEX AEROPLANES		PRACTICAL TRAINING			ATPL/MPL/TYPE RATING SKILL TEST OR PROF. CHECK	
Manoeuvres/Procedures		FSTD	A	Instructor initials when training completed	Tested or checked in FSTD or A	Examiner initials when test or check completed
	Normal take-offs with different flap settings, including expedited take-off					
2.2*	Instrument take-off; transition to instrument flight is required during rotation or immediately after becoming airborne	P---->	---->			
2.3	Crosswind take-off	P---->	---->			
2.4	Take-off at maximum take-off mass (actual or simulated maximum take-off mass)	P---->	---->			
2.5	Take-offs with simulated engine failure:	P---->	---->			
2.5.1*	shortly after reaching V <sub>2</sub>					
	(In aeroplanes which are not certificated as transport category or commuter category aeroplanes, the engine failure shall not be simulated until reaching a minimum height of 500 ft above the runway end. In aeroplanes having the same performance as a transport category aeroplane regarding take-off mass and density altitude, the instructor may simulate the engine failure shortly after reaching V <sub>2</sub> )					
2.5.2*	between V <sub>1</sub> and V <sub>2</sub>	P	X		M FFS only	



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MULTI-PILOT AEROPLANES AND SINGLE-PILOT HIGH-PERFORMANCE COMPLEX AEROPLANES		PRACTICAL TRAINING			ATPL/MPL/TYPE RATING SKILL TEST OR PROF. CHECK	
Manoeuvres/Procedures		FSTD	A	Instructor initials when training completed	Tested or checked in FSTD or A	Examiner initials when test or check completed
2.6	Rejected take-off at a reasonable speed before reaching V1	P---->	---->		M	
<b>SECTION 3</b>						
3	Flight manoeuvres and procedures	P---->	---->			
3.1	Manual flight with and without flight directors (no autopilot, no autothrust/autothrottle, and at different control laws, where applicable)					
3.1.1	At different speeds (including slow flight) and altitudes within the FSTD training envelope	P---->	---->			
3.1.2	Steep turns using 45° bank, 180° to 360° left and right	P---->	---->			
3.1.3	Turns with and without spoilers	P---->	---->			
3.1.4	Procedural instrument flying and manoeuvring including instrument departure and arrival, and visual approach	P---->	---->			
3.2	Tuck under and Mach buffet (if applicable), and other specific flight characteristics of the aeroplane (e.g. Dutch Roll)	P---->	---->X An aeroplane shall not be used for this exercise		FFS only	

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MULTI-PILOT AEROPLANES AND SINGLE-PILOT HIGH-PERFORMANCE COMPLEX AEROPLANES		PRACTICAL TRAINING			ATPL/MPL/TYPE RATING SKILL TEST OR PROF. CHECK	
Manoeuvres/Procedures		FSTD	A	Instructor initials when training completed	Tested or checked in FSTD or A	Examiner initials when test or check completed
3.3	Normal operation of systems and controls engineer's panel (if applicable)	OTD P---->	---->			
3.4	Normal and abnormal operations of following systems:				M	A mandatory minimum of 3 abnormal items shall be selected from 3.4.0 to 3.4.14 inclusive
3.4.0	Engine (if necessary propeller)	OTD P---->	---->			
3.4.1	Pressurisation and air conditioning	OTD P---->	---->			
3.4.2	Pitot/static system	OTD P---->	---->			
3.4.3	Fuel system	OTD P---->	---->			
3.4.4	Electrical system	OTD P---->	---->			
3.4.5	Hydraulic system	OTD P---->	---->			
3.4.6	Flight control and trim system	OTD P---->	---->			
3.4.7	Anti-icing/de-icing system, glare shield heating	OTD P---->				
3.4.8	Autopilot/flight director	OTD P---->			M (single pilot only)	
3.4.9	Stall warning devices or stall avoidance devices, and stability augmentation devices	OTD P---->				

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MULTI-PILOT AEROPLANES AND SINGLE-PILOT HIGH-PERFORMANCE COMPLEX AEROPLANES		PRACTICAL TRAINING			ATPL/MPL/TYPE RATING SKILL TEST OR PROF. CHECK	
Manoeuvres/Procedures		FSTD	A	Instructor initials when training completed	Tested or checked in FSTD or A	Examiner initials when test or check completed
3.4.10	Ground proximity warning system, weather radar, radio altimeter, transponder	P---->				
3.4.11	Radios, navigation equipment, instruments, FMS	OTD P---->				
3.4.12	Landing gear and brake	OTD P---->	---->			
3.4.13	Slat and flap system	OTD	---->			
3.4.14	Auxiliary power unit (APU)	OTD P---->	---->			
	Intentionally left blank					
3.6	Abnormal and emergency procedures:				M	A mandatory minimum of 3 items shall be selected from 3.6.1 to 3.6.9 inclusive
3.6.1	Fire drills, e.g. engine, APU, cabin, cargo compartment, flight deck, wing and electrical fires including evacuation	P---->	---->			
3.6.2	Smoke control and removal	P---->	---->			
3.6.3	Engine failures, shutdown and restart at a safe height	P---->	---->			
3.6.4	Fuel dumping (simulated)	P---->	---->			
3.6.5	Wind shear at take-off/landing	P	X		FFS only	
3.6.6	Simulated cabin pressure failure/emergency descent	P---->	---->			

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MULTI-PILOT AEROPLANES AND SINGLE-PILOT HIGH-PERFORMANCE COMPLEX AEROPLANES		PRACTICAL TRAINING			ATPL/MPL/TYPE RATING SKILL TEST OR PROF. CHECK	
Manoeuvres/Procedures		FSTD	A	Instructor initials when training completed	Tested or checked in FSTD or A	Examiner initials when test or check completed
3.6.7	Incapacitation of flight crew member	P---->	---->			
3.6.8	Other emergency procedures as outlined in the appropriate aeroplane flight manual (AFM)	P---->	---->			
3.6.9	TCAS event	OTD P---->	An aeroplane shall not be used		FFS only	
3.7 3.7.1	Upset recovery training Recovery from stall events in: – take-off configuration; – clean configuration at low altitude; – clean configuration near maximum operating altitude; and – landing configuration.	P FFS qualified for the training task only	X An aeroplane shall not be used for this exercise			
3.7.2	The following upset exercises: – recovery from nose-high at various bank angles; and – recovery from nose-low at various bank angles	P FFS qualified for the training task only	X An aeroplane shall not be used for this exercise		FFS only	
3.8	Instrument flight procedures					

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MULTI-PILOT AEROPLANES AND SINGLE-PILOT HIGH-PERFORMANCE COMPLEX AEROPLANES		PRACTICAL TRAINING			ATPL/MPL/TYPE RATING SKILL TEST OR PROF. CHECK	
Manoeuvres/Procedures		FSTD	A	Instructor initials when training completed	Tested or checked in FSTD or A	Examiner initials when test or check completed
3.8.1*	Adherence to departure and arrival routes and ATC instructions	P---->	---->		M	
3.8.2*	Holding procedures	P---->	---->			
3.8.3*	3D operations to DH/A of 200 ft (60 m) or to higher minima if required by the approach procedure					
Note: According to the AFM, RNP APCH procedures may require the use of autopilot or flight director. The procedure to be flown manually shall be chosen taking into account such limitations (for example, choose an ILS for 3.8.3.1 in the case of such AFM limitation).						
3.8.3.1*	Manually, without flight director	P---->	---->		M (skill test only)	
3.8.3.2*	Manually, with flight director	P---->	---->			
3.8.3.3*	With autopilot	P---->	---->			
3.8.3.4*	Manually, with one engine simulated inoperative during final approach, either until touchdown or through the complete missed approach procedure (as applicable), starting: (i) before passing 1 000 ft above aerodrome level; and (ii) after passing 1 000 ft above aerodrome level. In aeroplanes which are not certificated as transport category aeroplanes (JAR/FAR 25) or as commuter category aeroplanes (SFAR 23), the approach with simulated engine failure and the ensuing go-around	P---->	---->		M	

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MULTI-PILOT AEROPLANES AND SINGLE-PILOT HIGH-PERFORMANCE COMPLEX AEROPLANES		PRACTICAL TRAINING			ATPL/MPL/TYPE RATING SKILL TEST OR PROF. CHECK	
Manoeuvres/Procedures		FSTD	A	Instructor initials when training completed	Tested or checked in FSTD or A	Examiner initials when test or check completed
	shall be initiated in conjunction with the 2D approach in accordance with 3.8.4. The go-around shall be initiated when reaching the published obstacle clearance height/altitude (OCH/A); however, not later than reaching an MDH/A of 500 ft above the runway threshold elevation. In aeroplanes having the same performance as a transport category aeroplane regarding take-off mass and density altitude, the instructor may simulate the engine failure in accordance with exercise 3.8.3.4.					
3.8.4*	2D operations down to the MDH/A	P*---->	---->		M	
3.8.5	Circling approach under the following conditions: (a)*approach to the authorised minimum circling approach altitude at the aerodrome in question in accordance with the local instrument approach facilities in simulated instrument flight conditions; followed by: (b) circling approach to another runway at least 90° off centreline from the final approach used in item (a), at	P*---->	---->			

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MULTI-PILOT AEROPLANES AND SINGLE-PILOT HIGH-PERFORMANCE COMPLEX AEROPLANES		PRACTICAL TRAINING			ATPL/MPL/TYPE RATING SKILL TEST OR PROF. CHECK	
Manoeuvres/Procedures		FSTD	A	Instructor initials when training completed	Tested or checked in FSTD or A	Examiner initials when test or check completed
	the authorised minimum circling approach altitude. Remark: If (a) and (b) are not possible due to ATC reasons, a simulated low visibility pattern may be performed.					
3.8.6	Visual approaches	P---->	---->			
<b>SECTION 4</b>						
4	Missed approach procedures	P*---->	---->			
4.1.	Go-around with all engines operating* during a 3D operation on reaching decision height	P*---->	---->			
4.2.	Go-around with all engines operating* from various stages during an instrument approach	P*---->	---->			
4.3.	Other missed approach procedures	P*---->	---->			
4.4*	Manual go-around with the critical engine simulated inoperative after an instrument approach on reaching DH, MDH or MAPt	P*---->	---->		M	
4.5.	Rejected landing with all engines operating: – from various heights below DH/MDH; – after touchdown (balked landing) In aeroplanes which are not certificated as transport category aeroplanes (JAR/FAR	P---->	---->			

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MULTI-PILOT AEROPLANES AND SINGLE-PILOT HIGH-PERFORMANCE COMPLEX AEROPLANES		PRACTICAL TRAINING			ATPL/MPL/TYPE RATING SKILL TEST OR PROF. CHECK	
Manoeuvres/Procedures		FSTD	A	Instructor initials when training completed	Tested or checked in FSTD or A	Examiner initials when test or check completed
	25) or as commuter category aeroplanes (SFAR 23), the rejected landing with all engines operating shall be initiated below MDH/A or after touchdown.					
<b>SECTION 5</b>						
5	Landings	P				
5.1.	Normal landings* with visual reference established when reaching DA/H following an instrument approach operation					
5.2.	Landing with simulated jammed horizontal stabiliser in any out-of-trim position	P---->	An aeroplane shall not be used for this exercise		FFS only	
5.3.	Crosswind landings (aircraft, if practicable)	P---->	---->			
5.4.	Traffic pattern and landing without extended or with partly extended flaps and slats	P---->	---->			
5.5.	Landing with critical engine simulated inoperative	P---->	---->		M	
5.6.	Landing with two engines inoperative: – aeroplanes with three engines: the centre engine and one outboard engine as far	P	X		M FFS only (skill test only)	



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MULTI-PILOT AEROPLANES AND SINGLE-PILOT HIGH-PERFORMANCE COMPLEX AEROPLANES		PRACTICAL TRAINING			ATPL/MPL/TYPE RATING SKILL TEST OR PROF. CHECK	
Manoeuvres/Procedures		FSTD	A	Instructor initials when training completed	Tested or checked in FSTD or A	Examiner initials when test or check completed
	as practicable according to data of the AFM; and – aeroplanes with four engines: two engines at one side					

7. Class ratings – sea

Section 6 shall be completed to revalidate a multi-engine class rating sea, VFR only, where the required experience of 10 route sectors within the previous 12 months has not been completed.

CLASS RATING SEA		PRACTICAL TRAINING	CLASS RATING SKILL TEST OR PROFICIENCY CHECK
Manoeuvres/Procedures		Instructor's initials when training completed	Examiner's initials when test completed
<b>SECTION 1</b>			
<b>1 Departure</b> Preflight including: – documentation; – mass and balance; – weather briefing; and – NOTAM.			
1.2 Pre-start checks External/internal			
1.3 Engine start-up and shutdown Normal malfunctions			
1.4 Taxiing			
1.5 Step taxiing			
1.6 Mooring: Beach Jetty pier Buoy			

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CLASS RATING SEA	PRACTICAL TRAINING	CLASS RATING SKILL TEST OR PROFICIENCY CHECK
Manoeuvres/Procedures	Instructor's initials when training completed	Examiner's initials when test completed
1.7 Engine-off sailing		
1.8 Pre-departure checks: Engine run-up (if applicable)		
1.9 Take-off procedure: – normal with flight manual flap settings; and – crosswind (if conditions are available).		
1.10 Climbing: – turns onto headings – level off		
1.11 ATC liaison – Compliance, R/T procedures		
<b>SECTION 2</b>		
<b>2 Airwork (VFR)</b>		
2.1 Straight and level flight at various air-speeds including flight at critically low airspeed with and without flaps (including approach to VMCA when applicable)		
2.2 Steep turns (360° left and right at 45° bank)		
2.3 Stalls and recovery: (i) clean stall; (ii) approach to stall in descending turn with bank with approach configuration and power; (iii) approach to stall in landing configuration and power; and (iv) approach to stall, climbing turn with take-off flap and climb power (single-engine aeroplanes only).		
2.4 ATC liaison – Compliance, R/T procedures		
<b>SECTION 3</b>		
<b>3 En-route procedures VFR</b>		
3.1 Flight plan, dead reckoning and map reading		
3.2 Maintenance of altitude, heading and speed		
3.3 Orientation, timing and revision of ETAs		

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CLASS RATING SEA	PRACTICAL TRAINING	CLASS RATING SKILL TEST OR PROFICIENCY CHECK
Manoeuvres/Procedures	Instructor's initials when training completed	Examiner's initials when test completed
3.4 Use of radio navigation aids (if applicable)		
3.5 Flight management (flight log, routine checks including fuel, systems and icing)		
3.6 ATC liaison – Compliance, R/T procedures		
<b>SECTION 4</b>		
4 Arrivals and landings		
4.1 Aerodrome arrival procedure (amphibians only)		
4.2 Normal landing		
4.3 Flapless landing		
4.4 Crosswind landing (if suitable conditions)		
4.5 Approach and landing with idle power from up to 2000' above the water (single-engine aeroplane only)		
4.6 Go-around from minimum height		
Glassy water landing		
Rough water landing		
4.8 ATC liaison – Compliance, R/T procedure,		
<b>SECTION 5</b>		
<b>5 Abnormal and emergency procedures</b> (This section may be combined with sections 1 through 4)		
5.1 Rejected take-off at a reasonable speed		
5.2 Simulated engine failure after take-off (single-engine aeroplane only)		
5.3 Simulated forced landing without power (single-engine aeroplane only)		
5.4 Simulated emergencies: (i) fire or smoke in flight (ii) systems' malfunctions as appropriate		
5.5 ATC liaison – Compliance, R/T procedures		
<b>SECTION 6</b>		
<b>6 Simulated asymmetric flight</b>		

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CLASS RATING SEA	PRACTICAL TRAINING	CLASS RATING SKILL TEST OR PROFICIENCY CHECK
Manoeuvres/Procedures	Instructor's initials when training completed	Examiner's initials when test completed
(This section may be combined with sections 1 through 5)		
6.1 Simulated engine failure during take-off (at a safe altitude unless carried out in FFS and FNPT II)		
6.2 Engine shutdown and restart (ME skill test only)		
6.3 Asymmetric approach and go-around		
6.4 Asymmetric approach and full-stop landing		
6.5 ATC liaison – Compliance, R/T procedures		

**C. Specific requirements for the helicopter category**

1. In the case of skill test or proficiency check for type ratings and the ATPL, applicants shall pass Sections 1 to 4 and 6 (as applicable) of the skill test or proficiency check. Failure in more than five items will require applicants to repeat the entire test or check. Applicants failing not more than five items shall repeat the failed items. Failure in any item in the case of a retest or a recheck or failure in any other items already passed will require the applicants to repeat the entire test or check again. All sections of the skill test or proficiency check shall be completed within 6 months.
2. In the case of proficiency check for an IR, applicants shall pass Section 5 of the proficiency check. Failure in more than 3 items will require applicants to repeat the entire Section 5. Applicants failing not more than 3 items shall repeat the failed items. Failure in any item in the case of a recheck or failure in any other items of Section 5 already passed will require applicants to repeat the entire check.

**FLIGHT TEST TOLERANCE**

3. The applicant shall demonstrate the ability to:
  - (a) operate the helicopter within its limitations;
  - (b) complete all manoeuvres with smoothness and accuracy;

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- (c) exercise good judgement and airmanship;
  - (d) apply aeronautical knowledge;
  - (e) maintain control of the helicopter at all times in such a manner that the successful outcome of a procedure or manoeuvre is never in doubt;
  - (f) understand and apply crew coordination and incapacitation procedures, if applicable; and
  - (g) communicate effectively with the other crew members, if applicable.
4. The following limits shall apply, corrected to make allowance for turbulent conditions and the handling qualities and performance of the helicopter used.
- (a) IFR flight limits
    - Height
      - Generally ±100 ft
      - Starting a go-around at decision +50 ft/-0 ft
    - height/altitude
      - Minimum descent +50 ft/-0 ft
    - height/MAP/altitude
    - Tracking
      - On radio aids ±5°
    - For “angular” deviations Half-scale deflection, azimuth and glide path (e.g. LPV, ILS, MLS, GLS)
    - 2D (LNAV) and 3D (LNAV/VNAV) “linear” lateral deviations cross-track error/deviation shall normally be limited to ± ½ of the RNP value associated with the procedure. Brief deviations from this standard up to a maximum of one time the RNP value are allowable.
    - 3D linear vertical deviations (e.g. RNP APCH (LNAV/VNAV) using BaroVNAV) not more than – 75 ft below the vertical profile at any time, and not more than + 75 ft above the vertical profile at or below 1 000 ft above aerodrome level.

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Heading	
all engines operating	±5°
with simulated engine failure	±10°
Speed	
all engines operating	±5 knots
with simulated engine failure	+10 knots/–5 knots
(b) VFR flight limits	
Height:	
Generally	±100 ft
Heading:	
Normal operations	±5°
Abnormal operations/emergencies	±10°
Speed:	
Generally	±10 knots
With simulated engine failure	+10 knots/-5 knots
Ground drift:	
T.O. hover I.G.E.	±3 ft
Landing	±2 ft (with 0 ft rearward or lateral flight)

**CONTENT OF THE TRAINING/SKILL TEST/PROFICIENCY CHECK**

**GENERAL**

5. The following symbols mean:

P = Trained as PIC for the issue of a type rating for single-pilot helicopters (SPH) or trained as PIC or co-pilot and as PF and PM for the issue of a type rating for multi pilot helicopters (MPH).

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6. The practical training shall be conducted at least at the training equipment level shown as (P), or may be conducted up to any higher equipment level shown by the arrow (---->).

The following abbreviations are used to indicate the training equipment used:

FFS = full-flight simulator

FTD = flight training device

H = helicopter

7. The starred items (\*) shall be flown in actual or simulated IMC, only by applicants wishing to renew or revalidate an IR(H) or extend the privileges of that rating to another type.
8. Instrument flight procedures (Section 5) shall be performed only by applicants wishing to renew or revalidate an IR(H) or extend the privileges of that rating to another type. An FFS or an FTD 2/3 may be used for this purpose.
- 8a. To establish or maintain PBN privileges, one approach shall be an RNP APCH. Where an RNP APCH is not practicable, it shall be performed in an appropriately equipped FSTD.

By way of derogation from subparagraph above, in cases where a proficiency check for revalidation of PBN privileges does not include an RNP APCH exercise, the PBN privileges of the pilot shall not include RNP APCH. The restriction shall be lifted if the pilot has completed a proficiency check including an RNP APCH exercise.

9. Where the letter 'M' appears in the skill test or proficiency check column, this will indicate a mandatory exercise.
10. An FSTD shall be used for practical training and testing if the FSTD forms part of a type rating course. The following considerations will apply to the course:
- (a) the qualification of the FSTD as set out in the relevant requirements of MCAR-Part-ARA and MCAR-Part-ORA;
  - (b) the qualifications of the instructor and examiner;
  - (c) the amount of FSTD training provided on the course;
  - (d) the qualifications and previous experience in similar types of the pilots under training; and

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- (e) the amount of supervised flying experience provided after the issue of the new type rating.

**MULTI-PILOT HELICOPTERS**

11. Applicants for the skill test for the issue of the multi-pilot helicopter type rating and ATPL(H) shall pass only Sections 1 to 4 and, if applicable, Section 6.
12. Applicants for the revalidation or renewal of the multi-pilot helicopter type rating proficiency check shall pass only Sections 1 to 4 and, if applicable, Section 6.

SINGLE/MULTI-PILOT HELICOPTERS		PRACTICAL TRAINING			SKILL TEST OR PROFICIENCY CHECK	
Manoeuvres/Procedures		FSTD	H	Instructor initials when training completed	Checked in FSTD or H	Examiner initials when test completed
<b>SECTION 1 – Preflight preparations and checks</b>						
1.1	Helicopter exterior visual inspection; location of each item and purpose of inspection		P		M (if performed in the helicopter)	
1.2	Cockpit inspection	P	---->		M	
1.3	Starting procedures, radio and navigation equipment check, selection and setting of navigation and communication frequencies	P	---->		M	
1.4	Taxiing/air taxiing in compliance with ATC instructions or with instructions of an instructor	P	---->		M	
1.5	Pre-take-off procedures and checks	P	---->		M	
<b>SECTION 2 – Flight manoeuvres and procedures</b>						
2.1	Take-offs (various profiles)	P	---->		M	
2.2	Sloping ground or crosswind take-offs & landings	P	---->			
2.3	Take-off at maximum take-off mass (actual or simulated maximum take-off mass)	P	---->			



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SINGLE/MULTI-PILOT HELICOP- TERS		PRACTICAL TRAINING			SKILL TEST OR PRO- FICIENCY CHECK	
Manoeuvres/Procedures		FSTD	H	Instruc- tor ini- tials when training com- pleted	Checked in FSTD or H	Examiner initials when test com- pleted
2.4	Take-off with simulated en- gine failure shortly before reaching TDP or DPATO	P	---->		M	
2.4.1	Take-off with simulated en- gine failure shortly after reaching TDP or DPATO	P	---->		M	
2.5	Climbing and descending turns to specified headings	P	---->		M	
2.5.1	Turns with 30° bank, 180° to 360° left and right, by sole reference to instruments	P	---->		M	
2.6	Autorotative descent	P	---->		M	
2.6.1	For single-engine helicopters (SEH): — autorotative landing; or — power recovery, provided that applicants, in the preced- ing year, completed training that included an autorotative landing and that training was entered and signed in the ap- plicants' logbook by the in- structor. For multi-engine helicopters (MEH): power recovery.	P	---->		M	
2.7	Landings, various profiles	P	---->		M	
2.7.1	Go-around or landing follow- ing simulated engine failure before LDP or DPBL	P	---->		M	
2.7.2	Landing following simulated engine failure after LDP or DPBL	P	---->		M	
<b>SECTION 3 – Normal and abnormal operations of the following systems and proce- dures</b>						

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SINGLE/MULTI-PILOT HELICOPTERS		PRACTICAL TRAINING			SKILL TEST OR PROFICIENCY CHECK	
Manoeuvres/Procedures		FSTD	H	Instructor initials when training completed	Checked in FSTD or H	Examiner initials when test completed
3	Normal and abnormal operations of the following systems and procedures:				M	A mandatory minimum of 3 items shall be selected from this section
3.1	Engine	P	---->			
3.2	Air conditioning (heating, ventilation)	P	---->			
3.3	Pitot/static system	P	---->			
3.4	Fuel System	P	---->			
3.5	Electrical system	P	---->			
3.6	Hydraulic system	P	---->			
3.7	Flight control and trim system	P	---->			
3.8	Anti-icing and de-icing system	P	---->			
3.9	Autopilot/Flight director	P	--->			
3.10	Stability augmentation devices	P	---->			
3.11	Weather radar, radio altimeter, transponder	P	---->			
3.12	Area navigation system	P	---->			
3.13	Landing gear system	P	---->			
3.14	APU	P	---->			
3.15	Radio, navigation equipment, instruments and FMS	P	---->			
<b>SECTION 4 – Abnormal and emergency procedures</b>						
4	Abnormal and emergency procedures				M	A mandatory minimum of 3 items shall be selected

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SINGLE/MULTI-PILOT HELICOP- TERS		PRACTICAL TRAINING			SKILL TEST OR PRO- FICIENCY CHECK	
Manoeuvres/Procedures		FSTD	H	Instruc- tor ini- tials when training com- pleted	Checked in FSTD or H	Examiner initials when test com- pleted
						from this section
4.1	Fire drills (including evacua- tion if applicable)	P	---->			
4.2	Smoke control and removal	P	---->			
4.3	Engine failures, shutdown and restart at a safe height	P	---->			
4.4	Fuel dumping (simulated)	P	---->			
4.5	Tail rotor control failure (if ap- plicable)	P	---->			
4.5.1	Tail rotor loss (if applicable)	P	A heli- copter shall not be used for this exer- cise			
4.6	Incapacitation of crew mem- ber – MPH only	P	---->			
4.7	Transmission malfunctions	P	---->			
4.8	Other emergency procedures as outlined in the appropriate flight manual	P	---->			
<b>SECTION 5 – Instrument flight procedures (to be performed in IMC or simulated IMC)</b>						
5.1	Instrument take-off: transition to instrument flight is required as soon as possible after be- coming airborne	P*	---->*			
5.1.1	Simulated engine failure dur- ing departure	P*	---->*		M*	

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SINGLE/MULTI-PILOT HELICOP- TERS		PRACTICAL TRAINING			SKILL TEST OR PRO- FICIENCY CHECK	
Manoeuvres/Procedures		FSTD	H	Instruc- tor ini- tials when training com- pleted	Checked in FSTD or H	Examiner initials when test com- pleted
5.2	Adherence to departure and arrival routes and ATC instructions	P*	---->*		M*	
5.3	Holding procedures	P*	---->*			
5.4	3D operations to DH/A of 200 ft (60 m) or to higher minima if required by the approach procedure	P*	---->*			
5.4.1	Manually, without flight director. Note: According to the AFM, RNP APCH procedures may require the use of autopilot or flight director. The procedure to be flown manually shall be chosen taken into account such limitations (for example, choose an ILS for 5.4.1 in the case of such AFM limitation).	P*	---->*		M* (unless Exercise 5.4.2 is completed)	
5.4.2	Manually, with flight director	P*	---->*		M* (unless Exercise 5.4.1 is completed)	
5.4.3	With coupled autopilot	P*	---->*			
5.4.4	Manually, with one engine simulated inoperative; engine failure has to be simulated during final approach before passing 1 000 ft above aerodrome level until touchdown or until completion of the missed approach procedure	P*	---->*		M*	
5.5	2D operations down to the MDA/H	P*	---->*		M*	

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SINGLE/MULTI-PILOT HELICOPTERS		PRACTICAL TRAINING			SKILL TEST OR PROFICIENCY CHECK	
Manoeuvres/Procedures		FSTD	H	Instructor initials when training completed	Checked in FSTD or H	Examiner initials when test completed
5.6	Go-around with all engines operating on reaching DA/H or MDA/MDH	P*	---->*			
5.6.1	Other missed approach procedures	P*	---->*			
5.6.2	Go-around with one engine simulated inoperative on reaching DA/H or MDA/MDH	P*	---->*		M*	
5.7	IMC autorotation with power recovery	P*	---->*		M*	
5.8	Recovery from unusual attitudes	P*	---->*		M*	
<b>SECTION 6 — Use of optional equipment</b>						
6	Use of optional equipment	P	---->			

## SINGLE-PILOT HELICOPTERS

13. To exercise the privileges of the type rating in accordance with point FCL.725(d), applicants for the issue, revalidation or renewal of a single-pilot helicopter type rating shall:
- (a) for single-pilot operations, complete the skill test or proficiency check in single-pilot operations;
  - (b) in multi-pilot operations, complete the skill test or proficiency check in multi-pilot operations;
  - (c) for both single-pilot and multi-pilot operations, complete the skill test or proficiency check in multi-pilot operations and, additionally, the following manoeuvres and procedures in single-pilot operations:
    - (1) for single-engine helicopters: 2.1 take-off and 2.6 and 2.6.1 autorotative descent and autorotative landing;

- (2) for multi-engine helicopters: 2.1 take-off and 2.4 and 2.4.1 engine failures shortly before and shortly after reaching TDP;
- (3) for IR privileges, in addition to point (1) or (2), as applicable, one approach of Section 5, unless the criteria of Appendix 8 are met;
- (d) in order to remove a restriction to multi-pilot operations from a single-pilot helicopter type rating in accordance with point FCL.725(d)(2), complete a proficiency check that includes the manoeuvres and procedures referred to in points (c)(1) or (c)(2), as applicable.

**D. Specific requirements for the powered-lift aircraft category**

- 1. In the case of skill tests or proficiency checks for powered-lift aircraft type ratings, applicants shall pass Sections 1 to 5 and 6 (as applicable) of the skill test or proficiency check. Failure in more than five items will require applicants to repeat the entire test or check. Applicants failing not more than five items shall repeat the failed items. Failure in any item in the case of a retest or a recheck or failure in any other items already passed will require applicants to repeat the entire test or check. All sections of the skill test or proficiency check shall be completed within 6 months.

**FLIGHT TEST TOLERANCE**

- 2. Applicants shall demonstrate the ability to:
  - (a) operate the powered-lift aircraft within its limitations;
  - (b) complete all manoeuvres with smoothness and accuracy;
  - (c) exercise good judgement and airmanship;
  - (d) apply aeronautical knowledge;
  - (e) maintain control of the powered-lift aircraft at all times in such a manner that the successful outcome of a procedure or manoeuvre is never in doubt;
  - (f) understand and apply crew coordination and incapacitation procedures; and
  - (g) communicate effectively with the other crew members.
- 3. The following limits shall apply, corrected to make allowance for turbulent conditions and the handling qualities and performance of the powered-lift aircraft used.

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(a) IFR flight limits:

Height

Generally  $\pm 100$  ft

Starting a go-around at decision height/altitude  $+50$  ft/ $-0$  ft

Minimum descent height/altitude  $+50$  ft/ $-0$  ft

Tracking

On radio aids  $\pm 5^\circ$

Precision approach half scale deflection,  
azimuth and glide path

Heading

Normal operations  $\pm 5^\circ$

Abnormal operations/emergencies  $\pm 10^\circ$

Speed

Generally  $\pm 10$  knots

With simulated engine failure  $+10$  knots/ $-5$  knots

(b) VFR flight limits:

Height

Generally  $\pm 100$  ft

Heading:

Normal operations  $\pm 5^\circ$

Abnormal operations/emergencies  $\pm 10^\circ$

Speed

Generally  $\pm 10$  knots

With simulated engine failure  $+10$  knots/ $-5$  knots

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Ground drift

T.O. hover I.G.E.

±3 ft

Landing

±2 ft (with 0 ft rearward or lateral flight)

**CONTENT OF THE TRAINING/SKILL TEST/PROFICIENCY CHECK**

4. The following symbol means:

P= Trained as PIC or co-pilot and as PF and PM for the issue of a type rating as applicable

5. The practical training shall be conducted at least at the training equipment level shown as (P), or may be conducted up to any higher equipment level shown by the arrow (---->).

6. The following abbreviations are used to indicate the training equipment used:

FFS = full-flight simulator

FTD = flight training device

OTD = other training device

PL = powered-lift aircraft

- 6a. The starred items (\*) shall be flown solely by reference to instruments. If this condition is not met during the skill test or proficiency check, the type rating will be restricted to VFR only.

7. Where the letter 'M' appears in the skill test or proficiency check column, this will indicate a mandatory exercise.

8. FSTDs shall be used for practical training and testing if they form part of an approved type rating course. The following considerations will apply to the approval of the course:

- (a) the qualification of the FSTDs as set out in the relevant requirements of MCAR-Part-ARA and MCAR-Part-ORA; and
- (b) the qualifications of the instructor.



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POWERED-LIFT AIRCRAFT CATEGORY		PRACTICAL TRAINING					SKILL TEST OR PROFICIENCY CHECK	
Manoeuvres/Procedures		OTD	FTD	FFS	PL	Instructor's initials when training completed	Checked in FFS PL	Examiner's initials when test completed
<b>SECTION 1 – Preflight preparations and checks</b>								
1.1	Powered-lift aircraft exterior visual inspection; location of each item and purpose of inspection				P			
1.2	Cockpit inspection	P	---->	---->	--->			
1.3	Starting procedures, radio and navigation equipment check, selection and setting of navigation and communication frequencies	P	---->	---->	--->		M	
1.4	Taxiing in compliance with ATC instructions or with instructions of an instructor		P	---->	--->			
1.5	Pre-take-off procedures and checks including power check	P	---->	---->	--->		M	
<b>SECTION 2 – Flight manoeuvres and procedures</b>								
2.1	Normal VFR take-off profiles: Runway operations (short take-off and landing (STOL) and vertical take-off and landing (VTOL)) including crosswind Elevated heliports Ground level heliports		P	---->	--->		M	
2.2	Take-off at maximum take-off mass (actual or		P	---->				

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POWERED-LIFT AIRCRAFT CATEGORY		PRACTICAL TRAINING					SKILL TEST OR PROFICIENCY CHECK	
Manoeuvres/Procedures		OTD	FTD	FFS	PL	Instructor's initials when training completed	Checked in FFS PL	Examiner's initials when test completed
	simulated maximum take-off mass)							
2.3.1	Rejected take-off: – during runway operations; – during elevated heliport operations; and – during ground level operations.		P	---->			M	
2.3.2	Take-off with simulated engine failure after passing decision point: during runway operations; during elevated heliport operations; and during ground level operations.		P	---->			M	
2.4	Autorotative descent in helicopter mode to ground (an aircraft shall not be used for this exercise)	P	---->	---->			M FFS only	
2.4.1	Windmill descent in aeroplane mode (an aircraft shall not be used for this exercise)		P	---->			M FFS only	
2.5	Normal VFR landing profiles: runway operations (STOL and VTOL) elevated heliports ground level heliports		P	---->	--- ->		M	
2.5.1	Landing with simulated engine failure after reaching decision point:							

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POWERED-LIFT AIRCRAFT CATEGORY		PRACTICAL TRAINING					SKILL TEST OR PROFICIENCY CHECK	
Manoeuvres/Procedures		OTD	FTD	FFS	PL	Instructor's initials when training completed	Checked in FFS PL	Examiner's initials when test completed
	– during runway operations; – during elevated heliport operations; and – during ground level operations.							
2.6	Go-around or landing following simulated engine failure before decision point		P	---->			M	
<b>SECTION 3 – Normal and abnormal operations of the following systems and procedures:</b>								
3	Normal and abnormal operations of the following systems and procedures (may be completed in an FSTD if qualified for the exercise):						M	A mandatory minimum of 3 items shall be selected from this section
3.1	Engine	P	---->	---->				
3.2	Pressurisation and air conditioning (heating, ventilation)	P	---->	---->				
3.3	Pitot/static system	P	---->	---->				
3.4	Fuel System	P	---->	---->				
3.5	Electrical system	P	---->	---->				
3.6	Hydraulic system	P	---->	---->				
3.7	Flight control and trim system	P	---->	---->				
3.8	Anti-icing and de-icing system, glare shield heating (if fitted)	P	---->	---->				
3.9	Autopilot/Flight director	P	--->	--->				

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POWERED-LIFT AIRCRAFT CATEGORY		PRACTICAL TRAINING					SKILL TEST OR PROFICIENCY CHECK	
Manoeuvres/Procedures		OTD	FTD	FFS	PL	Instructor's initials when training completed	Checked in FFS PL	Examiner's initials when test completed
3.10	Stall warning devices or stall avoidance devices and stability augmentation devices	P	---->	---->				
3.11	Weather radar, radio altimeter, transponder, ground proximity warning system (if fitted)	P	---->	---->				
3.12	Landing gear system	P	---->	---->				
3.13	APU	P	---->	---->				
3.14	Radio, navigation equipment, instruments and FMS	P	---->	---->				
3.15	Flap system	P	---->	---->				
<b>SECTION 4 – Abnormal and emergency procedures</b>								
4	Abnormal and emergency procedures (may be completed in an FSTD if qualified for the exercise)						M	A mandatory minimum of 3 items shall be selected from this section
4.1	Fire drills, engine, APU, cargo compartment, flight deck and electrical fires including evacuation if applicable	P	---->	---->				
4.2	Smoke control and removal	P	---->	---->				

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POWERED-LIFT AIRCRAFT CATEGORY		PRACTICAL TRAINING					SKILL TEST OR PROFICIENCY CHECK	
Manoeuvres/Procedures		OTD	FTD	FFS	PL	Instructor's initials when training completed	Checked in FFS PL	Examiner's initials when test completed
4.3	Engine failures, shut-down and restart (an aircraft shall not be used for this exercise) including one engine in-operative conversion from helicopter to aeroplane modes and vice versa	P	---->	---->			FFS only	
4.4	Fuel dumping (simulated, if fitted)	P	---->	---->				
4.5	Wind shear at take-off and landing (an aircraft shall not be used for this exercise)			P			FFS only	
4.6	Simulated cabin pressure failure/emergency descent (an aircraft shall not be used for this exercise)	P	---->	---->			FFS only	
4.7	ACAS event (an aircraft shall not be used for this exercise)	P	---->	---->			FFS only	
4.8	Incapacitation of crew member	P	---->	---->				
4.9	Transmission malfunctions	P	---->	---->			FFS only	
4.10	Recovery from a full stall (power on and off) or after activation of stall warning devices in climb, cruise and approach configurations (an aircraft shall not be used for this exercise)	P	---->	---->			FFS only	

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POWERED-LIFT AIRCRAFT CATEGORY		PRACTICAL TRAINING					SKILL TEST OR PROFICIENCY CHECK	
Manoeuvres/Procedures		OTD	FTD	FFS	PL	Instructor's initials when training completed	Checked in FFS PL	Examiner's initials when test completed
4.11	Other emergency procedures as detailed in the appropriate flight manual	P	---->	---->				
<b>SECTION 5 — Instrument flight procedures (to be performed in IMC or simulated IMC)</b>								
5.1	Instrument take-off: transition to instrument flight is required as soon as possible after becoming airborne	P*	----> >*	----> >*				
5.1.1	Simulated engine failure during departure after decision point	P*	----> >*	----> >*			M*	
5.2	Adherence to departure and arrival routes and ATC instructions	P*	----> >*	----> >*			M*	
5.3	Holding procedures	P*	----> >*	----> >*				
5.4	Precision approach down to a decision height not less than 60 m (200 ft)	P*	----> >*	----> >*				
5.4.1	Manually, without flight director	P*	----> >*	----> >*			M* (Skill test only)	
5.4.2	Manually, with flight director	P*	----> >*	----> >*				
5.4.3	With use of autopilot	P*	----> >*	----> >*				
5.4.4	Manually, with one engine simulated inoperative; engine failure has to be simulated during final approach before passing the OM and	P*	----> >*	----> >*			M*	

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POWERED-LIFT AIRCRAFT CATEGORY		PRACTICAL TRAINING					SKILL TEST OR PROFICIENCY CHECK	
Manoeuvres/Procedures		OTD	FTD	FFS	PL	Instructor's initials when training completed	Checked in FFS PL	Examiner's initials when test completed
	continued either to touchdown or until completion of the missed approach procedure							
5.5	Non-precision approach down to the MDA/H	P*	---- >*	---- >*			M*	
5.6	Go-around with all engines operating on reaching DA/H or MDA/MDH	P*	---- >*	---- >*				
5.6.1	Other missed approach procedures	P*	---- >*	---- >*				
5.6.2	Go-around with one engine simulated inoperative on reaching DA/H or MDA/MDH	P*					M*	
5.7	IMC autorotation with power recovery to land on runway in helicopter mode only (an aircraft shall not be used for this exercise)	P*	---- >*	---- >*			M* FFS only	
5.8	Recovery from unusual attitudes (this one depends on the quality of the FFS)	P*	---- >*	---- >*			M*	
<b>SECTION 6 — Optional equipment</b>								
6	Use of optional equipment		P	---->	--- ->			

**E. Specific requirements for the airship category**

1. In the case of skill tests or proficiency checks for airship type ratings, applicants shall pass Sections 1 to 5 and 6 (as applicable) of the skill test or proficiency check. Failure in more than five items will require applicants to repeat the entire test or

check. Applicants failing not more than five items shall take the failed items again. Failure in any item in the case of a retest or a recheck, or failure in any other items already passed will require applicants to repeat the entire test or check again. All sections of the skill test or proficiency check shall be completed within 6 months.

## **FLIGHT TEST TOLERANCE**

2. Applicants shall demonstrate the ability to:
  - (a) operate the airship within its limitations;
  - (b) complete all manoeuvres with smoothness and accuracy;
  - (c) exercise good judgement and airmanship;
  - (d) apply aeronautical knowledge;
  - (e) maintain control of the airship at all times in such a manner that the successful outcome of a procedure or manoeuvre is never in doubt;
  - (f) understand and apply crew coordination and incapacitation procedures; and
  - (g) communicate effectively with the other crew members.
3. The following limits shall apply, corrected to make allowance for turbulent conditions and the handling qualities and performance of the airship used.
  - (a) IFR flight limits:

Height	
Generally	±100 ft
Starting a go-around at decision height/altitude	+50 ft/-0 ft
Minimum descent height/altitude	+50 ft/-0 ft
Tracking	
On radio aids	±5°
Precision approach	half-scale deflection, azimuth and glide path
Heading	



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Normal operations	$\pm 5^{\circ}$
Abnormal operations/emergencies	$\pm 10^{\circ}$
(b) VFR flight limits:	
Height	
Generally	$\pm 100$ ft
Heading	
Normal operations	$\pm 5^{\circ}$
Abnormal operations/emergencies	$\pm 10^{\circ}$

**CONTENT OF THE TRAINING/SKILL TEST/PROFICIENCY CHECK**

4. The following symbol means:

P = Trained as PIC or co-pilot and as PF and PM for the issue of a type rating as applicable.

5. The practical training shall be conducted at least at the training equipment level shown as (P), or may be conducted up to any higher equipment level shown by the arrow (---->).

- 6 The following abbreviations are used to indicate the training equipment used:

FFS = full-flight simulator

FTD = flight training device

OTD = other training device

As = airship

- 6a. The starred items (\*) shall be flown solely by reference to instruments. If this condition is not met during the skill test or proficiency check, the type rating will be restricted to VFR only.
7. Where the letter 'M' appears in the skill test or proficiency check column, this will indicate a mandatory exercise.
8. FSTDs shall be used for practical training and testing if they form part of a type rating course. The following considerations will apply to the course:

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- (a) the qualification of the FSTDs as set out in the relevant requirements of MCAR-Part-ARA and MCAR-Part-ORA; and
- (b) the qualifications of the instructor.

AIRSHIP CATEGORY		PRACTICAL TRAINING					SKILL TEST OR PROFICIENCY CHECK	
Manoeuvres/Procedures		OTD	FTD	FFS	As	Instructor's initials when training completed	Checked in FFS As	Examiner's initials when test completed
<b>SECTION 1 – Preflight preparations and checks</b>								
1.1	Preflight inspection				P			
1.2	Cockpit inspection	P	---->	---->	---->			
1.3	Starting procedures, radio and navigation equipment check, selection and setting of navigation and communication frequencies		P	---->	---->		M	
1.4	Off-mast procedure and ground manoeuvring			P	---->		M	
1.5	Pre-take-off procedures and checks	P	---->	---->	---->		M	
<b>SECTION 2 – Flight manoeuvres and procedures</b>								
2.1	Normal VFR take-off profile			P	---->		M	
2.2	Take-off with simulated engine failure			P	---->		M	
2.3	Take-off with heaviness > 0 (Heavy T/O)			P	---->			
2.4	Take-off with heaviness < 0 (Light/TO)			P	---->			
2.5	Normal climb procedure			P	---->			
2.6	Climb to Pressure Height			P	---->			
2.7	Recognising of pressure height			P	---->			

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AIRSHIP CATEGORY		PRACTICAL TRAINING					SKILL TEST OR PROFICIENCY CHECK	
Manoeuvres/Procedures		OTD	FTD	FFS	As	Instructor's initials when training completed	Checked in FFS As	Examiner's initials when test completed
2.8	Flight at or close to pressure height			P	---->		M	
2.9	Normal descent and approach			P	---->			
2.10	Normal VFR landing profile			P	---->		M	
2.11	Landing with heaviness > 0 (Heavy Ldg.)			P	---->		M	
2.12	Landing with heaviness < 0 (Light Ldg.)			P	---->		M	
	Intentionally left blank							
<b>SECTION 3 – Normal and abnormal operations of the following systems and procedures</b>								
3	Normal and abnormal operations of the following systems and procedures (may be completed in an FSTD if qualified for the exercise):						M	A mandatory minimum of 3 items shall be selected from this section
3.1	Engine	P	---->	---->	---->			
3.2	Envelope pressurisation	P	---->	---->	---->			
3.3	Pitot/static system	P	---->	---->	---->			
3.4	Fuel system	P	---->	---->	---->			
3.5	Electrical system	P	---->	---->	---->			
3.6	Hydraulic system	P	---->	---->	---->			

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AIRSHIP CATEGORY		PRACTICAL TRAINING					SKILL TEST OR PROFICIENCY CHECK	
Manoeuvres/Procedures		OTD	FTD	FFS	As	Instructor's initials when training completed	Checked in FFS As	Examiner's initials when test completed
3.7	Flight control and trim system	P	---->	---->	---->			
3.8	Ballonet system	P	---->	---->	---->			
3.9	Autopilot/flight director	P	--->	--->	--->			
3.10	Stability augmentation devices	P	---->	---->	---->			
3.11	Weather radar, radio altimeter, transponder, ground proximity warning system (if fitted)	P	---->	---->	---->			
3.12	Landing gear system	P	---->	---->	---->			
3.13	APU	P	---->	---->	---->			
3.14	Radio, navigation equipment, instruments and FMS	P	---->	---->	---->			
	Intentionally left blank							
<b>SECTION 4 – Abnormal and emergency procedures</b>								
4	Abnormal and emergency procedures (may be completed in an FSTD if qualified for the exercise)						M	A mandatory minimum of three items shall be selected from this section
4.1	Fire drills, engine, APU, cargo compartment, flight deck and electrical	P	---->	---->	---->			

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AIRSHIP CATEGORY		PRACTICAL TRAINING					SKILL TEST OR PROFICIENCY CHECK	
Manoeuvres/Procedures		OTD	FTD	FFS	As	Instructor's initials when training completed	Checked in FFS As	Examiner's initials when test completed
	fires, including evacuation if applicable							
4.2	Smoke control and removal	P	---->	---->	---->			
4.3	Engine failures, shut-down and restart: in particular phases of flight, inclusive multiple engine failure	P	---->	---->	---->			
4.4	Incapacitation of crew member	P	---->	---->	---->			
4.5	Transmission/gearbox malfunctions	P	---->	---->	---->		FFS only	
4.6	Other emergency procedures as outlined in the appropriate flight manual	P	---->	---->	---->			
<b>SECTION 5 – Instrument Flight Procedures (to be performed in IMC or simulated IMC)</b>								
5.1	Instrument take-off: transition to instrument flight is required as soon as possible after becoming airborne	P*	----> >*	----> >*	----> >*			
5.1.1	Simulated engine failure during departure	P*	----> >*	----> >*	----> >*		M*	
5.2	Adherence to departure and arrival routes and ATC instructions	P*	----> >*	----> >*	----> >*		M*	
5.3	Holding procedures	P*	----> >*	----> >*	----> >*			
5.4	Precision approach down to a decision	P*	----> >*	----> >*	----> >*			

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AIRSHIP CATEGORY		PRACTICAL TRAINING					SKILL TEST OR PROFICIENCY CHECK	
Manoeuvres/Procedures		OTD	FTD	FFS	As	Instructor's initials when training completed	Checked in FFS As	Examiner's initials when test completed
	height not less than 60 m (200 ft)							
5.4.1	Manually, without flight director	P*	---- >*	---- >*	---- >*		M* (Skill test only)	
5.4.2	Manually, with flight director	P*	---- >*	---- >*	---- >*			
5.4.3	With use of autopilot	P*	---- >*	---- >*	---- >*			
5.4.4	Manually, with one engine simulated inoperative; engine failure has to be simulated during final approach before passing the OM and continued to touchdown or until completion of the missed approach procedure	P*	---- >*	---- >*	---- >*		M*	
5.5	Non-precision approach down to the MDA/H	P*	---- >*	---- >*	---- >*		M*	
5.6	Go-around with all engines operating on reaching DA/H or MDA/MDH	P*	---- >*	---- >*	---- >*			
5.6.1	Other missed approach procedures	P*	---- >*	---- >*	---- >*			
5.6.2	Go-around with one engine simulated inoperative on reaching DA/H or MDA/MDH	P*					M*	
5.7	Recovery from unusual attitudes (this one depends on the quality of the FFS)	P*	---- >*	---- >*	---- >*		M*	

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AIRSHIP CATEGORY		PRACTICAL TRAINING					SKILL TEST OR PROFICIENCY CHECK	
Manoeuvres/Procedures		OTD	FTD	FFS	As	Instructor's initials when training completed	Checked in FFS As	Examiner's initials when test completed
<b>SECTION 6 – Optional equipment</b>								
6	Use of optional equipment		P	----	>			

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**AMC1 to Appendix 9 Training, skill test and proficiency check for MPL, ATPL, type and class ratings, and proficiency check for IRs**

**APPLICATION AND REPORT FORM**

If applicable, this form is also the certificate of completion of the type rating course for ZFTT.

<b>APPLICATION AND REPORT FORM</b>				
<b>ATPL, MPL, TYPE RATING, TRAINING, SKILL TEST AND</b>				
<b>PROFICIENCY CHECK AEROPLANES (A) AND HELICOPTERS (H)</b>				
Applicant's last name(s):	Aircraft:	SE-SP: A <input type="checkbox"/> H <input type="checkbox"/>	ME-SP: A <input checked="" type="checkbox"/> H <input type="checkbox"/>	
Applicant's first name(s):		SE-MP: A <input checked="" type="checkbox"/> H <input type="checkbox"/>	ME-MP: A <input checked="" type="checkbox"/> H <input type="checkbox"/>	
Signature of applicant:	Operations:	SP <input type="checkbox"/> MP <input type="checkbox"/>		
Type of licence held:	Checklist:	Training record: <input type="checkbox"/>	Type rating: <input type="checkbox"/>	
Licence number:		Skill test: <input type="checkbox"/>	Class rating: <input type="checkbox"/>	
		IR: <input type="checkbox"/>		
State of licence issue:		Proficiency check: <input type="checkbox"/>	ATPL: <input type="checkbox"/>	MPL: <input type="checkbox"/>

<b>1</b>	<b>Theoretical training for the issue of a type or class rating performed during period</b>			
From:	To:	At:		
Mark obtained:	% (Pass mark 75%):	Type and number of licence:		
Signature of HT:		Name(s) in capital letters:		
<b>2</b>	<b>FSTD</b>			
FSTD (aircraft type):	Three or more axes:		Ready for service and used:	
	Yes			
	No <input type="checkbox"/>			
FSTD manufacturer:	Motion or system:	Visual aid: Yes <input checked="" type="checkbox"/> No <input type="checkbox"/>		
FSTD operator:	FSTD ID code:			
Total training time at the controls:		Instrument approaches at aerodromes to a decision altitude or height of:		



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Location, date and time:			Type and number of licence:		
Type rating instructor <input type="checkbox"/> Class rating instructor <input type="checkbox"/> ..... instructor <input type="checkbox"/>					
Signature of instructor:			Name(s) in capital letters:		
3	Flight training: in the aircraft		in the FSTD (for ZFTT)		
Type of aircraft:		Registration:		Flight time at the controls:	
Take-offs:		Landings:		Training aerodromes or sites (take-offs, approaches and landings):	
Take-off time:				Landing time:	
Location and date:				Type and number of licence held:	
Type rating instructor <input type="checkbox"/> Class rating instructor <input type="checkbox"/>					
Signature of instructor:			Name(s) in capital letters:		
4	Skill test	Proficiency check			
Skill test and proficiency check details:					
Aerodrome or site:			Total flight time:		
Take-off time:			Landing time:		
Pass <input type="checkbox"/>		Fail <input type="checkbox"/>		Reason(s) why, if failed:	
Location and date:			SIM or aircraft registration:		
Examiner's certificate number (if applicable):			Type and number of licence:		
Signature of examiner:			Name(s) in capital letters:		

**AMC2 to Appendix 9 Training, skill test and proficiency check for MPL, ATPL, type and class ratings, and proficiency check for IRs**

**TRAINING, SKILL TEST AND PROFICIENCY CHECK: SP AEROPLANES**

Section 3.B of the training and skill test and proficiency check content for SP aeroplanes included in Appendix 9.B should include training on a circling approach, after an IFR approach.

**GM1 to Appendix 9 Training, skill test and proficiency check for MPL, ATPL, type and class ratings, and proficiency check for IRs**

**TYPE SPECIFIC UPRT AND GO-AROUND TRAINING IN FSTD**

(a) General

- (1) The upset recovery training exercises should be mainly manoeuvre-based but may include some scenario-based training elements. The manoeuvre-based training enables type rating applicants to apply their handling skills and recovery strategy whilst leveraging CRM principles to return the aeroplane from an upset condition to a stabilised flight path.
- (2) If training is conducted in an FSTD, it is important that applicants understand the limitations of the FSTD in replicating the physiological and psychological aspects of upset recovery exercises.

Note: In order to avoid negative training and negative transfer of training, the ATO should ensure that the selected upset recovery exercises take into consideration the limitations of the FFS.

(b) Stall event recovery in FSTD (Appendix 9, Section B(5) exercise 7.2.1; Section B(6) exercise 3.7.1)

- (1) It is of utmost importance that stall event recovery training takes into account the capabilities of the FFS used. To deliver stall event recovery training, the FFS should be qualified against the relevant UPRT elements of CS-FSTD Issue 2. Stall event recovery training should include training up to the stall (approach-to-stall). Post-stall training may be delivered provided the device has been qualified against the relevant optional elements of CS-FSTD Issue 2 and the operator demonstrates that negative training or negative transfer of training is avoided. A 'stall event' is defined as an occurrence whereby the aeroplane experiences one or more conditions associated with an approach-to-stall or a post stall.
- (2) Stall event recovery training should emphasise the requirement to reduce the AoA whilst accepting the resulting altitude loss. High-altitude stall event training should be included so that flight crew experience the aeroplane control response, the significant altitude loss during the recovery, and the increased time required to recover. The training should also emphasise the risk of triggering a secondary stall event during the recovery.
- (3) Recovery from a stall event should always be conducted in accordance with the stall event recovery procedures of the OEMs.

Note: If an OEM-approved recovery procedure does not exist, ATOs should develop and train the aeroplane-specific stall recovery procedure based on the template in Table 1 below. Refer to Revision 3 of the Airplane Upset Prevention and Recovery Training Aid (AUPRTA) for a detailed explanation and rationale of the stall event recovery template as recommended by the OEMs.

**Table 1: Recommended stall event recovery template**

Stall event recovery template		
Pilot Flying (PF)		Pilot Monitoring (PM)
Immediately do the following at first indication of a stall (aerodynamic buffeting, reduced roll stability and aileron effectiveness, visual or aural cues and warnings, reduced elevator (pitch) authority, inability to maintain altitude or arrest rate of descent, stick shaker activation (if installed)) during any flight phases <i>except at lift-off</i> .		
1.	<b>AUTOPILOT — DISCONNECT</b> (A large out-of-trim condition could be encountered when the autopilot is disconnected)	<b>MONITOR</b> airspeed and attitude throughout the recovery and <b>ANNOUNCE</b> any continued divergence
2.	<b>AUTOTHRUST/AUTOTHROTTLE — OFF</b>	
3.	<b>(a) NOSE-DOWN PITCH CONTROL</b> apply until stall warning is eliminated <b>(b) NOSE-DOWN PITCH TRIM</b> (as needed) (Reduce the AoA whilst accepting the resulting altitude loss.)	
4.	<b>BANK — WINGS LEVEL</b>	
5.	<b>THRUST — ADJUST</b> (as needed) (Thrust reduction for aeroplanes with underwing-mounted engines may be needed)	
6.	<b>SPEEDBRAKES/SPOILERS — RETRACT</b>	
7.	When airspeed is sufficiently increasing — <b>RECOVER</b> to level flight (Avoid the secondary stall due to premature recovery or excessive G-loading)	

- (c) Nose-high and nose-low recovery exercises (Appendix 9, Section B(5) exercise 7.2.2; B(6) exercise 3.7.2)

Nose-high and nose-low recovery exercises should be conducted in accordance with the strategies recommended by the OEMs contained in Tables 2 and 3 below.

Note: As the OEM procedures always take precedence over the recommendations, ATOs should consult the OEM on whether any approved type-specific recovery procedures are available prior to using the templates.

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Refer to Revision 3 of the Airplane Upset Prevention and Recovery Training Aid (AUPRTA) for a detailed explanation and rationale of nose-high and nose-low recovery strategies as recommended by the OEMs.

**Table 2: Recommended nose-high recovery strategy template**

Nose-high recovery strategy template	
Either pilot — Recognise and confirm the developing situation by announcing ‘nose high’	
PF	PM
1. <b>AUTOPILOT — DISCONNECT</b> (A large out-of-trim condition could be encountered when the autopilot is disconnected)	<b>MONITOR</b> airspeed and attitude throughout the recovery and <b>ANNOUNCE</b> any continued divergence
2. <b>AUTOTHRUST/AUTOTHROTTLE — OFF</b>	
3. <b>APPLY</b> as much nose-down control input as required to obtain a nose-down pitch rate	
4. <b>THRUST — ADJUST</b> (if required) (Thrust reduction for aeroplanes with underwing-mounted engines may be needed)	
5. <b>ROLL — ADJUST</b> (if required) (Avoid exceeding 60-degree bank)	
6. When airspeed is sufficiently increasing — <b>RECOVER</b> to level flight (Avoid the secondary stall due to premature recovery or excessive G-loading)	
<b>NOTE:</b> (1) Recovery to level flight may require use of pitch trim. (2) If necessary, consider reducing thrust in aeroplanes with underwing-mounted engines to aid in achieving nose-down pitch rate. (3) <b>WARNING:</b> Excessive use of pitch trim or rudder may aggravate the upset situation or may result in high structural loads.	

**Table 3: Recommended nose-low recovery strategy template**

<b>Nose-low recovery strategy template</b>	
<b>Either pilot —</b> Recognise and confirm the developing situation by announcing ‘ <b>nose low</b> ’ (If the autopilot or autothrust/autothrottle is responding correctly, it may not be appropriate to decrease the level of automation while assessing if the divergence is being stopped)	
<b>PF</b>	<b>PM</b>
1. <b>AUTOPILOT — DISCONNECT</b> (A large out-of-trim condition could be encountered when the autopilot is disconnected)	<b>MONITOR</b> airspeed and attitude throughout the recovery and <b>ANNOUNCE</b> any continued divergence
2. <b>AUTOTHRUST/AUTOTHROTTLE — OFF</b>	
3. <b>RECOVERY</b> from stall if required	

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4.	<b>ROLL</b> in the shortest direction to wings level (It may be necessary to reduce the G-loading by applying forward control pressure to improve roll effectiveness)	
5.	<b>THRUST and DRAG — ADJUST</b> (if required)	
6.	<b>RECOVER</b> to level flight (Avoid the secondary stall due to premature recovery or excessive G-loading.)	
<b>NOTE:</b> (1) Recovery to level flight may require use of pitch trim. (2) <b>WARNING:</b> Excessive use of pitch trim or rudder may aggravate the upset situation or may result in high structural loads		

- (d) Go-around with all engines operating from various stages during an instrument approach (Appendix 9, Section B(5) exercise 7.3; B(6) exercise 4.1.)
- (1) The objective of the go-around exercises is to expose the student pilot to the physiological effects caused by a go-around. The instructor should ensure that student pilots understand the objective of the exercises and provide students with appropriate coping strategies, including TEM. Due consideration should be given to environmental conditions when evaluating the demonstration of task proficiency and related criteria.
  - (2) A go-around may be commenced at any time during an approach, including before the aeroplane is in the landing configuration. Historically, most go-around training has been conducted when the aeroplane is in the landing configuration prior to commencing the go-around. Students must be prepared to adapt the go-around manoeuvre if the go-around is commenced prior to the point where the aeroplane is fully configured for landing. Situation awareness in relation to flap and gear configuration, aeroplane speed and missed approach altitude is important.
  - (3) Unanticipated go-arounds may startle the students (e.g. unexpected ATC constraints, automation malfunction, adverse weather, etc.). Students may find themselves faced with a situation where they have to perform a large number of critical actions under a high workload (e.g. setting thrust, landing gear retraction, flight path management). The instructor should explain that there is also a possibility of disorientation during a go-around because of the somatogravic effect produced by large longitudinal acceleration felt by the inner-ear as the aeroplane speed increases. This effect cannot be reproduced in an FSTD.
  - (4) It is vital that the correct pitch attitude is selected and maintained, while the aeroplane is kept in trim as it accelerates (depending on the aeroplane

type). On some aeroplane types with under-slung engines the pitch response with all engines functioning may be amplified due to the relatively low gross weight towards the end of a flight and the high thrust available from modern aeroplane engines. It is particularly important that trim changes are anticipated on such aeroplanes.

- (5) ATOs should develop scenarios for go-around training containing different take-off and approach stall situations that also involve surprise and startle effects and include:
  - (i) a go-around from the non-landing configuration;
  - (ii) a go-around at low gross weight using maximum go-around thrust;
  - (iii) a go-around from the outer marker or equivalent point;
  - (iv) a go-around below 500 ft using, as applicable/permitted, reduced go-around thrust;
  - (v) a go-around initiated above the published missed approach altitude; and
  - (vi) a normal go-around from the landing configuration using reduced go-around thrust (if available / type-specific).
- (6) Training should also incorporate topics such as flight path management (manual and automatic), application of procedures, startle factors, communication, workload management and situation awareness. The objective of this training is to highlight:
  - (i) differences to procedures when the aircraft is in the non-landing configuration;
  - (ii) differences in handling characteristics at low gross weights and high thrust settings;
  - (iii) the threat associated with go-arounds close to the published missed approach altitudes;
  - (iv) startle and surprise associated with an unplanned go-around (ATC, blocked runway, etc.);
  - (v) the importance of effective communication between flight crew;

- (vi) the requirement to be aware of the aircraft energy state during a go-around; and
  - (vii) the importance of engaging the autopilot or flight director in the correct modes during a go-around.
- (7) Go-around training should not be limited to addressing the somatogravic effects caused by a go-around. Training should also cover topics such as flight path management (manual and automatic), application of procedures, startle factor, communication, workload management and situation awareness. Flight path management training should address:
  - (i) the handling differences of a lighter than normal aircraft which may differ to handling experienced during take-off when the aircraft is much heavier;
  - (ii) the different reaction of the aeroplane (pitch and vertical speed) comparing a go-around performed with reduced G/A thrust (if the function is available) and a go-around performed with full G/A thrust (a different weight).
- (8) The importance of correct selection of TO/GA modes by the PF should also be emphasised (pushing TO/GA, selected the correct thrust lever detent, etc.)
- (9) The importance of the PM role in the go-around manoeuvre should also be highlighted. The PM usually has higher workload as they need to reconfigure the aircraft, engage FMA modes, communicate with ATC and monitor the actions of the PF. This excessive workload for the PM may lead him or her to prioritise actions to the detriment of monitoring activities. The phenomenon of attentional tunnelling may also need to be addressed. This happens when one pilot, or both, focus exclusively on a problem at the expense of general monitoring of the flight parameters.

## **Appendix 10 – Revalidation and renewal of type ratings, and revalidation and renewal of IRs when combined with the revalidation or renewal of type ratings – EBT practical assessment**

### **A – General**

1. The revalidation and renewal of type ratings as well as the revalidation and renewal of IRs when combined with the revalidation or renewal of type ratings in accordance with this Appendix shall be completed only at EBT operators which comply with all of the following:
  - (a) they have established an EBT programme relevant for the applicable type rating or the IR in accordance with point ORO.FC.231 of MCAR-Part-ORO;
  - (b) they have an experience of at least 3 years in conducting a mixed EBT programme;
  - (c) for each type rating within the EBT programme, the organisation has appointed an EBT manager. EBT managers shall comply with all of the following:
    - (i) they shall hold examiner privileges for the relevant type rating;
    - (ii) they shall have extensive experience in training as an instructor for the relevant type rating;
    - (iii) they shall either be the person nominated in accordance with point ORO.AOC.135(a)(2) of MCAR-Part-ORO or a deputy of that person.
2. The EBT manager responsible for the relevant type rating shall ensure that the applicant complies with all qualification, training and experience requirements of this MCAR for the revalidation or the renewal of the relevant rating.
3. Applicants who wish to revalidate or renew a rating in accordance with this Appendix shall comply with all of the following:
  - (a) they shall be enrolled in the operator's EBT programme;
  - (b) in the case of revalidation of a rating, they shall complete the operator's EBT programme within the period of validity of the relevant rating;
  - (c) in the case of renewal of a rating, they shall comply with procedures developed by the EBT operator in accordance with point ORO.FC.231(a)(5) of MCAR-Part-ORO.



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4. The revalidation or renewal of a rating in accordance with this Appendix shall comprise all of the following:
- (a) continuous EBT practical assessment within an EBT programme;
  - (b) demonstration of an acceptable level of performance in all competencies;
  - (c) the administrative action of licence revalidation or renewal for which the EBT manager responsible for the relevant type rating shall do all of the following:
    - (1) ensure that the requirements of point FCL.1030 are complied with;
    - (2) when acting in accordance with point FCL.1030(b)(2), endorse the applicant's licence with the new expiry date of the rating. That endorsement may be completed by another person on behalf of the EBT manager, if that person received a delegation from the EBT manager to do so in accordance with the procedures established in the EBT programme.

**B – Conduct of the EBT practical assessment**

The EBT practical assessment shall be conducted in accordance with the operator's EBT programme.

**AMC1 to Appendix 10 Revalidation and renewal of type ratings, and revalidation and renewal of IRs when combined with the revalidation or renewal of type ratings – EBT practical assessment**

**APPLICATION AND REPORT FORM — ADMINISTRATIVE PROCEDURES RELATED TO TYPE RATINGS**

- (a) Minimum information provided in the form for Appendix 10.

Applicant's last name(s):	Applicant's first name(s):
Signature of applicant:	State of licence issue:
Type of licence held:	Licence number:
Type rating:	FSTD (aircraft type):
EBT module 1	Session 1.....Name of the instructor: _____
	Type and number of licence: _____
	Location, date and time: _____ FSTD ID code: _____
	_____
EBT module 1	Session 2.....Name of the instructor: _____
	Type and number of licence: _____

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<b>EBT module 1</b>	Location, date and time: _____ FSTD ID code: _____	
	Session X.....Name of the instructor: _____	
	Type and number of licence: _____	
	Location, date and time: _____ FSTD ID code: _____	
	Completion of the module: <input type="checkbox"/>	_____ date / signature (EBT manager)
<b>EBT module 2</b>	Session 1.....Name of the instructor: _____	
	Type and number of licence: _____	
	Location, date and time: _____ FSTD ID code: _____	
	_____	
	Session 2.....Name of the instructor: _____	
	Type and number of licence: _____	
	Location, date and time: _____ FSTD ID code: _____	
	Session X.....Name of the instructor: _____	
	Type and number of licence: _____	
	Location, date and time: _____ FSTD ID code: _____	
Completion of the module: <input type="checkbox"/>		_____ date / signature (EBT manager)
(...)		
<b>EBT module X</b>	Session 1.....Name of the instructor: _____	
	Type and number of licence: _____	
	Location, date and time: _____ FSTD ID code: _____	
	_____	
	Session 2.....Name of the instructor: _____	
	Type and number of licence: _____	
	Location, date and time: _____ FSTD ID code: _____	
	Session X.....Name of the instructor: _____	
	Type and number of licence: _____	
	Location, date and time: _____ FSTD ID code: _____	
Completion of the module: <input type="checkbox"/>		_____ date / signature (EBT manager)
Completion of the operator's EBT programme from ____ (date) to ____ (date) <input type="checkbox"/>		_____ date / signature (EBT manager)
Name(s) in capital letters: _____		Signature of examiner (EBT manager) _____
Type and number of licence: _____		_____
Examiner certificate number: _____		Date of applicant's licence endorsement: _____
Delegation of signature for licence endorsement (instructor)		
Name: _____		Signature _____
Position in the operator: _____		
Date: _____		

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- (b) AOC declaration for revalidation and renewal under the EBT programme for the purpose of AMC1 ARA.GEN.315(a) point (d) and for the purpose of point 1(a) of Appendix 10.

I confirm all of the following:

The EBT manager holds a current type rating examiner certificate in the type rating filled in in <a href="#">Appendix 10</a> (copy to be attached);	YES	<input type="checkbox"/>
The instructor(s) that conducted the training to the applicant has (have) been standardised.	YES	<input type="checkbox"/>
The EBT operator has performed a verification of the grading system at least once in the last 3 years.	YES	<input type="checkbox"/>
The integrity of the applicant training data is ensured.	YES	<input type="checkbox"/>

Signature of the training manager or EBT manager \_\_\_\_\_

- (c) In order for the EBT manager to delegate their signature in accordance with point 4(c)(2) of Appendix 10 to another person to endorse the licence of the applicant, the following should apply:
- (1) the person signing the licence should be nominated,
  - (2) the person signing the licence should hold or have held an instructor certificate,
  - (3) the approved procedure for delegation of signature should include procedures to prevent the person who received the delegation from signing the licence when the EBT programme applicable to the validity period has not been completed.
- (d) The authority may customise the form above by requesting additional information or changing the order of the elements of the form.

**GM1 to Appendix 10 — Revalidation and renewal of type ratings, and revalidation and renewal of IRs when combined with the revalidation or renewal of type ratings — EBT practical assessment**

**REVALIDATION AND RENEWAL OF TYPE RATING — ADMINISTRATIVE PROCEDURES**

- (a) The operator may nominate several deputy EBT managers to ensure the availability of at least one examiner for each fleet, in the context of workload to manage the EBT programme, several locations of the training facilities, or bases, etc.

- (b) For the first revalidation of type rating after the transition from mixed EBT, the examiner may use mixed EBT module(s) in addition to the other EBT module(s) as a means to revalidate the type rating.
- (c) In accordance with the approved procedure in Appendix 10, 4. (c)(2), and as provided in AMC1 to Appendix 10 point (c), the EBT manager may nominate the EBT instructor who completed the EBT module as the person to whom the signature of the examiner is delegated. A stamp or electronic signature may exclusively be given from the EBT manager to the EBT instructor, in order to document the delegation in a transparent and secure manner. Following that process, EBT instructors on behalf of the EBT manager can endorse an applicant's licence.
- (d) The EBT programme is included in the operations manual and, in accordance with ORO.FC.145 of MCAR-Part-ORO, for CAT it is subject to prior approval including any changes, its syllabi and the use of individual FSTD.
- (e) The requirements for completion of the operator's EBT programme (see the form set out in AMC1 to Appendix 10) can be found in point ORO.FC.231(a)(3) of MCAR-Part-ORO and include, as a minimum, the completion of:
  - (1) a minimum of two EBT modules;
  - (2) line evaluation(s) of competence. In the case of renewal of a type rating, the line evaluation of competence can be performed only when the pilot has their type rating renewed; and
  - (3) ground training.
- (f) The EBT programme includes equivalencies of approaches (point ORO.FC.231(g)) and determines the necessary training frequency for particular approaches. Therefore, pilots can maintain their PBN privileges when completing an EBT programme. Additionally, in the case of specific approaches related to PBN which require a specific approval in accordance with Subpart B of MCAR-Part-SPA, the requirements of that Subpart (SPA.PBN) apply.

## **GM2 to Appendix 10 — Revalidation and renewal of type ratings, and revalidation and renewal of IRs when combined with the revalidation or renewal of type ratings – EBT practical assessment**

### **EBT PRACTICAL ASSESSMENT — PROFICIENCY CHECK**

EBT practical assessment (or Practical assessment) is defined in FCL.010. More information can be found in ICAO Doc 9868 'PANS-TRG'.

- (a) The demonstration of skills to revalidate or renew referred to in the definition of 'proficiency check' in point FCL.010 is equivalent to the EBT practical assessments conducted in the EBT programme and the final review of the examiner. In fact, one single EBT practical assessment demonstrates the necessary skills performed in legacy training; however, EBT goes one step further — to revalidate or renew, the pilot performs at least two demonstrations, corresponding to at least two EBT modules within the validity period of the type rating.
- (b) A proficiency check is equivalent to the combination of the evaluation phase (EVAL) and manoeuvres training phase (MT). However, EBT also requires a scenario-based training phase (SBT) following the EVAL to complete the module.