

DEPARTMENT OF CIVIL AVIATION

**MAURITIUS CIVIL AIRWORTHINESS
REQUIREMENTS**

DEPARTMENT OF CIVIL AVIATION
MAURITIUS CIVIL AIRWORTHINESS REQUIREMENTS

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These Chapters are published separately, but are an integral part of the Mauritius Civil Airworthiness Requirements.

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FOREWORD

The Mauritius Civil Aviation Authority (CAA) is issued pursuant to Regulation 135 of the Mauritian Civil Aviation Regulations. This Mauritius Civil Aviation Requirements (ICAR) SCB outlines the minimum requirements in respect of the fitness of persons for air traffic engineering, maintenance requirements, licensing of aircraft maintenance engineers, and the approval of persons for regulations. It is intended to be applied in addition to the obligations imposed by the Civil Aviation Regulations.

The requirements are effective from the date printed thereon and supersede any previous requirements in force prior to that date. Certain provisions, amendments or modifications issued under the authority will continue to be in force where the applicable requirements have been changed, and unless otherwise approved. Compliance with the current Mauritius Civil Aviation Requirements will be deemed to retain the existing approval or qualification of any certificate or document.

- J. Failure to comply with any of the requirements may result in the suspension or revocation of the licence or approval and/or subject to the penalties provided under Regulation 18 of the Civil Aviation Regulations.

Attention is drawn to the fact that the CAA may be contacted through the National Civil Aviation Authority (NCAA) and that the fee payable from the date stipulated in the Notice.

Queries on the Mauritius Civil Aviation Requirements should be referred to the Director Department of Civil Aviation.



A. GUNGAH

Director of Civil Aviation

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CHAPTER 1.0

DEFINITIONS

- 1 For the purposes of the Mauritius Civil Airworthiness Requirements the following terms and their definitions apply in addition to the definitions prescribed in the Mauritius Civil Aviation Regulations
- 1.1 “Aircraft Component” means any component, part, unit or item that, when fitted to an aircraft may, if it is not sound or functioning correctly, affect the safety of the aircraft or causes it to become a danger to persons or property. Such components include airframe and systems components, engines, propellers, electrical, instrument, and radio equipment and their accessories.
- 1.2 “Aircraft Equipment” means any equipment provided in accordance with the Schedules to the Mauritius Civil Aviation Regulations and limited to equipment required to be approved.
- 1.3 “Aircraft Material” means material for use in components or equipment which could affect their airworthiness standard.
- 1.4 – Reserved –
- 1.5 “Approved” means approved by the Authority.
- 1.6 “Authority” means the Director of Civil Aviation of Mauritius (DCA).
- 1.7 “Time in service” means the total time in service required to be recorded in the technical log by regulation 18(2) (a) of the Civil Aviation Regulations.
- 1.8 “Maintenance programme” means the maintenance schedule and related procedures, such as a reliability programme and a condition monitoring programme necessary for the safe operation of those aircraft to which it applies.

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CHAPTER 1.1

REGISTRATION OF AIRCRAFT

1 Introduction

- 1.1 Pursuant to Regulations 6 and 7 of the Mauritius Civil Aviation Regulations, this Chapter prescribes the requirements for registration of aircraft in Mauritius.
- 1.2 Registration of an aircraft is a one-off exercise unless there is a change of ownership.
- 1.3 Registration of an aircraft does not permit an aircraft to fly without a valid Certificate of Airworthiness.
- 1.4 For the purpose of this Chapter, where the significance of the owner of an aircraft is required for the application for a Certificate of Registration or for a change of ownership or for the notification for cancellation of a certificate of registration, and if the owner is a body corporate, the significance shall be that of the Managing Director, Secretary or other official duly authorised to sign under the seal of the company.

2 Application for a Certificate of Registration

- 2.1 Application shall be made on Form DCA AWF 5 and submitted to:

Department of Civil Aviation of Mauritius
Airworthiness Division
SSR International Airport
PLAISANCE

Note: The fees payable for this purpose will be prescribe separately.

- 2.2 An applicant must satisfy the eligibility criteria of the Mauritius Civil Aviation Regulations.

3 Registration of Aircraft

- 3.1 Before an aircraft can be registered, proof of cancellation of foreign registration or, for a new aircraft, proof that the aircraft has never been registered elsewhere must be submitted to the Authority.

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- 3.2 A certificate from the Comptroller of Customs that no customs duty, tax or charge is due in respect of aircraft shall also be submitted by the applicant.

Note: The applicant needs to apply separately to the Telecommunication Authority of Mauritius for a Radio Station Licence, by filling the required forms detailing the type of equipment, lass and power of emission with copy to the Director of Civil Aviation, The DCA will recommend the issuance of a Radio Station Licence only after having confirmation that the equipment referred to are operating and functioning satisfactorily.

4 **Change of Ownership**

- 4.1 A new Certificate of Registration is required when there is a change in the ownership of an aircraft. An application for registration of aircraft using Form DCA AWF 5 in respect of the new owner shall be made to the Authority. The aircraft shall not be flown again until such time as a new Certificate of Registration in respect of the new owner has been issued.
- 4.2 The original Certificate of Registration shall be returned to the Authority. The former aircraft owner must complete the relevant section on page 2 of DCA AWF 5 and submit it to the Authority.

5 **Notification for Cancellation of a Certificate of Registration**

- 5.1 Notification for cancellation of a Certificate of Registration shall be made by the owner of the aircraft.
- 5.2 An affidavit from the owner, duly authenticated by a notary confirming his ownership together with the statement that he has sold/transferred his aircraft to the new owner and has received the sale proceeds in full (if applicable).
- 5.3 Notification of cancellation of an aircraft registration by the Authority to a foreign authority will only be made if requested by the owner.

6.1 **Deregistration of Aircraft**

- 6.2 When an aircraft has been destroyed or permanently withdrawn from service, the registered owner of the aircraft shall within 28 days, give written notice to the Director of Civil Aviation of the fact by sending him the certificate of registration of the aircraft after duly completing the relevant portion of page 2 thereof for necessary action.

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CHAPTER 1.2

CATEGORIES OF AIRCRAFT

1 Introduction

1.1 Certificates of Airworthiness and associated documents are issued in various categories which prescribe the conditions under which the aircraft may be flown and the purposes for which it may be used.

2 Categories and usage of aircraft

2.1 Certificates of Airworthiness may be issued in the following categories:

- (a) Transport Category (Passenger) aircraft may be used for any purpose.
- (b) Transport Category (Cargo) aircraft may be used for any purpose other than public transport of passengers.
- (c) Aerial Work Category aircraft may be used for hire or reward other than public transport.
- (d) Private Category aircraft may be used for any purpose other than public transport or aerial work but is limited to aircraft not exceeding 2730 kg. Maximum Total Mass Authorised (MTMA)
- (e) Special Category aircraft may be used for the purposes specified in the certificate of airworthiness (other than public transport). This does not include the carriage of passengers unless expressly permitted.

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CHAPTER 1.3

NATIONALITY AND REGISTRATION MARKS OF AIRCRAFT

1. INTRODUCTION

1.1 For the purpose of Regulation 10 of the Civil Aviation Regulations 2007 this chapter prescribes the form and the manner in which nationality and registration marks are to be affixed on the aircraft.

2. DEFINITION

(a) **Nationality marks**

Group of characters affixed on aircraft surface to identify the country to which the aircraft belongs.

(b) **Registration marks**

A group of characters affixed on aircraft surface Following nationality marks to identify a particular aircraft.

3. NATIONALITY AND REGISTRATION MARKS TO BE USED ON AIRCRAFT REGISTERED IN MAURITIUS

3.1 The nationality mark of the aircraft registered in Mauritius shall be the numeral 3 followed by capital letter B in Roman character and the registration mark shall be a group of three capital letters in Roman characters as assigned by the Director of Civil Aviation. The letters shall be without ornamentation and a hyphen shall be placed between the nationality and registration marks.

3.2 The nationality and registration marks shall be painted on the aircraft or shall be affixed on it by any other means ensuring a similar degree of permanency in the following manner.

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4. POSITION OF NATIONALITY AND REGISTRATION MARKS

4.1 Flying machines and gliders

(a) Wings - on fixed wing aircraft, the marks shall appear on the left half of the lower surface of the wing structure, or shall extend across the whole of the lower surface of both wings. As far as possible the marks shall be equidistant from the leading and trailing edges of the wings. The tops of the letters shall be towards the leading edge of the wings.

(b) Fuselage (or equivalent structure) or vertical tail surfaces

The marks shall be either on each side of the fuselage (or equivalent structure) between the wings and tail surfaces.

(i) In the case of a single vertical tail surface, on the upper halves of each side of the surface.

(ii) In the case of more than one vertical tail surface, on the upper halves of the outer tails.

4.2 Air ships and balloons

4.2.1 Airships

The marks on an airship shall appear on each side of the airship and on the line of symmetry. They shall be placed lengthwise near the maximum cross-section of the airship.

4.2.2 Spherical Balloons

The marks shall appear in two places diametrically opposite. They shall be located lengthwise near the maximum horizontal circumference of the balloon.

4.2.3 Non-spherical balloons (other than unmanned free balloons). The marks shall appear on each side near the maximum cross-section of the balloon, immediately above either the rigging band or the points of attachment of the basket suspension cables.

4.2.4 The side marks on airships and balloons shall be visible both from the side and from the ground.

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5. SIZE OF THE MARKS

5.1 Flying Machines and Gliders

5.1.1 Wings - The letters constituting nationality and registration marks shall be of equal height. The height of the letters shall be at least 50 cms.

5.1.2 Fuselage (or equivalent structure) and vertical tail surfaces.

The marks on the fuselage (or equivalent structure) shall not interfere with the visible outlines of the fuselage (or equivalent structure). The marks on the vertical tail surfaces shall be such as to leave a margin of at least 5 cms along each side of the vertical tail surface. The letters constituting each group of marks shall be of equal height. The height of the marks shall be at least 30cms. However, where owing to the construction of the aircraft a height of 30 cms is not reasonably practicable, the height shall be the greatest height reasonably practicable in the circumstances, being not less than 15 cms.

5.2 Airships and balloons

Three letters constituting each group of marks shall be of equal heights and the height of the letters shall be at least 75 cms.

6. THE WIDTH AND SPACING OF THE MARKS

6.1 The width of each letter (except the letter I) and the length of the hyphen between the nationality and registration marks shall be two thirds of the height of a letter.

6.2 The letters and the hyphen shall be formed by solid lines and shall be of a colour contrasting with the background on which they appear. The thickness of the lines shall be one sixth of a height of a letter.

6.3 Each letter shall be separated from the letter which it immediately precedes or follows by a space equal to half width of a letter. A hyphen shall be regarded as a letter for this purpose.

7. The nationality and registration marks shall be displayed to the best advantage, taking into consideration the constructional features of the aircraft. These shall always be kept in good condition so that these can be read clearly and easily.

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8. IDENTIFICATION PLATE

In addition to the above, an aircraft shall carry an identification plate inscribed with the nationality and registration marks, together with the name and address of the registered owner of the aircraft. The plate shall be made of fire proof metal and shall be affixed, in a prominent position, to the fuselage or basket, as the case may be and near the main entrance to the aircraft.

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CHAPTER 1.4

ISSUE OF CERTIFICATES OF AIRWORTHINESS

1 Introduction

- 1.1 Pursuant to regulation 14 of the Mauritius Civil Aviation Regulations, this Chapter prescribes the requirements for the issue of a Mauritius Certificate of Airworthiness for new and used aircraft.
- 1.2 An aircraft to which a certificate of airworthiness is issued shall be operated in compliance with the terms and conditions of that certificate and within the approved operating limitations in its flight manual.
- 1.3 The categories in which Certificates of Airworthiness may be issued are specified in the Mauritius Civil Aviation Regulations.
- 1.4 This Chapter spells out the general requirements for the issue of the Mauritius Certificate of Airworthiness.

2 Application for a Certificate of Airworthiness

- 2.1 Application shall be made on Form DCA AWF 6 and submitted to:

Department of Civil Aviation of Mauritius
Airworthiness Division
SSR International Airport
PLAISANCE

Note: The fees payable for this purpose will be prescribed separately.

3 Requirements

- 3.1 Prior to issuing any Certificate of Airworthiness, the Authority will conduct an investigation to determine if the aircraft meets the Mauritius airworthiness requirements. The applicant will have to furnish to the Authority the information, data, reports, etc., prescribed in Chapter 1.3 Appendix 1 and to meet any additional requirements decided by the Authority during the investigation.

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- 3.2 The aircraft must have a type certificate that has been accepted by the Authority Any variation in observance of the requirements permitted by the Airworthiness Authority of the State of Design or of the State of Manufacture or Special Conditions imposed by the Airworthiness Authority of an exporting state must be acceptable to the Authority.
- 3.3 The aircraft may be required to be made available for survey by the Authority at suitable times and for such periods considered necessary. The owner shall prepare the aircraft to permit access as necessary and shall perform any checks and tests that may be requested.
- 3.4 Each application for issue in Mauritius of a Certificate of Airworthiness or revalidation of a foreign Certification of Airworthiness shall be accompanied with documents from an appropriately approved organisation or, when otherwise approved, an appropriately licensed aircraft maintenance engineer, which
- (a) state the type, model and manufacturer's serial number of the aircraft;
 - (b) substantiate that the aircraft complies with the airworthiness requirements appropriate to the aircraft type and which are acceptable to the Authority;
 - (c) substantiate that all Mauritius airworthiness requirements and special conditions applicable to the aircraft have been complied with;
 - (d) certify in regard to a used aircraft, that the aircraft and its records have been inspected and as far as can be reasonably determined the aircraft is safe to fly subject to the requirements prescribed in the approved flight manual or the Certificate of Airworthiness.
- 3.6 Upon being registered in Mauritius, all work on the aircraft shall be undertaken by appropriately approved person or organisation or, when otherwise approved, licensed aircraft maintenance engineer. A Certificate of Release to Service shall be issued and attached to the log book or other approved records together with full particulars of the work done.
- Note: Requirements for the compilation of aircraft, engine and variable pitch propeller log book entries and engineering records are prescribed in Section 4 Chapter 4.6.
- 3.7 The flight test carried out under the exporting country's authority may be accepted for the issue of a Mauritius Certificate of Airworthiness. When the flight test is required by the Authority, the owner shall be responsible to ensure that:
- (a) the aircraft and its engine(s) have been certified as fit for flight by appropriately licensed aircraft maintenance engineers.

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Note: A Certificate of Fitness for flight shall be issued in duplicate. One copy must be retained by the person issuing the Certificate.

- (b) a flight test schedule is prepared and is acceptable to the Authority.
- (c) the handling characteristics are satisfactory and climb performance equals or exceeds the scheduled performance.
- (d) the flight tests are conducted by a person or organisation acceptable to the Authority.

Note: The test may be witnessed by officers of the Authority.

- (e) a report on the flight tests in an acceptable format shall be submitted to the Authority.

3.8 For new aircraft the owner shall arrange for the aircraft to be inspected during the course of construction to determine that it conforms in all essential aspects with the approved design and that its construction and assembly are satisfactory. The owner shall nominate a person responsible acceptable to the Authority to carry such inspections. When necessary the Authority may also inspect the aircraft in addition to the abovementioned inspections.

4. **Acceptable Standards**

- 4.1 Acceptable standards of airworthiness are those standards relating to the design, materials, construction, equipment, performance and maintenance of aircraft.
- 4.2 In respect of paragraph 3.2 above, where airworthiness standards have not been established by the Department of Civil Aviation of Mauritius, the Department will accept standards prescribed in the relevant Chapters of FAR's or BCAR's or EASA or their approved subordinate documents such as FAA advisory Circulars and CAA Civil Aircraft Inspection Procedures, or other such standards approved by the airworthiness authority of the country of manufacture of the aircraft.
- 4.3 Unless otherwise approved by the Director of Civil Aviation, airworthiness standards established by the Department of Civil Aviation of Mauritius shall supersede all others.
- 4.4 In respect of paragraph 3.2 above, persons considering the importation of aircraft into Mauritius may, prior to importation, consult with an airworthiness representative of the

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Department of Civil Aviation to ensure that they are knowledgeable with respect to the standards of airworthiness that the aircraft must meet in order to qualify for a C of A.

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CHAPTER 1.4

ISSUE OF CERTIFICATE OF AIRWORTHINESS

APPENDIX 1

GENERAL REQUIREMENTS

1 Introduction

1.1 The following identifies the general requirements which must be satisfied prior to the issue of a Mauritius Certificate of Airworthiness.

2 New Aircraft

2.1 The general requirements are as follows:

- (a) Export Certificates of Airworthiness for the aircraft, engines and propellers (as applicable).

The Certificates shall be endorsed with:

- (i) the national requirements with which the aircraft complies giving the title, issue numbers and effective date.
- (ii) such deviations from the national requirements as may have been authorised in writing by the Airworthiness Authorities which issue the Certificates.
- (iii) such additional special conditions that was required before the issue of the Certificates.
- (b) A list of applicable Airworthiness Directives together with:
- (i) A declaration of the Airworthiness Directives that had been complied with. Where alternate means of compliance are offered, the means chosen shall be stated.
- (ii) Identification of Airworthiness Directives that require repetitive compliance. Information as to when the next compliance is due must also be provided.

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- (c) A list of Service Bulletins, including Alert Service Bulletins, complied with on aircraft engines, propellers (as applicable) and equipment.
- (d) Statement of Modification Status which shall include:
 - (i) Customer options incorporated.
 - (ii) Equipment incorporated.
- (e) Statement of compliance with mandatory equipment and radio apparatus requirements specified in the Schedules of the Mauritius Civil Aviation Regulations.
- (f) Statement of compliance with requirements specified in the Mauritius Airworthiness Notices.
- (g) A list of defects, if any, that is to be rectified by the applicant at the time of issue of the Export Certificate of Airworthiness.
- (h) Equipment list.
- (i) Weighing report.
- (j) Weight and centre-of-gravity schedule.
- (k) Time/life limitations.
- (l) Records of compass system and magnetic compass swing.
- (m) Noise Certificate.

3 **First-of-type Aircraft**

- 3.1 In addition to the requirements in paragraph 2, the following is required for a first of-type aircraft exported to Mauritius, unless otherwise notified:
 - (a) Statement of build standard which shall include the aircraft specification.
 - (b) A copy of the aircraft and engine type certificates and applicable supplemental type certificates.

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- (c) Type certificate data sheets or specifications for aircraft, engine and propeller, including any supplemental type specifications.
- (d) Wiring diagrams.
- (e) Electrical load analysis.
- (f) Maintenance Review Board Report where applicable.
- (g) Maintenance Planning Data (which should include corrosion prevention and control programme, and structural integrity programme, where applicable)
- (h) Master Minimum Equipment List, where applicable.
- (i) Noise certificate.
- (j) One copy each of the following manuals:
 - (1) Flight Manual or Pilot Operating Handbook (in addition to the copy for each aircraft).
 - (2) Operations Manual (in addition to the copy for each aircraft).
 - (3) Aircraft Maintenance Manual.
 - (4) Engine Maintenance Manual.
 - (5) Propeller Maintenance Manual.
 - (6) APU Maintenance Manual.
 - (7) Parts Catalogue.
 - (8) Standard Practices Manual.
 - (9) Structural Repair Manual.
 - (10) Structurally Significant Items.
 - (11) Loading Procedures Manual.
 - (12) Weight and Balance Manual.
 - (13) Non-destructive Testing Manual.

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- (k) Complete sets of Service Bulletins for aircraft, engine, propeller and APU. Amendment service for the above documents must be provided to the Authority.

4 Used Aircraft

- 4.1 In addition to the requirements in paragraph 2 and, where applicable, in paragraph 3, the following is also required for a used aircraft:
 - (a) A complete history of past operational uses of the aircraft.
 - (b) A complete history of the aircraft, engines, propellers, components and equipment including:
 - (i) The number of landings and pressurisation cycles.
 - (ii) The maintenance programme to which the aircraft has previously been maintained, including previous check cycle and future check cycle.
 - (c) The time in service since new of any components of the aircraft, engines, propellers or equipment which are subject to mandatory life limitations.
 - (d) The time in service since new and since overhaul of any components of the aircraft, engines, propellers or equipment which are subject to an approved overhaul period.
 - (e) Details of all changes of major structural components such as wings, tailplanes, helicopter rotors or transmission components and histories of the replacing components.
 - (f) Details of major structural repairs including the nature of damage in each case.
 - (g) The particulars and results of airworthiness acceptance tests.

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CHAPTER 1.5

RENEWAL OF CERTIFICATE OF AIRWORTHINESS

1 Introduction

- 1.1 Pursuant to Regulation 14 of the Mauritius Civil Aviation Regulations, this Chapter prescribes the requirements for renewal of a Certificate of Airworthiness.

Note: Mauritius Certificates of Airworthiness are normally issued or renewed for periods not exceeding one year or such period at the discretion of the Authority taking into consideration the continued airworthiness programme of the owner/operator.

2 Application for Renewal of Certificate of Airworthiness

- 2.1 Application shall be made on Form DCA AWF 6A and submitted to:

Department of Civil Aviation of Mauritius

Airworthiness Division
SSR International Airport, PLAISANCE
Mauritius

Note: (1) The fees for renewal of a Certificate of Airworthiness will be prescribed at a later date.

- (2) The application and all documents required by this Chapter should be submitted at least two weeks prior to the expiry date of the Certificate.

3 Requirements

- 3.1 The renewal of a Certificate of Airworthiness is dependent on evidence being provided that the aircraft complies with the appropriate airworthiness requirements and is airworthy.

- 3.2 An inspection of the aircraft may be required but all relevant records shall be reviewed prior to the renewal of the Certificate of Airworthiness. The depth and extent of the inspection, if required, will depend on:

- (a) the age of the aircraft, areas and types of operation and conditions of storage.

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- (b) the extent of any unscheduled work that has been carried out on the aircraft since the last renewal following such events as serious or persistent defects, defects or damages requiring major repairs or modifications, inspections completed following hard or overweight landings or abnormal stresses during flight or on the ground, corrosion in major structure, etc.
 - (c) evidence that the approved maintenance schedules or approved overhaul and/or replacement periods for the aircraft and its components have been fully observed.
 - (d) evidence that airworthiness requirements or instructions, such as mandatory modifications and inspections, airworthiness directives, etc., prescribed or approved for the aircraft and its components by the Authority, have been complied with fully.
 - (e) evidence of, observance of the aircraft or component manufacturers' recommendations, such as service bulletins, service letters, etc., which may affect the airworthiness of the aircraft.
- 3.3 Prior to renewal of the Certificate of Airworthiness the aircraft may be required to be made available for survey by Airworthiness Officers of the Authority. If a survey is required, the owner shall have the aircraft prepared for inspection in an acceptable condition to enable tests and inspections to be made. Additional work may be required by the Authority following a survey of the aircraft.
- 3.4 Unless there is a system of monitoring the weight and centre of gravity of the aircraft, the aircraft should be weighed prior to the initial issue of a Mauritius Certificate of Airworthiness. For aircraft exceeding 5700kg MTMA, it should be reweighed within two years after the date of manufacture and thereafter at intervals not exceeding five years. The weighing and centre of gravity report shall be submitted in a prescribed format to the Authority.
- 3.5 If a flight test is required, the aircraft shall be tested to schedules approved by the Authority. Particulars and results of the tests shall be submitted in an acceptable format to the Authority. In lieu of an annual flight test, a programme for aircraft performance and engine condition monitoring must be implemented.
- 4 Records and Log Books**
- 4.1 The relevant log books, modification record book and maintenance records forming part of log books, and records permitted to be kept by other approved means shall be submitted to the Authority prior to renewal of the Certificate of Airworthiness.

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4.2 Full particulars of the work done relating to the renewal of the Certificate of Airworthiness shall be entered and certified in the log books or other approved records.

4.3 Copies of the valid Certificates of Releases to Service/Schedule Maintenance Inspection and Certificate of Maintenance Review should be submitted to the Authority prior to the renewal of the Certificate of Airworthiness.

5 **Aircraft Documents**

5.1 Unless otherwise required, the aircraft flight manual and maintenance schedule shall be made available for survey if required by the Authority. The owner shall ensure that these documents together with the maintenance, overhaul, repair manuals and crew manuals, etc., are up-to-date.

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CHAPTER 1.6

EXPORT CERTIFICATE OF AIRWORTHINESS

1 Introduction

- 1.1 The Airworthiness Authority of the country of import usually requires evidence from the Airworthiness Authority of the country of export as to the airworthiness of the aircraft concerned. The evidence of airworthiness adopted and accepted internationally is usually in the form of an Export Certificate of Airworthiness.
- 1.2 The Export Certificate of Airworthiness does not, by itself, give authority for the aircraft to be flown. Such authority will have to be obtained from the Airworthiness Authority of the country in which the aircraft is to be registered.

2 Application

Application shall be made on Form DCA AWF 6B and submitted to:

Department of Civil Aviation
Airworthiness Division
SSR International Airport
Plaisance
Mauritius

Note: The application and all documents required by this Chapter should be submitted at least one month prior to the actual issue date of the Certificate.

3 Requirements

- 3.1 The documents and other evidence specified in Chapter 1.3 and Chapter 1.5 of this Section shall be furnished to the Authority to qualify an aircraft for the issue of an Export Certificate of Airworthiness.
- 3.2 The certifications referred to in paragraph 3.1 shall be accompanied by details with respect to requirements or design standards with which the aircraft does not comply and for which exemption has been granted by the Authority.
- 3.3 The certifications referred to in paragraphs 3.1 and 3.2 shall have a valid Certificate of Airworthiness.

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- Note: (1) An Export Certificate of Airworthiness is not a Certificate of Airworthiness for the purposes of the Mauritius Civil Aviation Regulations.
- (2) The Mauritius Export Certificate of Airworthiness will certify only to the eligibility of the aircraft to receive the Mauritius Certificate of Airworthiness in a particular category and unless specifically endorsed will not certify compliance with the airworthiness requirements of the importing country.
 - (4) An aircraft is required to be de-registered within the period of validity of an Export Certificate of Airworthiness.
 - (5) An Export Certificate of Airworthiness will be reissued in case the subject aircraft has not undertaken any flight since the first issue of the Export Certificate of Airworthiness on condition that the storage is performed as per manufacturer recommendation or as per an approved programme by the Authority and that all mandatory inspections, modifications and testing due are complied with. The maximum storage period acceptable will be 3 months.

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CHAPTER 2

FERRY FLIGHT PERMIT

This Chapter prescribes the requirements for Ferry Flight approval pursuant to Regulation 16 of the Civil Aviation Regulations.

1 Introduction

- 1.1 A Certificate of Airworthiness issued in respect of an aircraft shall cease to be in force if the aircraft or such of its equipment as is necessary for the airworthiness of the aircraft is not overhauled, repaired or modified in a manner and with material of a type approved by the Authority. Any failure to maintain an aircraft in an airworthy condition as defined by appropriate airworthiness requirements shall render the aircraft ineligible for operation until the aircraft is restored to an airworthy condition.
- 1.2 However, in circumstances when restoration of the aircraft to an airworthy condition is not possible at the place of occurrence, the Authority may in exceptional circumstances, prescribe particular limiting conditions to permit the aircraft to fly without fare-paying passengers to a facility at which it can be restored to an airworthy condition.
- 1.3 The Ferry Flight Permit does not constitute an authorization to operate in the airspace of other States. The operator has to seek clearances from the appropriate authorities of the respective States over which the ferry flight will take place.

2 Procedures

- 2.1 This requirement applies to all Mauritius aircraft when the Certificate of Airworthiness has ceased to be in force when the aircraft suffers structural damage or system failure and the provision to fly to a facility at which it can be restored to an airworthy condition.
- 2.2 An operator may request for Ferry Flight Permit from the Authority to allow for ferry flight of aircraft for the purpose of positioning the aircraft to a place where repairs for returning to service are to be performed.
- 2.3 Ferry Flight Permit may be issued arising from the following provided the aircraft is capable of safe flight:
 - (a) structural damage – damage that occurred to primary or principle structures and/or any structures that affects the normal operation of aircraft.
 - (b) system failures – failures in aircraft systems that affect the normal operation of aircraft.

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- (c) at any other times determined by the Authority.
- 2.4 The operator is to make a request to the Authority for Ferry Flight Permit in writing. Details of defects including its reason for not able to effect a proper permanent rectification is required from the applicant. Any proposed temporary repair data and its justification is to be submitted to the Authority before a Ferry Flight Permit can be considered. Where structural damage is involved and temporary repair is required for the ferry flight, appropriate approved manufacturer's recommendation, operator's recommendation and confirmation of interim repair is required.
- 2.5 Application for a Ferry Flight Permit should be submitted in writing indicating at least the following:
- (a) the name and address of registered owner and its operator.
 - (b) the make, model, serial number and registration marks of the aircraft.
 - (c) the purpose of the flight.
 - (d) the proposed itinerary.
 - (e) the crew required for the ferry flight.
 - (f) details of non-compliance with applicable airworthiness requirements.
 - (g) any restriction the applicant considers necessary for safe operation of the aircraft.
 - (h) any other information considered necessary by the Authority for the purpose of prescribing operating limitations.
- 2.6 For the purpose of Ferry Flight Permit evaluation, the Authority may exercise its right to inspect the aircraft to enable determination to be made of any limitations for the ferry flight.
- 2.7 The Authority will issue the Ferry Flight Permit with prescribed operator's responsibilities once the Authority is satisfied that the aircraft is capable of safe flight and had been restored to an acceptable condition to meet the ferry flight requirements.
- 2.8 If the flight involves operations over States other than the State of Registry, the operator of the aircraft must obtain authorisations from the appropriate authorities of that State prior to undertaking the flight.

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2.9 A copy of Ferry Flight Permit is required to be displayed on board the aircraft.

3 Continuous Ferry Flight Authorisation

3.1 In lieu of individual Ferry Flight Permits, the Authority may grant a continuous Ferry Flight Authorisation to an AOC operator.

3.2 A continuous Ferry Flight Authorisation may be issued to AOC operators for aircraft that may not meet applicable airworthiness requirements but are capable of safe flight for the purpose of flying aircraft to a base where maintenance is to be performed.

3.3 The permit issued under this paragraph is an authorisation, including conditions and limitations for flight, which is set forth in the AOC operator's operations specifications.

3.4 A Continuous Ferry Flight Authorisation may be issued at the discretion of the Authority to an AOC operator only if the Authority is satisfied that the operator is responsible, capable of evaluating the condition of the aircraft and setting appropriate limitations for the ferry flight.

3.5.1 The holder of a Continuous Ferry Flight Authorisation shall inform the Authority in writing within 2 days of any ferry flights conducted under the authorisation.

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CHAPTER 2.1

**REQUIREMENT FOR COMPASS SWING AND REQUIREMENT OF SITE FOR
COMPASS CALIBRATION**

1 General

Pursuant to Regulation 19 of the Civil Aviation Regulations, this Chapter prescribes the requirements for Mauritius aircraft in respect of direct reading compasses, gyrostabilised remote indicating compass systems and non gyro-stabilised remote indicating compass systems.

Gyro-Stabilised Remote Indicating Compass means a compass system which has the magnetic sensing element located remotely from the indicator(s) together with gyroscopic means to stabilise or smooth the heading indications.

Non Gyro-Stabilised Remote Indicating Compass means a remote indicating compass without gyroscopic means of stabilisation or smoothing (e.g. Magnesyn Compass)

Direct Reading Compass means a compass which has the magnetic sensing element and heading indication located in the one instrument.

Standby Compass means a direct reading compass which is not used as the primary heading reference.

Compensation means the correction of deviations resulting from permanent magnetism in the aircraft.

Calibration means the measurement of residual deviations of a compass installed in an aircraft.

Deviation means the angle required to be added algebraically to the compass reading to obtain the aircraft magnetic heading.

2 REQUIREMENT FOR A COMPASS SWING

A compass swing is required:

- (a) Whenever a unit, which may affect the accuracy of the compass or its associated systems is installed, replaced or altered. For example, installation, replacement or alteration of a corrector unit, a direct reading compass or a standard type of magnetic sensing unit will require a swing.

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- (b) If the result of the compass calibration discloses a deviation in excess of the limits specified in paragraph 8.1 on any heading.
- (c) At each period as specified in the Approved Maintenance Schedule, or
 - (i) for IFR aircraft at least once every twelve months or
 - (ii) for VFR aircraft at each major inspection period of the aircraft.
- (d) If during a check-swing the deviation noted are in any way different from those on the existing deviation card.

On other occasions a check-swing is sufficient. A check-swing consists of aligning the aircraft fore and aft axis on various magnetic headings and comparing the deviations with those on the existing deviation card. Check-swinging of compasses may be carried out on the following occasions:

- (a) Whenever the accuracy of the compass is suspect.
- (b) After major overhaul of the aircraft, replacement of an engine mounted in the forward fuselage, or installation, removal or replacement of any magnetic material which may affect the accuracy of the compass.
- (c) After installation of a new electrical or radio system or major modification of the existing electrical or radio system, in which cases the swing shall be carried out with the electrical or radio services used in straight and level arise flight operating normally.
- (d) After installation of geophysical survey equipment or other equipment likely to have a strong external magnetic field or if the change of freight load is likely to affect the compass reading.
- (e) Whenever a compass has been subjected to shock, e.g. after a heavy landing.
- (f) After the aircraft has passed through a severe electrical storm.
- (g) Whenever the sphere of operation of the aircraft is change to one of different magnetic latitude.
- (h) After the aircraft has been in long term storage.

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3 Checks before Installations

3.1 Examination

Compass should be handled carefully to avoid shocks which might impair the pivot or cause other damage. Each compass should be examined before installations as follows:

- (a) The compass should be received in a transit box which should be undamaged.
- (b) The compass glass, anti-vibration devices, and all movable or working parts should be inspected for condition.
- (c) The grid wires should be undamaged and the graduations legible.
- (d) The locking device should function correctly and the grid ring rotates freely when unlocked.
- (e) The compass bowl must be free from dents and the card and damping fluid must not be discoloured.
- (f) The damping fluid must be free from sediments and bubbles.

3.2 Pivot Friction

This should be checked with the compass in a level position. The magnet system should be deflected through approximately 10° and held for 30 seconds by placing magnetic material near the compass. The magnetic material should then be removed and the settling position of the magnet system noted. The system should then be deflected approximately 10° in the opposite direction and the setting position again noted. The difference between the two settling positions should not exceed 2°. No tapping of the compass is permitted during this test.

3.3 Dumping Test

The magnet system should be deflected with a magnet through 90° and held for one minute. The deflecting force is then removed. The time taken for the magnet system to return through 85° should not be too long. Typical time for the return should not exceed 10 seconds. The figures given in the two preceding paragraphs are general guidelines and are not specific requirements. Reference to the manufacturer's specifications should always be made to ascertain the actual figures.

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4 **Installation**

The compass should be so mounted that a line passing through the lubber line and the pivot post is either on or parallel to the longitudinal axis of the aircraft, the pivot post being vertical when in the normal flying position. On most compasses the lubber line should always point forward. With compasses of the vertical type, where the compass card is edgewise, the lubber faces aft. When not integral, the compass corrector unit should be mounted as close as possible to the compass and should be centrally disposed about the pivot post with the word "AFT" positioned aft.

All brackets, mounts, arms or other parts on which the compass is mounted should be made of non-magnetic materials, and all nuts, screws and washers used for mounting should also be non-magnetic.

5 **Preparation for Compass Calibration**

- (a) A check should be made to ensure that all airborne equipment is stowed in its usual position in the aircraft. Loose items of equipment or tools not normally carried in the aircraft should be removed. Any person who needs to stay in the aircraft should see that he has no loose tools or equipment that may be magnetic on him.
- (b) The flying controls should be in their normal flying positions when taking the readings.
- (c) The aircraft should be placed in flying position on all headings, but where this is impracticable a tolerance of not more than 15 from the horizontal is permissible.
- (d) Compass corrector units should be in their null positions after installation or replacement of a compass or corrector unit is required.

6 **Compass Compensations**

A landing compass of known accuracy should be used for the purpose. The landing compass is used to sight the aircraft along its centre line. The headings should be within 5 degrees of each cardinal or intermediate 30 degree magnetic headings. The Compass deviations are then determined and the necessary compensations for coefficients A, B and C carried out.

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7 METHODS OF COMPASS COMPENSATION

7.1 Coefficient Method

- (a) Set the corrector unit to null (where applicable).
- (b) Head the aircraft longitudinal axis within 5 degrees of magnetic cardinal headings and determine the deviations.

Calculate coefficient A, B and C by the formulae:

$$\text{Coeff. A} = \frac{\text{Dev. North} + \text{Dev. East} + \text{Dev. South} + \text{Dev. West}}{4}$$

$$\text{Coeff. B} = \frac{\text{Dev. East} - \text{Dev. West}}{2}$$

$$\text{Coeff. C} = \frac{\text{Dev. North} - \text{Dev. South}}{2}$$

- (c) With the aircraft on any cardinal magnetic heading add Coefficient A algebraically to the compass reading to obtain the corrected reading. Rotate the compass or magnetic sensing element until the compass reads the corrected reading. This adjustment, normally, is not applicable to panel mounted compasses.
- (d) Head the aircraft on North within 5 degrees. Add Coefficient C algebraically to the compass reading. Adjust the NS compensator to make the compass read the corrected reading.
- (e) Head the aircraft on East within 5 degrees. Add Coefficient B algebraically to the compass reading. Adjust the EW compensator to make the compass read the corrected reading.
- (f) Carry out the compass calibration and raise the deviation card.

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7.2 Simplified Method

- (a) Set the compensator magnets to neutral.
- (b) Determine and remove if applicable any Coefficient A as in paragraph (b) and (c) in the "Coefficient Method".
- (c) Head the aircraft on magnetic north within 5 degrees. Determine the aircraft magnetic heading and adjust the NS Compensator to make the compass read the aircraft magnetic heading.
- (d) Head the aircraft on magnetic East within 5 degrees. Determine the aircraft magnetic heading and adjust the EW Compensator to make the compass read the aircraft magnetic heading.
- (e) Head the aircraft on magnetic South within 5 degrees. Determine the aircraft magnetic heading. Adjust the NS Compensator to make the compass read half the difference between the aircraft magnetic heading and the compass reading.
- (f) Head the aircraft on magnetic West within 5 degrees. Determine the aircraft magnetic heading. Adjust the EW Compensator to make the compass read half the difference between the aircraft magnetic heading and the compass reading.
- (g) Carry out the compass calibration and raise the deviation card.

8 Calibration

8.1 Compass calibration should be conducted by aligning the fore and aft axis of the aircraft with each cardinal and 30 degree magnetic heading. The deviation should be determined at each heading with the electrically operated services and radio normally used in straight and level cruise flight energised and all engines operating. Calibration with engines inoperative may be permitted where it has been demonstrated to the satisfaction of the Authority that significant changes in deviation will not result. The deviation at any heading shall not exceed:

- (a) Gyro-stabilised remote indicating compasses - 1 degree.
- (b) Non Gyro-stabilised remote indicating compasses - 1 degree.
- (c) Direct reading compasses used as the Primary Compasses -3 Degrees.
- (d) Standby Compasses - 3 degrees.

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- 8.2 When any flight or engine control is moved from its normal position for straight and level cruise flight - 1 degree.

Note: Interference resulting from transmission of radio signals or electrical services that are only operated intermittently and for short periods may be ignored.

9 **Recording**

- 9.1 The record of the compass swing should be entered and certified in the aircraft log book.

- 9.2 A compass deviation card should be compiled for primary standby compasses to show the following:

- (a) the magnetic heading and the compass reading necessary to achieve the magnetic heading at the cardinal and intermediate 30 degree headings.
- (b) the date of the compass swing.
- (c) the identification of the compass swing.
- (d) the type and serial number of the compass.
- (e) the signature and authorisation approval of the aircraft maintenance licence holder responsible for the swing.

- 9.3 The compass deviation card should be protected against water or other damage and should be so positioned that it may be easily read during flight.

10 **Requirement of a Compass Calibration Site**

10.1 **Pavement type and thickness**

The compass calibration site must be level in all directions. Pavement for the site may be of the rigid or flexible type. Whichever may be the type, the thickness of the pavement should be able to support the types of aircraft used. With concrete pavements the joint type and spacing should conform to standard practices. except that no magnetic materials are to be used.

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10.2 Size

The size of the site should be compatible with the requirements of the types of aircraft used. The radius of the site may be 15 metres, 18 metres, 24 metres or 33 metres depending on the size of the aircraft.

For very large aircraft, an analysis of the turning area required for the aircraft will be necessary to determine adaptability to the dimensions specified.

10.3 Location

- (a) Locate the site at least 100 metres from power and communication cables (both above and below ground) or from the aircraft. Locate the site at least 200 metres from large magnetic objects such as buildings, railway tracks, high voltage electrical transmission lines or cables carrying direct current (either above or below ground). Control cables runway and taxiway light bases or sign fixtures, pipelines, duct, grates for drainage and aircraft arresting gear should be avoided when they contain ferrous materials.
- (b) The site should be located so that its use will not interfere with or hinder the operation of other aircraft using the airport.
- (c) After tentative selection of a site, make a thorough magnetic survey of the site. This is necessary because many sites which meet all visually applied criteria regarding distances from structures, etc are still unsatisfactory because of locally generated or natural magnetic anomalies.
- (d) The difference between magnetic and true north must be uniform in the vicinity of the site. Make sufficient surveys to determine that the angular difference between true and magnetic north measured at any other point by more than one degree within a space between 1 and 3 metres above the surface of the site and extending over an area within a 75 metre radius from the centre.

10.4 Construction

- (a) Do not use magnetic materials, such as reinforcing steel or ferrous aggregate. in the construction of the site or of any pavement within 100 metres radius of the centre of the site. If any drainage pipe is required within 100 metres of the site, use non magnetic or aluminium culvert.
- (b) After all construction work on the site is completed, it is advisable to have the site magnetically re-surveyed to guard against the possibility of objectionable magnetic materials being introduced during the construction.

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- (c) Magnetic surveys of existing compass calibration sites should be performed at regular intervals of 5 years or less. Additional surveys should be performed after major construction of utility lines, buildings or any other structures within 200 metres of the centre of the site. It is advisable to paint the date of magnetic survey on the site near the N heading.

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CHAPTER 3

GENERAL REQUIREMENTS FOR MAINTENANCE OF AIRCRAFT AND AIRCRAFT COMPONENTS

1 General

- 1.1 Pursuant to regulation 14 and 15 of the Civil Aviation Regulations , this Chapter prescribes the requirements for Mauritius aircraft in respect of:

Maintenance of aircraft. This work must be conducted in accordance with a maintenance schedule prepared by the owner or operator of an aircraft and approved by the Authority.

Note: The contents of a maintenance schedule are dependent on the category of an aircraft, its complexity and the system of control over maintenance by the owner or operator. Specific requirements are stated in Chapter 3.

Overhaul, repair, inspection and modification of aircraft, components or equipment and replacements of components and equipment. This work must be undertaken in accordance with approved conditions and procedures, approved components, parts or material must be used and a certificate of release to service must be issued on completion of the work.

2 Responsibilities for Airworthiness

2.1 Owner's or Operator's Responsibilities

The owner or operator of an aircraft is responsible that maintenance works on his aircraft are conducted in accordance with the Mauritius airworthiness requirements and the aircraft is maintained in an airworthy condition. He shall ensure that:

- (a) All maintenance, mandatory modifications and inspections, overhauls or replacements on the aircraft, its engines, components or equipment are completed within any required periods and in accordance with the approved maintenance schedules, or other approved worksheets as applicable.
- (b) All work is undertaken by a MCAR-145 approved maintenance organisation.
- (c) The MCAR-145 approved maintenance organisation is notified of the work to be undertaken at each scheduled check or inspection, including rectification of defects or damage and any mandatory work to be completed unless the maintenance schedules adequately specify such work as may be applicable.

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- (d) The aircraft is not flown unless all work has been completed and certified on documents appropriate for the work and the pilot is notified of the status of the aircraft.
- (e) Where an aircraft has had abnormal loads applied in flight, experienced hard or overweight landings, or been struck by lightning, it is inspected in accordance with the manufacturers requirements or other schedules approved by the Authority and the results of the inspection plus details of repairs made are entered in the aircraft log book or other approved records and when appropriate the aircraft technical log.
- (f) Maintenance schedules and worksheets pertinent to his aircraft, components or equipment are revised whenever modifications to the aircraft or changes in maintenance practices or category of operation cause them to be inapplicable. Such revisions must be approved by the Authority and distributed to all persons or organisations responsible for maintenance of his aircraft.
- (g) Particulars of all work completed on his aircraft are, as appropriate, entered in the technical log, or other appropriate log book or approved records system together with the applicable certification document.
- (h) Approved data and documents are revised as soon as possible after receipt of amendment advice from the manufacturer and appropriate staffs are advised of amendments that affect airworthiness.

Note: The data and documents which may be approved for use in aircraft maintenance are specified in paragraph 3.2.

- (i) Where the flight or operating characteristics of the aircraft or its components may have been affected by maintenance or other work, the aircraft shall not be released to service until it has been certified as fit for flight and tested in flight in accordance with an approved test schedule, unless other procedures have been approved.

Note: Requirements for design of a certificate of fitness for flight under 'A' Conditions and specified in Appendix 1.

- (j) The effect of the work on the empty weight and centre of gravity position of the aircraft is calculated. Where significant changes have occurred the results shall be submitted to the Authority who will determine where reweighing and/or preparation of a new weight schedule is required.

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- (k) Authorised officers of the Authority are permitted access to his aircraft and establishment to assess whether these requirements are being observed; and, to inspect documents, aircraft, components, equipment, or work in progress to assess the competence and diligence of staff engaged in aircraft maintenance and other work.

2.2 Maintenance Organisation's Responsibilities

A person or organisation responsible for maintenance or other work on aircraft shall carry out the work under and in accordance with the requirements stipulated in the MCAR-145.

3 General Requirements for the Conduct of Maintenance and Other Work

3.1 Aircraft Components, Equipment and Materials

Such items shall not be used unless they comply with any mandatory airworthiness requirements and an Authorised Release Certificate or other acceptable document has been provided. Replacement items must be either identical with those installed in the aircraft, component, equipment or approved alternatives.

3.2 Approved Data and Documents

3.2.1 Pursuant to the Mauritius Civil Aviation Regulations the following data or documents are approved, except when the Authority has directed or notified otherwise:

- (a) Those aircraft, component or equipment manufacturer's maintenance data as specified in MCAR-145.
- (b) Data or design documents issued by the approved signatories and within the scope of a design organisation approved by the Authority.
- (c) Requirements specified by the United States Federal Aviation Administration Advisory Circular 43.13-1 as revised, provided any limitations by an aircraft manufacturer in the documents specified in paragraph 3.2.1(a) in respect of structural repairs or other work are observed.

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CHAPTER 3

GENERAL REQUIREMENTS FOR AIRCRAFT MAINTENANCE

APPENDIX 1

CERTIFICATE OF FITNESS FOR FLIGHT

The Certificate shall be as follows:

CERTIFICATE OF FITNESS FOR FLIGHT AIRCRAFT REGISTRATION

It is hereby certified that the aircraft defined hereon has been inspected and is fit for flight provided it is properly loaded.

This Certificate is valid until _____ or until the airworthiness condition of the aircraft is altered, whichever is earlier.

Signed _____ Authorisation No _____ Airframe

Date _____

Signed _____ Authorisation No _____ Engines

Date _____

- Note: (1) The maintenance organisation shall ensure that a Certificate of Fitness for Flight is issued after the aircraft's airframe and engine integrity are verified by the appropriately authorised certifying staff.
- (2) A Certificate of Fitness for Flight shall be certified only by holder(s) of an appropriate aircraft maintenance licence with privileges in airframe, engine or both.
- (3) The period of validity shall be stated but shall not exceed 7 days.
- (4) The Certificate shall be issued in duplicate and one copy kept elsewhere than in the aircraft.
- (5) If the original airworthiness condition of the aircraft is affected during the period of validity, the Certificate shall be re-issued.

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CHAPTER 3.1

CERTIFICATE OF RELEASE TO SERVICE - CERTIFICATION OF OVERHAUL, REPAIRS, REPLACEMENTS, MODIFICATIONS AND SCHEDULED MAINTENANCE INSPECTIONS

1. INTRODUCTION

In accordance with Civil Aviation Regulations, an aircraft registered in Mauritius for which a certificate of airworthiness has been issued or rendered valid shall not fly unless a certificate of release to service has been issued in respect of any repair, overhaul, replacement, modification or scheduled maintenance inspection to any part of the aircraft or its equipment, subject to conditions prescribed in paragraph 3.1.

2. DEFINITIONS

(a) Scheduled maintenance inspection

Inspection which forms part of an approved maintenance schedule, commonly known as periodic check or phase check.

(b) Maintenance means performance of all work necessary for the purpose of ensuring that the aircraft is airworthy and safe and includes servicing, repairs, replacements, overhauls, tests, operations and inspections.

3. CERTIFICATE OF RELEASE TO SERVICE

3.1 A certificate of release to service shall be issued in respect of any repair, replacement, overhaul, modification and maintenance carried out on an aircraft registered in Mauritius and has a certificate of airworthiness, except in the following cases:

- (i) When the authorised total mass of the aircraft does not exceed 2730 kg and the certificate of airworthiness is in special category.
- (ii) When any repair(s) or replacement(s) specified in Para 12 of the 6th schedule of Civil Aviation Regulations 2007 are carried out to an aircraft of total authorised mass not exceeding 2730 kg, operated for purposes other than public transport and the said repair(s) and replacement(s) are carried out in accordance with

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approved procedures/aeronautical practices personally by the owner or operator of the aircraft being the holder of the pilot's licence.

- (iii) If the replacement or repair is carried out at a place where it is not reasonably practical to carry out the work in a manner that certificate of release may be issued, the commander may fly the aircraft to the nearest place at which the certificate can be issued if in his opinion it is safe to fly to such a place. The commander shall, however, inform the Director of Civil Aviation within 10 days of the occurrence, of the reasons of making such a flight.
- 3.2 The certificate of release to service issued at completion of any repair, replacement, overhaul, modification and maintenance shall be signed in each of the licence/authorisation categories relevant to the work speciality of the particular maintenance except where otherwise approved by the Director of Civil Aviation.
 - 3.3 The certificate of release to service shall be signed only after the authorised signatory has satisfied that the work has been properly performed and that up-to-date instructions including manuals, drawings, tools and equipment have been used and all applicable mandatory modifications, and inspections have been complied with.
 - 3.4 The certificate of release to service shall contain full particulars of the work done including details of aircraft/component involved. The certificate shall be worded as follows:

"The works recorded above have been carried out in accordance with the requirements of the Civil Aviation Regulations in force and in that respect the aircraft/equipment is considered fit for release to service".

4. PERSONS AUTHORISED TO SIGN CERTIFICATE OF RELEASE TO SERVICE

- 4.1 The certificate of release to service shall be signed by one of the following:
 - (a) By the holder of an aircraft maintenance engineer's Licence granted under the Civil Aviation Regulations and entitling him to issue that certificate

or

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(b) By the holder of aircraft maintenance engineer's licence granted under the law of a country other than Mauritius and rendered valid under Civil Aviation Regulations, in accordance with the privileges endorsed on the licence.

or

(c) In respect of an aircraft the maximum total mass authorised of which does not exceed 2730 kg, by the holder of a licence or authorisation granted or issued under the law of a Contracting State in which the overhaul, repair, replacement, modification or inspection has been carried out under intimation to Director of Civil Aviation.

or

(d) By a person approved by the Director of Civil Aviation to issue such certificates and in accordance with that approval.

or

(e) By a person authorised by the Director of Civil Aviation to issue such certificates in a particular case and in accordance with that authority.

4.2 In respect of the adjustment and compensation of direct reading magnetic compasses, by the holder of an Airline Transport Pilot's Licence (aeroplanes), or a Flight Navigator's Licence granted or rendered valid under the Civil Aviation Regulations.

5. RETENTION OF RECORDS

5.1 When all the relevant work has been carried out, a certificate of release to service shall be issued and entered in/attached to the relevant Log Book or in any other manner in accordance with the record system approved by Director of Civil Aviation.

5.2 When the work has been carried out by the owner/pilot, the pilot's licence number and the signature of the person carrying out the work shall be entered in the appropriate Log Book.

5.3 All such records shall be retained by the operator/ owner of aircraft for a period of two years after the aircraft/engine/ propeller has been destroyed or permanently withdrawn from service or for such other periods as agreed to by Director of Civil Aviation.

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CHAPTER 3.2

**RESPONSIBILITIES OF LICENSED AIRCRAFT MAINTENANCE ENGINEERS AND
APPROVED OR AUTHORISED PERSONS OR ORGANISATIONS**

1 General

- 1.1 This Chapter prescribes the scope of responsibilities of licensed aircraft maintenance personnel pursuant to Regulations 19 and 20 of the Civil Aviation Regulations for the issue of certificates of Release to Service for the completion of overhauls, maintenance, modification, replacements, repairs and inspections.

Note: Persons authorised or approved to perform the functions of a licensed aircraft maintenance personnel shall also comply with the provisions of this Chapter.

- 1.2 A person who is appropriately licensed, authorised or approved shall not certify for the completion of work unless he has familiarised himself with all current information necessary for the work.

Note: When the work involves the assembly or any disturbance of a vital point or control system to which the MCAR applies, any duplicate inspection required must be certified before the relevant Certificate of Release to Service is issued.

- 1.3 For the purpose of this Chapter, the following definitions shall apply:

Overhaul- is a major work operation which involves dismantling, inspection and replacement of any necessary parts, reassembly and complete functional testing to specifications and renewal of operational life.

Modification- is any change made to an aircraft, engine, propeller, component, or equipment and their installation.

Replacement- is the removal of a part or component and its replacement with an identical part or component or substitution of another approved part.

Repair- is any rectification work which is not covered by any of the above definitions.

Inspection- is any work necessary to determine the condition of a component, whether damage or defects exist, or work has been completed in an approved manner.

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- Maintenance- is any scheduled maintenance inspection (SMI) or other work required by the approved maintenance schedule.
- Condition - is the physical state of a part or component.
- Assembly- means that items are put together, fitted, attached, installed, connected, secured, or adjusted correctly in the approved manner.
- Functioning- means ensuring that components or systems operate correctly and in the approved manner.
- Electronic- means a component which contains semi-conductor Component parts or microprocessors.
- Primary- means those parts of the structure which contribute structure significantly to carrying flight, ground or pressurisation loads, the failure of which could endanger the safety of the aircraft.

2 Privileges of an Aircraft Maintenance Licence

- 2.1 The aircraft maintenance licence alone does not permit the holder to issue certificates of release to service (CRS). To issue a CRS, the licenced holder must in addition hold a certification authorisation issued by a DCA approved organisation.
- 2.2 Subject to the rating and any limitations stated on an aircraft maintenance licence, the holder may be authorised to certify for the maintenance, modifications, replacements, repairs and inspections as appropriate.
- 2.3 There are many areas where work being carried out on an aircraft could affect other systems, equipment or components outside the licence holder's privileges. Where an overlap occurs the licence holder primarily responsible for the system must ensure such other works are certified by another licence holder with the appropriate privileges.

3 MCAR - 66 Aircraft Maintenance Engineer Licence Privileges

3.1 Category Airframe (A)

- 3.1.1 This category is responsible for the condition, assembly and functioning of all parts of the aircraft, components, equipment and systems not included in other categories.

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3.1.2 Certificates of Release to Service may be issued for any maintenance, modification, replacement, repair or inspection of components provided that the work has not involved any of the following:

- (a) Bolted joints requiring special techniques.
- (b) Complete riveted joints in primary structures.
- (c) Complete glued joints in primary structures.
- (d) Bonded assemblies in primary structures.
- (e) Fibre reinforced plastic/epoxy primary structures.
- (f) Cotton, linen, polyester /fibre laminate fabric covering of a complete fuselage or aerofoil.
- (g) Welded and brazed joints.
- (h) Non-destructive tests except dye penetrant and boroscopic inspections.
- (i) The disturbing of individual parts of units which are supplied as bench tested units, except for the replacement or adjustment of items normally replaceable or adjustable in service where subsequent functioning may be proved without the use of test equipment additional to the test equipment used for normal functioning check.

3.1.3 Work requiring the issue of Certificates of Release to Service may also be undertaken on electrical, instrument and radio systems associated with airframe systems on which the appropriately licensed aircraft maintenance engineer is rated, provided it is not also associated with engines and auxilliary power units and is within the following limitations:

(a) **Electrical Systems**

- (i) Aircraft in Category A Groups 1, 5 and 6 (single-engine rotorcraft only):

All work except complete overhaul, extensive modifications or new installations.

- (ii) Aircraft in Category A Groups 2, 3, and 6 (twin or more engine rotorcraft):

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Replacement of components provided that functioning checks to prove serviceability do not require the use of test apparatus.

- (iii) Aircraft in Category A Group 4 (below 5700 kg, MTMA):

Replacement of non-electronic components provided that functioning checks to prove serviceability do not require the use of test apparatus.

(b) **Instrument Systems**

Note: Certificates of Release to Service for work involving compass compensation and adjustment may not be issued unless the licence is endorsed for this purpose.

- (i) Aircraft in Category A Groups 1, 5 and 6 (single-engine rotorcraft only):

All work except complete overhaul, extensive modifications or new installations.

- (ii) Aircraft in Category A Groups 2, 3 and 6 (twin or more engine rotorcraft):

Replacement of components provided that functioning checks to prove serviceability do not require the use of test apparatus. Integrated flight systems and electronic automatic pilot systems are excluded.

- (iii) Aircraft in Category A Group 4 (below 5700 kg, MTMA):

Replacement of non-electronic components provided that functioning checks to prove serviceability do not require the use of test apparatus.

(c) **Radio Systems**

Replacement of components of VHF Communication Systems installed in aircraft below 2,730 kg MTMA.

3.2 Category Engine (C)

- 3.2.1 This category is responsible for the condition, assembly and functioning of the engine installation, rotorcraft transmission, auxiliary power unit and associated operational systems or devices required for their operation.

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3.2.2 Certificates of Release to Service may be issued for any maintenance modification, replacement, repair or inspection of components or parts provided that the work has not involved any of the following:

- (a) Dismantling of a piston engine other than to obtain access to the pistons.
- (b) Dismantling of main casings or main rotating assemblies of a turbine engine except where the particular engine maintenance manual provides instructions for the dismantling and replacement of main casings or rotating assemblies and provided that suitable training on such procedure and the use of any required tool or equipment has been received.
- (c) Removing or dismantling of reduction gears.
- (d) Dismantling of rotorcraft transmission gearbox casings except performed for the purpose of internal inspection and in accordance with the appropriate maintenance manual.
- (e) Propeller balancing, except those propellers which require check balancing in accordance with the aircraft maintenance manual, and provided that suitable training on the balancing equipment and procedure has been received.
- (f) Welded and brazed joints.
- (g) Non-destructive tests except colour contrast dye penetrant and boroscopic inspections.
- (h) The disturbing of individual parts of units which are supplied as bench tested units, except for the replacement or adjustment of items normally replaceable or adjustable in service where subsequent functioning may be proved without the use of test equipment additional to the test equipment used for normal functioning checks.

3.2.3 Work requiring the issue of Certificates of Release to Service may also be undertaken on electrical and instrument systems associated with engine systems within the following limitations:

(a) **Electrical Systems**

- (i) Engine in Category C Groups 1, 2 and 3:

All work except complete overhaul, extensive modifications or new installations.

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- (ii) Engine in Category C Groups 4, 5, 6 and 7 installed on aircraft below 5700 kg, (MTMA)

Replacement of non-electric components provided that functioning checks to prove serviceability do not require the use of test apparatus.

(b) **Instrument Systems**

- (i) Engine in Category C Groups 1, 2 and 3:

All work except complete overhaul, extensive modifications or new installations.

- (ii) Engine in Category C Groups 4, 5, 6 and 7 installed on aircraft below 5700 kg, MTMA:

Replacement of non-electric components provided that functioning checks to prove serviceability do not require the use of test apparatus.

3.3 **Category Electrical (E)**

3.3.1 This category is responsible for the condition, assembly and functioning of all parts and components of the electrical systems, including the associated data buses and multiplexed systems. Instrument and radio systems are excluded.

3.3.2 Certificates of Release to Service may be issued for any maintenance, modification, replacement, repair or inspection of components or parts provided the work has not involved the disturbing of individual parts of units which are supplied as bench tested units. The replacement or adjustment of items normally replaceable or adjustable in service and where subsequent functioning may be proved without the use of test equipment additional to the test equipment used for normal functioning checks is permitted.

3.3.3 Work requiring the issue of Certificates of Release to Service may also be undertaken on instrument systems of Category I Group 1 or 2 aircraft for which an electrical rating is held, within the following limitations:

- (a) Replacement of electrically operated components of instrument systems where correct functioning can be established without the use of specialised test equipment.

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3.4 **Category Instrument (I)**

- 3.4.1 This category is responsible for the condition, assembly and functioning of all parts and components of all indicating, recording and navigational instrument systems, automatic flight control systems, integrated flight systems, compass systems, pressurisation systems and oxygen systems, including the associated data buses and multiplexed systems. Radio system instruments are excluded.
- 3.4.2 Certificates of Release to Service may be issued for any maintenance, modification, replacement, repair or inspection of components or parts provided the work has not involved the disturbing of individual parts of instruments of units which are supplied as bench tested units. The replacement or adjustment of items normally replaceable or adjustable in service and where subsequent functioning may be proved without the use of test equipment additional to the test equipment used for normal functioning checks is permitted.
- 3.4.3 Work requiring the issue of Certificates of Release to Service may also be undertaken on electrical systems of Category E Group 1 or 2 aircraft for which an instrument rating is held, within the following limitations:
- (a) Replacement of components in electrical systems where correct functioning can be established without the use of specialised test equipment.
 - (b) Repair and minor replacement of inter wiring.

3.5 **Category Radio (R)**

- 3.5.1 This category is responsible for the condition, assembly and functioning of all parts and components of the radio communication, radio navigation and radar systems, including radio components of composite instruments, associated data buses and multiplexed systems.
- 3.5.2 Certificates of Release to Service may be issued for any maintenance, modification, replacement, repair or inspection of components or parts provided the work has not involved the disturbing of individual parts of radio equipment or units which are supplied as bench tested units. The replacement or adjustment of items normally replaceable or adjustable in service and where subsequent functioning may be proved without the use of test equipment additional to the test equipment for normal functioning checks is permitted.

4 **MCAR-66 Aircraft Maintenance Licence Privileges**

- 4.1 Details of the MCAR-66 licence privileges are found in MCAR-66.20.

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5 Responsibilities of Authorised or Approved Persons or Organisations

- 5.1 The extent of any approval of a person to undertake and certify for maintenance, overhaul, modification, replacement, repair or inspection of components or parts will be in accordance with the terms of the approval.

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CHAPTER 4

MAINTENANCE OF AIRCRAFT

1 General

1.1 Pursuant to regulation 11(4) of the Civil Aviation Regulations, this chapter prescribes the requirements for the preparation of:

- (a) maintenance of schedules; and
- (b) systems of control over maintenance on aircraft.

2 Maintenance Schedules

2.1 Owners or operators of Mauritius aircraft shall prepare and submit maintenance schedules, detailing the maintenance required at specific intervals on the aircraft, to the Authority for approval.

2.2 Mauritius operators operating foreign-registered aircraft shall provide, for the use and guidance of maintenance and operational personnel concerned, a maintenance schedule approved by the State of Registry. A copy of such a maintenance schedule shall be submitted to the Authority when the operator applies to include or use a foreign- registered aircraft in his operation.

2.3 All maintenance schedules shall contain the following information:

- (a) The owner's or operator's registered name and address.
- (b) The makes, type and series reference of the aircraft, its engine(s) and propeller(s).
- (c) The nationality and registration marks of the aircraft to which the schedule is applicable.
- (d) The periods at which the aircraft, its components, equipment and their installations shall be inspected, the extent of each inspection, and practices and procedures to be followed.

Note: Specific references in the maintenance schedules to the aircraft, component or equipment manufacturers current maintenance and overhaul manuals may be acceptable, instead of including the complete information, provided any aspects of the work on aircraft which are

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additional to or vary from the manufacturer's information are detailed in the maintenance schedule.

- (e) The periods at which components or equipment are inspected, checked, tested, calibrated etc and cleaned, lubricated, adjusted etc. as applicable and the practices and procedures to be followed.
- (f) A statement specifying the procedures for recording aircraft time in service, the periods at which scheduled inspections and other work are to be done, the periods at which a Certificate of Maintenance Review is to be issued and procedures for its issue.
- (g) A schedule detailing components or equipment which is to be overhauled or retired from service at specified calendar (elapsed) time, or flying time periods or other approved service life period.
- (h) Procedures and documentation for certification of all checks and inspections, issue of a Certificate of Maintenance Review and issue of a Certificate of Release to Service.

Note: The requirements for issue of Certificate of Maintenance Review are specified in Chapter 4 Appendix 1.

3 Systems of Control over Maintenance on Aircraft

- 3.1 An associated system of control over maintenance of aircraft is also required for aircraft operated in accordance with a Mauritius Air Operator Certificate.
- 3.2 The operator shall provide for each aeroplane for the use and guidance of maintenance and operational personnel concerned, a maintenance programme approved by the Authority containing the information required below. The maintenance programme is applicable to aircraft, engines, propellers and components. The design and application of the operator's maintenance programme shall observe human factors principles.
 - a) maintenance tasks and the intervals at which these are to be performed, taking into account the anticipated utilization of the aircraft and operating environment of the aircraft. The maintenance programme shall be based on information made available by the State of Design or by the organisation responsible for the type design (aircraft manufacturer AMM Chapter 5, MRB, MPD,...) and any additional applicable experience. The basic requirements for a maintenance programme shall include but are not limited to:
 - i) inspection;

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- ii) scheduled maintenance;
 - iii) overhaul and repairs;
 - iv) structural inspection; and
 - v) maintenance tasks and intervals specified and identified as mandatory in approval of the type design (Airworthiness Limitations, Certification Maintenance Requirements). These tasks and intervals shall be clearly identified as such;
- b) when applicable, a continuing structural integrity programme (SIP) which includes at least:
- i) supplemental inspections;
 - ii) corrosion prevention and control;
 - iii) structural modification and associated inspections;
 - iv) repair assessment methodology; and
 - v) widespread fatigue damage (WFD) review;
- c) procedures for changing or deviating from a) and b) above for tasks that do not have mandatory designations from the State of Design (ALI, CMR,...) ; and
- d) when applicable, condition monitoring and reliability programme descriptions for aircraft systems, components and engines (Refer to Appendix 2).

3.3 The associated system of control over maintenance shall also include the following:

- (a) Servicing procedures for each aircraft type including:
- (i) Procedures for re-fuelling, de-fuelling and replenishment of oils, fluids and gases;
 - (ii) The approved specification and/or grade of fuel, oil, water methanol, hydraulic fluids, oxygen etc required for each aircraft type;
 - (iii) The system of quality control to be observed by the operator in order that:
 - (aa) petroleum products used in his aircraft conform to the approved specifications;

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(bb) work undertaken by other organisations and persons during the servicing of an aircraft is done correctly and safely; and

(cc) adequate measures are taken by re-fuelling agencies to ensure the correct products are always supplied and that the likelihood of contamination and deterioration of petroleum products is minimal.

- (b) Policy for the use of manufacturers manuals and field service information.
- (c) Details of any reliability control programme or condition monitoring programme including a schedule of components or equipment subject to such programmes and the practices and procedures established for their use.

Note: Essential aspects are stated in Appendix 2 Chapter 4

- (d) A minimum equipment list for each aircraft type including the conditions under which an unserviceable or inoperative component or equipment may be carried in service and the class of person who may certify that an aircraft may continue in service with an allowable unserviceable or inoperative component or equipment in accordance with the requirements of Chapter 4.5.
- (e) Procedures for applying to the DCA for a concession or approval, of a change or variation, in compliance with a mandatory requirement or an approved maintenance schedule requirement.
- (f) The procedures to be observed for work undertaken on behalf of the operator by other organisations in Mauritius or other countries; and, the procedures for certification of such work and issue of the necessary certificates.
- (g) The procedures for the use of aircraft components, equipment and materials in maintenance or other work when an aircraft is away from Mauritius.

Note: Chapter 4.2 specifies the required records.

- (h) A list of all forms used in maintenance and other work plus a statement of their purposes and procedures for their use.

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CHAPTER 4

MAINTENANCE OF AIRCRAFT

APPENDIX 1

CERTIFICATE OF MAINTENANCE REVIEW

1 General

- 1.1 Pursuant to Regulation 17 of the Civil Aviation Regulations , the issue of a CMR provides evidence that, at the date of issue, the aircraft was in compliance with the requirements of the maintenance schedule approved by the DCA, that all modifications and inspections classified as mandatory had been satisfied, that defects entered in the technical log had been rectified or deferred in accordance with approved procedures and that all CRS had been issued in accordance with the Mauritius Airworthiness Requirements. A copy of the current CMR must be carried on board the aircraft to which it relates.
- 1.2 CMR signatories work on behalf of approved organisations and as such, approved organisations must have procedures established as to how the signatory will comply with the requirement. For instance it may be acceptable for the signatory to accept authorised reports from various sections and rely on “no adverse comments” from quality audits, but he must have the right of access, questions and query to any relevant information, including quality audits, in order to carry out his task. It would be untenable if the signatory accepted reports without question from a reliability group if there were critical quality audits on that group of which he was not aware. In the absence of specific procedures, full access to all records will be required.
- 1.3 The CMR signatory shall be given access to such information as is necessary in order that he may carry out his obligations. It is therefore incumbent on the CMR signatory that he does research the records to the extent necessary to confidently issue the CMR. Thus the following records must be at his disposal: the maintenance programme, the technical log, technical records and mandatory information like Airworthiness Directives.

2 Aircraft above 2730 MTMA

In the case of aircraft above 2730 kg MTMA, the CMR shall be issued for a period of four calendar months unless a different period has been approved by the Authority. Nothing prevents the CMR from being reissued as many times as necessary during each year, but its validity must never exceed four months or such period as approved by the Authority. This flexibility of application of the CMR is intended to allow maintenance organisations to align its issue with an SMI if they wish to do so.

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3 **Aircraft below 2730 MTMA**

In the case of aircraft below 2730 kg MTMA, the CMR shall be issued for a period of one year. Unless otherwise agreed or directed by the Authority, the CMR must be aligned with the renewal of the Certificate of Airworthiness

4 **Conditions for Issue of CMR**

4.1 The signatory shall only issue a CMR when satisfied, at the time of the review that the following aspects of maintenance have been carried out:

- (a) All maintenance requirements prescribed by the approved maintenance schedule, including requirements on all lified items and out-of-phase checks or similar special checks, have been complied with.
- (b) All mandatory modifications and inspections have been complied with within the prescribed time periods.
- (c) All entries in the technical log have been rectified or deferred in accordance with procedures approved by the Authority.
- (d) All required CRS's have been issued.

4.2 The CMR shall be signed by the holder of an appropriate aircraft maintenance licence or a suitably authorised person of a maintenance organisation approved by the Authority.

5 **Requirements for Applicants**

5.1 Persons seeking authorisations/approvals to issue Certificates of Maintenance Review shall:

- (a) hold an DCA Aircraft Maintenance Engineer Licence in at least two categories under Chapter 8 appropriate to the aircraft type for which authorisation/approval is sought.; or
- (b) Reserved
- (c) Reserved

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- 5.2 Such person shall also:
- (a) have at least eight years' experience of aircraft maintenance, which includes at least two years' recent experience involving the certification of maintenance; and
 - (b) hold a position within the Approved Organisation compatible with the responsibilities involved; and
 - (c) have successfully completed familiarisation training on the operator's requirements for which authorisation/approval is sought.
- 5.3 CMR certifying staff shall be trained in the procedures of the Organisation, and have passed the prescribed examinations and based upon the following:
- (i) The concept of Approval in accordance with Section 8 and other requirements prescribed by the Authority.
 - (ii) The status of the Certificate of Maintenance Review and the responsibilities of a signatory of the Certificate.
 - (iii) The form and implementation of the Approved Maintenance Schedule for the type of aircraft concerned.
 - (iv) The details of the systems and procedures contained in the Exposition and associated documents, together with the requirements of the Organisation for their implementation.
 - (v) The maintenance support systems which are related to continuing airworthiness, e.g. reliability programmes, defect control, production control, development engineering, training, certification authority and modification control.
 - (vi) The form and use of the aircraft technical log, deferred defect log, fuel and instrument log, and the minimum equipment list.
 - (vii) The form and implementation of mandatory inspections/ modifications as required by Airworthiness Directives (Mandatory Modification Inspections) for the type of aircraft concerned.
- 5.4 Persons seeking authorisations/approvals to issue Certificates of Maintenance Review for new aircraft, shall hold a DCA licence in at least one category (except category "R") or a MCAR-66 Category B1 licence appropriate to the aircraft type for which authorisation/approval is sought. In addition, the person shall comply with the requirements in paragraphs 5.2 to 5.3

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5.5 For the purpose of paragraph 5.4, ‘new aircraft’ means a Mauritius aircraft delivered new from the manufacturer, which has not yet been registered or operated in Mauritius. The CMR for such new aircraft must be issued before its first flight as a Mauritius aircraft.

6 Validity of Authorisations/Approvals

6.1 Authorisations/approvals granted in accordance with this Appendix shall only be used, subject to their conditions of validity, whilst the holder remains in the employ of the Approved Organisation and his licence remains valid.

CERTIFICATE OF MAINTENANCE REVIEW

A Certificate of Maintenance Review shall be issued at the times specified in the Approved Maintenance Schedule or the relevant Approval Document of the Maintenance Schedule, as appropriate. The certification shall be in the following format:

AIRCRAFT TYPE:	REGISTRATION:
INSPECTION RECORD REFERENCE:	
THIS MAINTENANCE REVIEW WAS CARRIED OUT ON:	
Certified that a maintenance review of this aircraft and such of its equipment as is necessary for its airworthiness has been carried out in accordance with the requirements of the Civil Aviation Regulations for the time being in force.	
SIGNED:	
AUTHORISATION:	
DATE:	
The Next Maintenance Review is due on or before:	

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CHAPTER 4

MAINTENANCE OF AIRCRAFT

APPENDIX 2

RELIABILITY CONTROL PROGRAMMES

- 1 Approval for the establishment of a reliability control programme and/or condition monitoring programme will be dependent on the operator submitting adequate details of the company policies and for administering such programmes.
- 2 The following aspects are essential and must be included in the submission:
 - (a) Programmes and their associated control systems must be directed by a board consisting of senior members of the operator who are responsible for engineering quality and maintenance and who will be responsible to establish company policy and procedures to co-ordinate all action within the company and to liaise with the Authority on the initial approval and subsequent revisions to the programme, and surveillance of the programme.
 - (b) Responsibilities of each board member and their departments, and the responsibilities for co-ordination between the departments .
 - (c) The Information to be utilised for assessment of reliability.
 - (d) Policies for the establishment of levels of acceptable reliability for all components and equipment controlled by the programme.
 - (e) Procedures for selection of items to be included in the programme and schedule of the items that are controlled by the programme.
 - (f) Policies for monitoring and analysis of operational data, investigation of unsatisfactory performance and appropriate rectification action.
 - (g) Provision of forms and exhibits to ensure that all action is formally documented and to facilitate monitoring and surveillance of the programme.
 - (h) Provision for an ETOPS reliability programme in accordance with MCAR 4.6 Appendix 1 paragraph 6.

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CHAPTER 4.1

TECHNICAL LOGS

1 General

This Chapter prescribes the requirements for Technical Logs required, pursuant to Regulation 18 of the Civil Aviation Regulations, to be carried in Mauritius aircraft.

- 2 Technical logs shall be provided by the owner or operator of an aircraft and shall contain the following information:
- (a) An identification that the document is a technical log required pursuant to the Civil Aviation Regulations.
 - (b) A list of the contents of the Log and directions for making the records unless such information is provided separately.
 - (c) The name and address of the registered owner or operator.
 - (d) The nationality and registration marks of the aircraft.
 - (e) Instructions on how to defer defects. An aircraft or equipment defect can only be deferred in the following ways:
 - (i) The deferment is in accordance with the provision spelt out in the Minimum Equipment List (MEL).
 - (ii) The defect is related to a cabin item which is not safety related.
 - (iii) The defect is allowed in the Maintenance Manual or Structural Repair Manual.
 - (iv) The deferment is under the Authority of a Despatch Authorisation.
 - (v) The defect has incorporated an approved repair in accordance with the operator's procedures.
 - (vi) The deferment is otherwise allowed by the Authority.
 - (f) A record which shall have serially numbered sheets with provision for the following entries:

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- (i) The date and time at which each flight began and ended.
- (ii) Places and times of departure and arrival.
- (iii) Hours of flight.
- (iv) Certification for completion of all checks and inspections made in accordance with an approved maintenance schedule and which require certification by a nominated signatory.

Note: Such certifications must include the signature and licence, authorisation or approval reference of the persons and the date and time of certification.

- (v) Recording defects, failures, malfunctions or damage occurring to the aircraft, its components or equipment.
- (vi) The certification on a certificate of release to service by an appropriately licensed aircraft maintenance engineer or other authorised/approved person in respect of any work completed to rectify defects, failures, malfunctions or damage.
- (vii) In respect of the deferment of rectification of any defects, failures, malfunctions or allowable damage, a certification by an appropriately licensed aircraft maintenance engineer or other authorised/approved person recording the deferment and stating any conditions relevant to operation of the aircraft. The statement must refer to the relevant technical log entry.
- (g) The signature of the commander of the aircraft.
- (h) A fuel and oil record which shall have serially numbered sheets with provision for the following entries:
 - (i) Date, time and place of refuelling.
 - (ii) The quantities of fuel, oil, water-methanol etc. uplifted and the quantities available in each tank or combination of tanks.
 - (iii) The grade of fuel, or other fluids, uplifted and its proprietary name and type of specification.

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- (iv) The measuring means used to determine the quantities of fuel in the aircraft after re-fuelling.

Note: The fuel & oil record may be provided as a separate document in which case it shall be retained by the operator for a period of three months.

- 3 Entries in the technical log shall be made in ink or indelible pencil.
- 4 The record sheets shall be in duplicate with provision for a copy of each entry made to be retained by the operator at the place where the entry was made.
- 5 The original copy of maintenance and defect records shall be retained by the owner or operator for a period of two years following the expiry of any period of validity or the date of an entry.
- 6 Appropriate data shall be extracted and entered in the aircraft and engine log books or other approved records system as soon as possible after the conclusion of each flight or scheduled series of flights.

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CHAPTER 4.2

AIRCRAFT RECORDS SYSTEM

1 General

Pursuant to regulation 27 and Tenth Schedule of the Mauritius Civil Aviation Regulation, log books are required to be kept for aircraft, engines and variable pitch propellers. This Chapter prescribes the records to be maintained in log books or other approved records systems in respect of:

- (a) The engineering history of aircraft, engines and propellers including components and equipment as applicable.
- (b) The maintenance completed.
- (c) Other work completed.
- (d) Defects, damage, failures or malfunctions that have occurred.
- (e) Airworthiness data.

2 The owner or operator of aircraft operated in accordance with an Air Operator Certificate approval may obtain approval to use a records system instead of the prescribed log books provided the system includes the required data and records, and procedures are established which will ensure that accurate records are maintained. A record of all important modifications and major repairs shall also be kept for each aircraft in an approved Modification Record Book.

3 The operator shall ensure that the following records are maintained for aircraft, engines and variable pitch propellers including their components and equipment for the periods specified in paragraph 4:

- (a) The total time in service and number of landings of the aircraft on a daily basis.
- (b) All maintenance checks or inspections completed in accordance with an approved maintenance schedule including the date and total time in service when the certifications were made.
- (c) All overhauls, repairs, replacements or modifications completed and the date and total time in service when the certifications were made.

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- (d) Particulars of any defects, failures, malfunctions or damage occurring to the aircraft, its components and equipment, the rectification action taken and a reference to any relevant technical log entries.
- (e) The approved data or documents observed for all work other than that completed in accordance with approved maintenance schedules or approve work sheets.
- (f) Details of any concession approved for maintenance or other work.
- (g) Details of mandatory inspections completed including the results of such inspections.
- (h) The total time in service of aircraft components which are subject to a mandatory life limitations.
- (i) The time in service since new or overhaul as appropriate of any components or equipment which are subject to an approved overhaul period, a special check or inspection within a specified period.
- (j) The total time in service of major airframe components of complex aircraft.
- (k) The total time in service since new and the flight time since last overhaul of major components that have been replaced in the engines or propellers.
- (l) In respect of engines on which performance checks have been made such data which may be required during subsequent maintenance or operation.
- (m) The current status of compliance with all mandatory continuing airworthiness information.
- (n) A continuous record of the changes in empty weight and centre of gravity position due to modifications, repairs, alterations etc.
- (o) Detailed maintenance records to show that all requirements for the signing of the certificate of release to service have been met.

4 **Records above are to be preserved for the following periods:**

- (a) Paragraphs 3 (a) to (m) - a minimum period of 24 months after the date the aircraft or aircraft component has been destroyed or permanently withdrawn from service.

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- (b) Paragraph 3 (n) - a period of time as per the requirement in paragraph 27(6) of the Civil Aviation Regulations.
- (c) Paragraph 3 (o) - a minimum period of 2 years after the signing of the certificate of release to service. The certificate of release itself shall be preserved for a period of time as per the requirement in regulation 19(7)(d) of the Civil Aviation Regulation .

Note: (1) A person responsible for making an entry in a log book or other approved record may be required to substantiate any statements made in such records.

- (2) Periods for retention for technical logs and fuel oil record is given in Chapter 4.1

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CHAPTER 4.3

REQUIRED INSPECTION AND TESTS

1 General

Pursuant to Regulation 14(9)(b) of the Civil Aviation Regulations the Authority may require an inspection or test to be made on an aircraft to determine whether it is airworthy. This Chapter prescribes the requirements to establish the airworthiness condition of an aircraft following:

- (a) The completion of maintenance involving the adjustment, repair, modification or replacement of any part of a control system or units of the flight, engine and propeller controls, their related system controls, and associated operating mechanisms. Duplicate inspections are required of all work which, if not completed correctly, could affect the safety of an aircraft.
- (b) The application of abnormal loads in flight or on the ground.
- (c) Modifications, repairs or replacements of components which may affect the accuracy of a magnetic compass or compass system.

2 Duplicate Inspection of Control Systems

Note: A duplicate inspection is an inspection first made and certified by one qualified person and then repeated and certified by a second qualified person.

The requirements are as follows:

- (a) Duplicate inspections shall be made and certified by appropriately licensed aircraft maintenance engineers or persons approved or authorized to undertake work on the particular control system. In an emergency and when only minor adjustments are involved the second inspection may be made and certified by a flight engineer or pilot licensed for the aircraft type (except a student).
- (b) Duplicate inspections of all affected control systems in an aircraft shall:-
 - (i) Be made after its assembly and before the first flight, and
 - (ii) Before flight after overhaul, repair, replacement or adjustments.

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Inspections may be limited to a specific section or part of a system when only a minor adjustment or minor work has been done.

- (c) The inspections shall be of sufficient depth to determine that the control system(s) have been installed and adjusted in accordance with the manufacturers requirements or other approved data or documents. The procedures shall be specified in an approved maintenance schedule or work-sheet (which for complex systems should include a check list of the necessary operations) and shall also ensure that full and correct movement of controls throughout the system(s) relative to movement of the flight crew's controls is obtained both prior to and after all covers and fairings are finally secured.
- (d) Control systems subject to duplicate inspections must not be disturbed or readjusted after the first inspection has been completed and certified. The second inspection must be made as early as practical after the first inspection but may be commenced before the first inspection is completed in areas where access is difficult or other similar problems exist.
- (e) Any disturbance of a control system after completion of a duplicate inspection will require further duplicate inspections and certifications of the part of the system that has been disturbed.
- (f)) If a duplicate inspection is required, it shall be the final operation to establish the integrity of the system when all other work has been completed.
- (g) The approved worksheets or approved data for the overhaul and repair of sealed components shall, where appropriate, include procedures for:-
 - (i) Duplicate inspections and certifications of the sections/ parts which will be concealed during bench assembly and which cannot be proved to be functioning in accordance with the manufacturers requirements when subsequently installed on an aircraft; and
 - (ii) Duplicate inspections, of such units, after final assembly for functioning and correct relative movement. The certification for these inspections shall be attached as part of the approved certificate for the component. The certifications shall be made by persons, whose names and duties are stated in the approved quality control system or company exposition.
- (h) Where it is not possible to make duplicate inspections of a complete system due to the routing of controls through inaccessible sections, the persons responsible for duplicate inspections may accept certifications for prior duplicate inspections of

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specific areas or for sealed units provided a certification of the earlier inspections is available and duplicate inspections of the accessible sections are made, the correct units are installed, the system functions in accordance with the manufacturer's requirements, and has full, free and correct directional movement. The certifications for all such duplicate inspections shall be attached as part of the final duplicate inspections.

3 INSPECTION FOLLOWING ABNORMAL LOADS IN FLIGHT OR ON THE GROUND

- 3.1 An aircraft that has been subject to abnormal loads or stresses in flight or on the ground shall be inspected in accordance with the requirements of the manufacturer or an approved maintenance schedule or worksheet prior to the next flight.
- 3.2 Such inspections shall be made by an appropriately licensed aircraft maintenance engineer. The results and a certification, of the inspections shall be entered in the log book or other approved records. A report of any damage and rectification action shall be submitted in accordance with Chapter 4.9.

4 TESTING OF MAGNETIC COMPASSES

- 4.1 Each magnetic compass on aircraft on which the undermentioned work has been completed shall be checked to determine whether the work has affected the accuracy of the compass(es). Where there is any indication of a change in accuracy a compass swing in accordance with an approved procedure in Chapter 3.7 shall be completed.
 - (a) The replacement of an engine mounted in the forward fuselage or the installation, removal or replacement of any magnetic material which may affect the accuracy of a compass.
 - (b) The installation of a new electrical system or major modification to an existing system.
 - (c) The installation of geophysical survey equipment or other equipment likely to have a strong external magnetic field.
 - (d) The replacement of any component of a compass installation which may affect the accuracy of the installation.

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CHAPTER 4.4

MANDATORY REPORTS

1 General

- 1.1 Pursuant to regulation 128 of the Civil Aviation Regulations, This chapter prescribes the procedure for mandatory reporting and investigation of reportable occurrences/incidents to Mauritian registered aircraft engaged in public transport and have maximum total mass authorized of more than 2730 kgs, excepting those within the preview of accidents.
- 1.2 This Chapter prescribes the requirements for reporting the occurrence or detection of defects, failures or malfunctions in an aircraft, its components or equipment, which could jeopardize the safe operation of an aircraft or cause it to become a danger to persons or property.
- 1.3 For the purpose of this requirements the following definition will apply:

“Accidents” means an occurrence associated with the operation of an aircraft which takes place between the time any person boards the aircraft with the intention of flight until such times as all persons have disembarked, in which :-

“a person is fatally or seriously injured as a result of being in or upon the aircraft or by direct contact with the aircraft or anything attached thereto, except when the injuries are from natural causes, self-inflicted or inflicted by other persons, or when the injuries are stowaways hiding outside the areas normally available to the passengers and crews; or the aircraft incurs damage or structural failure which adversely affects the structure, strength, performance or flight characteristics of the aircraft and which would normally require major repair or replacement of the affected component; the aircraft is completely inaccessible or is missing, that is to say, the official search for it has been terminated and its wreckage has not been located”

“Defect” means the condition existing in an aircraft or aircraft components arising from any cause other than damage, which will preclude it or another component from performing the intended function or would reduce their expected service life.

“Major defect” means a defect which reduces the safety of aircraft or its components and includes defects discovered as a result of occurrence of any emergency or during the cause of normal operation or maintenance.

“Repetitive defect” means the defect which recurs inspite of attempts made to rectify the same on a particular aircraft or another aircraft of the same type.

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- 2 **Reports shall, as applicable, be submitted by:**
- (a) The holder of an Air Operator Certificate, or the owner or operator of the aircraft, following the occurrence to their aircraft of a potentially hazardous defect, failure or malfunction during any flight time period or the detection of such problems during maintenance or other work on an aircraft.
 - (b) Approved persons or organisations who during maintenance or other work become aware of serious or hazardous defects, failures or malfunctions on aircraft, components or equipment.
 - (c) The holder of an Air Operator Certificate in respect of each interruption to a scheduled flight that resulted from a known or suspected defect, failure or malfunction not classified as potentially hazardous.
 - (d) The holder of an Air Operator Certificate in the form of a periodical summary of technical delays, systems defects, failures or malfunctions, component premature removals, and investigations made by the holder into important technical problems.
- 3 Potentially hazardous occurrences referred to in Paragraph 2(a) and appendix 1 of this chapter are defects, failures or malfunctions of aircraft, components or equipment that result in:
- (a) Fire or operation of fire or smoke warning systems.
 - (b) Significant leakage of fuel, oil or other fluid.
 - (c) Smoke, vapour, toxic or noxious fumes inside the aircraft.
 - (d) Malfunction, stiffness, slackness or reduced range of movement of any controls.
 - (e) Incorrect assembly of components, causing possible malfunction.
 - (f) Engine malfunction resulting in partial loss of power, engine shutdown, en-route diversion, or air/ramp turn-back.
 - (g) Failure or malfunction of the thrust reverser system.
 - (h) Failure of a propeller feathering system to shut down an engine or to control thrust.
 - (i) Use of incorrect fuel, oil or other fluid.

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- (j) Fuel system malfunction affecting fuel supply, distribution and jettison.
 - (k) Fuel spillage on ground.
 - (l) Significant failure or malfunction of electrical, instrument, hydraulic, pneumatic, flight control, pressurisation or ice protection systems or of the radio and navigation equipment.
 - (m) On a multi-engine rotorcraft, loss of drive of one engine.
 - (n) Operation of any rotorcraft transmission condition-warning system.
 - (o) Failure of any required emergency equipment to operate or inadvertent operation that causes a hazardous situation.
 - (p) Failure of aircraft primary structure.
 - (q) Cracks, permanent deformation or corrosion of aircraft structure or major aircraft components that exceed specified limits, defects found as the result of a mandatory inspection.
 - (r) Structural damage resulting from any cause which requires any permanent or temporary repair before the aircraft can fly.
 - (s) Failure or malfunction of ground equipment used for testing/checking aircraft systems or equipment.
 - (t) Any other occurrence that has jeopardised or may endanger the safe operation of an aircraft, or cause a danger to persons or property.
- 4 Defects, failures or malfunctions shall be reported to the Authority in accordance with the following:
- (a) Potentially hazardous occurrences specified in paragraph 3, within 24 hours of the occurrence or its detection or such other period approved to the Authority.
 - (b) Statistical summaries of defects, failures, malfunctions and premature removals of components and equipment, within a period acceptable to the Authority.
- 5 The reports shall be provided in an acceptable format, except that initial report

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made in accordance with paragraph 4(a) may be transmitted by telephone to the Airworthiness Division, Department of Civil Aviation of Mauritius provided a written report is submitted within 24 hours. Reports shall include as much of the following data that is available at the time:

- (a) Aircraft type and registration marks.
- (b) Name of the operator or owner.
- (c) The date, flight number, and stage of the flight or the maintenance being performed when the defect, failure or malfunction occurred or was detected.
- (d) Any precautionary or emergency procedures used.
- (e) A description of the defect, failure or malfunction.
- (f) The identification of the component, equipment or system involved, including the make, serial number and part number(s) of the major component(s) involved.
- (g) The total time in service since new and/or overhaul and the time in service since the last maintenance on the items involved.
- (h) The apparent cause of the occurrence.
- (i) The action taken to rectify the defect, failure or malfunction and any action to preclude its recurrence.
- (j) Whether the aircraft was grounded.
- (k) Other pertinent information necessary for more complete identification, seriousness of the defect etc., corrective action taken etc.

6 Reports shall not be withheld because all the required information is not available.

7 When all the pertinent data is not available or the cause of the occurrence cannot be determined without further investigation a supplementary report shall be submitted detailing the missing data and any additional information that becomes available since the initial report such as:

- (a) The total number of flights since new if a primary structural component is affected.

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- (b) Details of damage which indicates the pattern of sequence of failure.
- (c) A brief summary of any pertinent data that could assist in identification or determination of the seriousness, cause, associated effects of the occurrence.

8 Defective aircraft, components and equipment which are the subject of a report may be required to be available for investigation by officers of the Authority. Any such components or equipment removed from an aircraft shall not be despatched from Mauritius, nor have any work commenced on them if it would impede any investigation without the prior approval of an authorised officer of the Authority

9. OCCURENCES CAUSING DELAYS TO SCHEDULE SERVICES

Delay to a scheduled service of 15 minutes duration or more on account of a defect/malfunction in an aircraft shall also be reported to the Director of Civil Aviation within 24 hours of receipt of information by the main base of the operator, giving at least the following information:-

- Service number, date and place of the delay,
- Registration marks and type of aircraft involved
- Duration of the delay
- Brief reasons for the delay and details of rectification action taken

10. INVESTIGATION AND REVIEW

The operators/owners shall evolve a system for undertaking detailed and speedy investigation of all reportable occurrences by the qualified technical staff. The main purpose of the investigation is to avoid recurrences, as such all efforts during the investigation should be made to determine the cause of the occurrence rather than who caused it.

The system shall also include analyses of all results of investigation and periodic timely review to assess the adequacy of rectification action taken in respect of each occurrence to determine if any weakness in the basic design of any aircraft component or in the layout of any system or in the maintenance techniques of the operators exist. Should any such weakness be detected, necessary corrective/preventive action shall be taken by the operator under intimation to this department. The representatives of this department shall

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also have the option to associate themselves with this review and ask for any additional information connected with the occurrences, if considered necessary.

In case completion of any investigation is likely to take longer than three months, a monthly progress report shall be furnished to this department till the finalisation of the investigation.

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CHAPTER 4.4

APPENDIX 1

Examples of Occurrences required to be reported

A Damage to an aircraft

- (i) Any failure of aircraft primary structure
- (ii) Damage which necessitates repair before further flight, due to, for example, ingestion, collision, meteorological conditions, hard or overweight landing, overheating, incorrect techniques or practices, etc.
- (iii) Cracks, permanent deformation or corrosion of aircraft structure not hitherto experienced, or greater than expected to be encountered and routinely dealt with under the normal maintenance, repair or inspection procedures.
- (iv) Any failure of non-primary structure which endangers the aircraft.
- (v) Any part of the aircraft becoming detached in flight.

B. Injury to a person

This is intended to include any minor injury sustained by a passenger or member of the aircraft crew while aboard the aircraft, for example injury to a passenger as a result of turbulence, the scalding of a member of the cabin staff as a result of faulty design, inadequate servicing or the incorrect handling of galley equipment.

C. The impairment during flight of the capacity of a member of flight crew to undertake the functions to which his licence relates

Such impairment could be caused by the onset of illness (eg food poisoning), the injudicious use of therapeutic drugs, alcohol, etc. judgement as to whether such impairment “endangers” the aircraft is relevant in this case.

D. the use in flight of any procedure taken for the purpose of overcoming an emergency.

- (i) The use, other than for training or test purposes, of any emergency equipment or prescribed emergency procedures.

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- (ii) The use of any non-standard procedure adopted by the crew to deal with an emergency.
- (iii) An emergency auto-rotative landing

Occurrences requiring :

- (a) The declaration of an emergency situation
- (b) An emergency evacuation of the aircraft.

E. Failure of an aircraft system or of any equipment of an aircraft.

- (i) Fire or explosion
- (ii) Fire or smoke warning
- (iii) In-flight engine shut-down, or significant loss of power.
- (iv) Inability to feather or unfeather a propeller, to shut down an engine, or to control thrust.
- (v) Inability to re-light or re-start a serviceable engine.
- (vi) Malfunction of the thrust reversal system.
- (vii) Fuel system malfunctions affecting fuel supply and distribution.
- (viii) Malfunctions of the fuel jettisoning system
- (ix) Significant leakage of fuel, hydraulic fluid, or oil.
- (x) Occurrence where the use of alternative systems or procedures has been necessary to obtain the desired aircraft configuration for any flight phase, eg flaps, droop, undercarriage etc.
- (xi) Total inability to achieve the intended aircraft configuration for any flight phase.
- (xii) Failure or malfunction of electrical power sources or distribution systems.

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- (xiii) Failure or malfunction of a hydraulic system necessitating the use of an alternative system. Failure of a hydraulic pump. Overheating in a hydraulic system.
- (xiv) Failure or malfunction of a pneumatic system necessitating the use of an alternative system. Failure of a pneumatic pump.
- (xv) Pressurisation system malfunction necessitating a changed flight plan, or the use of emergency or stand by oxygen system.
- (xvi) Build up of ice on the aircraft beyond the capability of the ice-protection equipment.
- (xvii) Failure of ice-protection equipment.
- (xviii) Failure or malfunction of radio or navigational equipment.
- (xix) Warnings of insecure hatches and doors during flight.
- (xx) Smoke, toxic or noxious fumes in crew. Passenger or freight compartments
- (xxi) Failure of wheels, brakes and tyres.
- (xxii) Engine surging sufficient to cause loss of power or to require subsequent remedial action.
- (xxiii) On a multi-engined rotorcraft, loss of drive of one engine.
- (xxiv) Operation of any rotorcraft transmission condition-warning system.
- (xxv) Malfunction of any rotorcraft auto-stabilisation mode.

F. Any reportable occurrence arising from the control of an aircraft in flight by its flight crew

- (i) Abandoned take-off.
- (ii) unintentional deviation from intended track or altitude, caused by a procedural, systems or equipment defect.
- (iii) Unplanned diversion, or unscheduled return to departure aerodrome

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- (iv) Precautionary or forced landing
- (v) Discontinued approach from below decision height
- (vi) Unintentional contact with the ground, including touching down before the runway threshold.
- (vii) Over-running the ends or sides of the runway or landing strip.
- (viii) Serious loss of braking action.
- (ix) Loss of control from any cause, eg turbulence.
- (x) Occurrence of stall or a stick push, other than for training or test purposes.
- (xi) Operation, whether genuine or spurious, of the stall warning (stickshake) system, other than for training or test purposes.
- (xii) Stiffness, limitation of movement or poor or delayed response in the operation of any primary control.
- (xiii) Malfunction of any control.
- (xiv) Reversion to manual control of powered primary control, other than for training or test purposes.
- (xv) Inadvertent incorrect operation of primary or ancillary controls.

G. Failure or inadequacy of facilities or services on the ground used or intended to be used for the purpose of or in connection with the operation of aircraft.

Failure or inadequacy of :

- (i) Aids to navigation
- (ii) Communications services
- (iii) Prescribed let-down procedures
- (iv) Meteorological reporting and forecasting services.

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- (v) Aerodrome lighting systems
- (vi) The marking of obstructions or hazards on the manoeuvring area.
- (vii) Facilities and procedures forming part of the ATS system.

H. Occurrences arising from

- (i) Receipt of incorrect or inadequate information from a ground source (ATS, ATIS, meteorological broadcast, etc)
- (ii) The incorrect transmission, receipt or interpretation of a radio telephone message (air-to-ground-to-air).
- (iii) Provision of an incorrect altimeter setting.
- (iv) Misidentification of aircraft in the use of radar.
- (v) The setting of an incorrect SSR code.
- (vi) Flight at a level, or on a route, different from that allocated.
- (vii) The separation between aircraft was less than that prescribed for the situation.
- (viii) Less than the prescribed terrain clearance was provided.
- (ix) Circuit failures affecting the category of the runway.
- (x) Runway obstructed by foreign objects.
- (xi) Major failures of runway guard-bar lighting.
- (xii) Major failures of or deterioration of surfaces in aerodrome manoeuvring areas.
- (xiii) Significant fuel spillage on the apron.
- (xiv) All undershoots/overshoots or aircraft leaving the runway paved areas.

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- (xv) Collision between moving aircraft and vehicles or any other ground equipment.
 - (xvi) Apron blast incidents.
- I. **Any reportable occurrence arising from the loading or the carriage of passengers, cargo (including mail) or fuel.**
- (i) Difficulty in controlling intoxicated, violent or armed passengers.
 - (ii) Incorrect fuel loading
 - (iii) The loading of unsuitable or contaminated fuel.
 - (iv) The carriage of hazardous or restricted cargo.
 - (v) The incorrect packing of cargo.
 - (vi) The incorrect stowage of cargo
 - (vii) Incorrectly secured cargo
 - (viii) Incorrect passenger loading.
- J. **Any other reportable occurrence which, in the opinion of a person reporting the occurrence constitutes an occurrence endangering, or which if not corrected would endanger, the safety of an aircraft, its occupants or any other person.**
- (i) Any incident arising from incorrect or misleading information on maps and charts.
 - (ii) Arising at an excessive frequency, of a specific type of occurrence which in isolation would not be considered “reportable”(eg high frequency of spurious warning signals for certain systems or high failure rate for specific component).

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- (iii) Incorrect assembly of components.
- (iv) Use of incorrect oil, hydraulic fluid or other essential fluids.
- (v) Failure or malfunction of ground equipment used for test/check out of aircraft systems and equipment.

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CHAPTER 4.5

MINIMUM EQUIPMENT LIST

- 1 Pursuant to regulation 24 of the Civil Aviation Regulations, the Authority may approve a minimum equipment list which permits an aircraft to commence a flight in specified circumstances notwithstanding that any specified item of equipment required by the Civil Aviation Regulations to be carried is not in a condition fit for use.
- 2 This Chapter prescribes the requirements for the preparation of Minimum Equipment Lists (MEL) that will specify the conditions under which, an aircraft can be authorised to continue in service with certain parts, components, equipment and systems inoperative or unserviceable, or with minor damage to, or missing airframe or engine parts of secondary importance. Each MEL shall be approved by the Authority and copies shall be included in the flight crew operations manual. The MEL prepared by the operator shall not be less restrictive than the Master Minimum Equipment (MMEL) list approved by the State of Design for that aircraft type.
- 3 **A minimum equipment list shall contain:**
 - (a) A general preamble which states:
 - (i) The operator's basic policies regarding operation of an aircraft, components or equipment.
 - (ii) The aircraft commander's responsibilities to report such defects or damage. The aspects to be considered by him in deciding whether to continue a flight without rectification action being taken.
 - (iii) The responsibilities of engineering staff regarding the deferment of rectification action and their notification and advice to the aircraft commander.
 - (iv) The certifications required for the deferment of rectification action and notification within the company that a deferment has been authorised.
 - (b) A list of the items that may be unserviceable. The following shall be included for each item:
 - (i) The number installed per aircraft and the number and location of the items required to be serviceable in specific circumstances.

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- (ii) The limits and conditions applicable in authorising the deferment together with the notification and advice to flight crews of deferments.
 - (iii) Any inspection or assessment required before an authorisation may be granted.
 - (iv) The rectification intervals within which of defects on specific items must be accomplished.
 - (v) Any limitations imposed on the operation of an aircraft with:
 - (a) unserviceable or inoperative, components, equipment, parts or systems.
 - (b) missing components or parts.
 - (c) minor damage.
- 4 The MEL shall indicate clearly items which have different dispatch requirements for ETOPS flights, in accordance with Chapter 4.6
- 5 A list, or amendment to a list, submitted for approval must be accompanied with justification for the acceptance of each item which should include the following information:
- (a) The part number and manufacturer's name of each item, except where a complete system is involved.
 - (b) Evidence of prior approval by the State of Design , of a similar proposal e.g. Inclusion of the item in an approved master minimum equipment list or configuration deviation list etc.
 - (c) A statement of the effect an unserviceability will have on the airworthiness status and the operational status of the aircraft including the various classes of operations in which the aircraft may operate.
 - (d) In respect of amendments, a statement of the failure rate of each item submitted and any company action to improve its reliability.
 - (e) A statement that the company's flight operations and engineering departments have agreed on the proposed schedule or amendment.

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- 6 Operation of an aircraft with either unserviceable or inoperative components or equipment that are not specified in a minimum equipment list, or damage exceeding that specified in the minimum equipment list may only be permitted by the Authority, or senior officers of the operator authorised by the Authority for this purpose. The powers of a delegation will be subject to specific limitations depending on the complexity of the aircraft involved, the technical and operational support which can be provided and the establishment of procedures detailing the conditions under which such permissions can be given.

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CHAPTER 4.6

EXTENDED-RANGE TWIN-ENGINE OPERATIONS (ETOPS)

1 General

1.1 This chapter prescribes the engineering requirements for ETOPS operations of Mauritius aircraft pursuant to regulation 45(4) of the Mauritius Civil Aviation Regulations .

2 Type Design

2.1 The essential airframe systems and the propulsion system for the particular airframe-engine combination shall be shown to be designed to fail-safe criteria and through service experience it must be determined that it can achieve a level of reliability suitable for the intended operation. The Configurations, Maintenance & Procedures (CMP) standard that establishes the suitability of an aircraft for extended range operation defines the minimum standard for the operation of ETOPS.

2.2 The operator shall obtain in writing from the manufacturer that the aircraft delivered to them complies with the type design, latest Airworthiness Directives and CMP standards.

2.3 The Type Design Approval for the aircraft does not reflect a continuing airworthiness or Operational Approval to conduct extended range operations. An Operational Approval for ETOPS operation has to be separately obtained from the Authority.

3 Operational Approval

3.1 The operator shall demonstrate the ability to maintain and operate the aircraft so as to achieve the necessary reliability and to train its personnel to achieve the competence in extended range twin-engine operations. The ETOPS maintenance requirements are in Appendix 1 of this chapter. The operator shall operate the aircraft type for twelve months, or a period as decided by the Authority, before applying for the ETOPS Operational Approval.

3.2 The ETOPS Operational Approval to conduct an extended range twin-engine operation is in the form of a written permission from the Authority.

3.3 An operator requesting approval for extended range twin-engine operations or an increase of diversion time shall submit the application, with the required supporting data, to the Authority at least three months prior to the proposed start of extended range

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operation with the specific airframe-engine combination. The operator shall submit the following:

- (a) Type Design Approval.
- (b) In-service experience.
- (c) Propulsion system reliability (operator and world fleet).
- (d) Reliability of significant airframe system.
- (e) A programme to show the APU's in-flight start capabilities.
- (f) Operator's Reliability and Maintenance Programmes.
- (g) Conformance to latest Airworthiness Directives and CMP standards.
- (h) Training of maintenance personnel.
- (i) Any other data requested by the Authority.

4 **Continuing Airworthiness**

- 4.1 The aircraft manufacturer and the Type Certification Authority may periodically review the in-service reliability of the airframe-engine combination. Further to these reviews and every time that an urgent problem makes it necessary, the Certification Authority may require that the type design CMP standard be revised to achieve and maintain the desired level of reliability and, therefore safety of the extended range twin-engine operation. The operator shall ensure that its ETOPS fleet is in compliance with the latest revised CMP standards.
- 4.2 The CMP standards prior to the revision will no longer be considered suitable for continued extended range twin-engine operation. The CMP standards and its revisions may require priority actions to be implemented before the next ETOPS flight and other actions to be implemented according to a schedule accepted by the Authority.
- 4.3 The validity of the ETOPS Operational Approval depends on the operator keeping its ETOPS fleets in compliance with the:
 - (a) Current CMP standards.
 - (b) Airworthiness Directives.

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- (c) Alert Service Bulletins.
- (d) Maintenance requirements as in Appendix 1 of this chapter.

5 **Minimum Equipment List (MEL)**

5.1 The MEL of the operator's ETOPS fleet shall indicate clearly items that have different dispatch requirements for ETOPS flights. Systems considered to have a fundamental influence on flight safety shall include but are not limited to:

- (a) Electrical power.
- (b) Hydraulic system.
- (c) Pneumatic.
- (d) Flight instrumentation.
- (e) Fuel.
- (f) Flight control.
- (g) Ice protection.
- (h) Engine start and ignition.
- (i) Propulsion system instruments.
- (j) Navigation and communications.
- (k) Auxiliary power-units.
- (l) Air conditioning and pressurisation.
- (m) Cargo fire suppression.
- (n) Emergency equipment.
- (o) Engine fire detection and extinguishing systems.
- (p) Any other equipment required for extended range twin-engine operations.

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6 Aircraft Dispatch

- 6.1 The operator shall ensure that the aircraft is precluded from being dispatch for ETOPS when:
- (a) After an engine in-flight shut-down (IFSD) on a previous flight.
 - (b) After primary airframe system failure on a previous flight.
 - (c) After a replacement of an engine.
 - (d) After failure of an engine power control system or significant adverse trends in engine performance.
 - (e) After any major maintenance work on the aircraft.
- 6.2 The aircraft shall operate at least one non-revenue (handling flight) or non-ETOPS revenue flight successfully before being released on extended range twin-engine operations. This shall be reflected in the aircraft technical log.
- 6.3 The report shall identify the following:
- (a) Aircraft Registration.
 - (b) Engine identification (position, make and serial number).
 - (c) Total time, cycles and time since last shop visit.
 - (d) For systems, time since overhaul or last inspection of the defective unit.
 - (e) Phase of flight.
 - (f) Corrective action.

7 APU In-flight Start Capabilities

- 7.1 If any work is performed on the Auxiliary Power Unit (APU) that may affect the starting and operation of the APU, an in-flight start shall be performed on the next flight. The result of the in-flight start shall be annotated in the Technical Log of the aircraft.
- 7.2 To ensure that the APU maintains its in-flight start capabilities, the operator shall have a programme to schedule an APU in-flight start once every three months for

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each aircraft of its ETOPS fleet. The result of the in-flight start shall be annotated in the Technical Log of the aircraft.

8 **Maintenance Training**

- 8.1 The operator shall have a training programme that focuses on the special nature of ETOPS. This programme shall be included in the normal maintenance training for the operator's maintenance personnel. The goal of this programme is to ensure that all personnel involved in ETOPS are provided with the necessary training so that the ETOPS maintenance tasks are properly accomplished and to emphasise the special nature of ETOPS maintenance requirements. Human factors principle shall be included in the training programme.
- 8.2 ETOPS qualified maintenance personnel are those that have completed the operators extended range training programme and have satisfactorily performed extended range tasks under supervision, within the framework of the operator's approved procedures for Personnel Authorisation.

9 **ETOPS Parts Control**

- 9.1 The operator shall develop a parts control programme with support from the manufacturer, that ensures the proper parts and configuration are maintained for ETOPS. The programme includes verification that parts placed on an ETOPS aircraft during parts borrowing or pooling arrangements, as well as those parts used after repair or overhaul, maintain the necessary ETOPS configuration for that aircraft.

10 **Extended Diversion Time Operation (EDTO)**

As from 31 March 2016, all aircraft fitted with more than two engines shall demonstrate compliance with the provisions of Appendix 2 of this chapter as applicable.

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CHAPTER 4.6

EXTENDED-RANGE TWIN-ENGINE OPERATIONS

APPENDIX 1

ETOPS MAINTENANCE REQUIREMENTS

1 Maintenance Programme and Procedures

- 1.1 The operator shall ensure that the maintenance programme for its ETOPS fleet contains the standards, guidance and direction necessary to support the intended operations. Maintenance personnel and other personnel involved shall be made aware of the special nature of ETOPS and have the knowledge, skills and ability to accomplish the requirements of the programme.
- 1.2 The maintenance programme for the aircraft being considered for ETOPS is the continuous airworthiness maintenance schedule currently approved for the operator. The operator shall review the schedule to ensure that it provides an adequate basis for development of ETOPS maintenance requirements. The programme shall incorporate human factors principles.
- 1.3 The operator shall have in place procedures to preclude identical action being applied to multiple similar elements in any ETOPS significant system (e.g. fuel control change on both engines). If this is not possible, the identical actions shall be done by different maintenance personnel/teams.
- 1.4 The operator shall include in the maintenance procedures the following:
 - (a) ETOPS related tasks shall be identified on the operator's routine work forms and related instructions.
 - (b) ETOPS related procedures, such as involvement of centralised maintenance control, shall be clearly defined in the operator's programme.
 - (c) An ETOPS service check shall be developed to verify that the status of the aircraft and certain critical items are acceptable. This check shall be accomplished and signed off by an ETOPS qualified authorised person immediately prior to an ETOPS flight.
 - (d) Log books shall be reviewed and documented, as appropriate, to ensure proper MEL procedures, deferred items, maintenance checks and system verification procedures have been properly performed.

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- 1.5 When the maintenance is contracted to a maintenance organisation, the operator shall ensure that the contractor complies with the ETOPS requirements and procedures. The operator shall establish control procedures to ensure that:
- (a) The maintenance personnel of the contracted maintenance organisation are qualified for ETOPS.
 - (b) All flight dispatch procedures and additional maintenance requirements as identified in the operator's maintenance control manual are complied with.

2 ETOPS Manual

- 2.1 The operator shall develop a manual for use by personnel involved in ETOPS. This manual need not include, but shall at least reference, the maintenance programme and other requirements described in this chapter of the Mauritius Airworthiness Requirements and clearly indicate where they are located in the operators manual system.
- 2.2 All ETOPS requirements, including supportive programmes, procedures, duties, and responsibilities, shall be identified and be subject to revision control. This manual shall be submitted to the Authority for approval before the implementation of ETOPS by the operator.

3 Oil Consumption Programme

- 3.1 The operator shall have in place an oil consumption programme. The programme shall reflect the manufacturer's recommendations and be sensitive to oil consumption trends. It shall consider the amount of oil added at the departing ETOPS stations with reference to the running average consumption; i.e. the monitoring must be continuous up to, and including, oil added at the ETOPS departure station. If oil analysis is meaningful to this make and model, it shall be included in the programme. The APU oil consumption shall also be part of the oil consumption programme.

4 Engine Condition Monitoring

- 4.1 The operator shall have an engine condition monitoring programme that describes the parameters to be monitored, method of data collection and corrective action process. The programme shall also incorporate the manufacturer's instructions and industry practice. This monitoring shall be used to detect deterioration at an early stage to allow for corrective action before safe operation is affected. The programme shall ensure that engine limit margins are maintained such that a prolonged single-engine diversion may be conducted without exceeding approved engine limits (i.e., rotor speeds, exhaust gas temperature) at all approved power levels and expected environmental conditions.

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- 4.2 The monitoring programme shall include assessment of in-flight shut-down (IFSD) rate of the operator's ETOPS fleet. The assessment shall include, as a minimum, engine hours flown in the period, in flight shut-down rate for all causes and engine removal rate, both on a 12 month moving average basis. When the IFSD rate exceeds 0.05/1000 engine hours for 120 minutes diversion time or exceeds 0.03/1000 engine hours for 180 minutes diversion time, the operator must notify the Authority as soon as possible.
- 4.3 The assessment of the operator's ETOPS fleet propulsion system reliability and IFSD rate shall be made available to the Authority on a monthly basis.
- 4.4 When any adverse sustained trend is noted, the operator shall in consultation with the Authority, conduct an immediate evaluation to ascertain the causes. The evaluation may result in corrective action or operational restrictions being applied.

5 **Verification Programme after Maintenance**

- 5.1 The operator shall develop a verification programme or establish procedures to ensure corrective action following an engine shut-down, primary system failure or adverse trends, any prescribed events which require a verification flight or other action. The operator shall establish the means to assure the accomplishment of the verification programme or the corrective action procedures. A clear description of who must initiate verification actions and the section or group responsible for the determination of what action is necessary shall be identified in the programme. Primary systems or conditions requiring verification actions shall be described in the operator's ETOPS manual.

6 **Reliability Programme**

- 6.1 An ETOPS reliability programme shall be developed by the operator or the operator's existing reliability programme supplemented. This programme shall be designed with early identification and prevention of ETOPS related problems as the primary goal. The programme shall be event-orientated and incorporate reporting procedures for significant events detrimental to ETOPS flights. This information shall be readily available for use by the Authority to help establish that the reliability level is adequate, and to assess the operators competence and capability to safely continue ETOPS. The Authority shall be notified within 72 hours of events reportable through this programme.
- 6.2 In addition to the items required to be reported as per Chapter 4.4 of the MCAR, the following items shall be included:
- (a) In-flight shut-downs.
 - (b) Uncommanded power changes or surges.

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- (c) Inability to control the engine or obtain desired power.
- (d) Unscheduled removal of engines.
- (e) Problems with systems critical to ETOPS.
- (f) Any other events detrimental to ETOPS.

6.3 The report shall identify the following:

- (a) Aircraft Registration.
- (b) Engine identification (position, make and serial number).
- (c) Total time, cycles and time since last shop visit.
- (d) For systems, time since overhaul or last inspection of the defective unit.
- (e) Phase of flight.
- (f) Corrective action.

7 **APU In-flight Start Capabilities**

7.1 If any work is performed on the Auxiliary Power Unit (APU) that may affect the starting and operation of the APU, an in-flight start shall be performed on the next flight. The result of the in-flight start shall be annotated in the Technical Log of the aircraft.

7.2 To ensure that the APU maintains its in-flight start capabilities, the operator shall have a programme to schedule an APU in-flight start once every three months for each aircraft of its ETOPS fleet. The result of the in-flight start shall be annotated in the Technical Log of the aircraft.

8 **Maintenance Training**

8.1 The operator shall have a training programme that focuses on the special nature of ETOPS. This programme shall be included in the normal maintenance training for the operator's maintenance personnel. The goal of this programme is to ensure that all personnel involved in ETOPS are provided with the necessary training so that the ETOPS maintenance tasks are properly accomplished and to emphasise the special nature of ETOPS maintenance requirements. Human factors principle shall be included in the training programme.

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8.2 ETOPS qualified maintenance personnel are those that have completed the operators extended range training programme and have satisfactorily performed extended range tasks under supervision, within the framework of the operator's approved procedures for Personnel Authorisation.

9 **ETOPS Parts Control**

9.1 The operator shall develop a parts control programme with support from the manufacturer, that ensures the proper parts and configuration are maintained for ETOPS. The programme includes verification that parts placed on an ETOPS aircraft during parts borrowing or pooling arrangements, as well as those parts used after repair or overhaul, maintain the necessary ETOPS configuration for that aircraft.

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CHAPTER 4.6

EXTENDED DIVERSION TIME OPERATION (EDTO)

APPENDIX 2

Extended Diversion Time Operation (EDTO)

The requirements for EDTO will be published after an assessment of the operators is carried out.

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CHAPTER 4.7

FLIGHT RECORDERS

1 General

- 1.1 Pursuant to Regulation 59, Scales P, S and SS of the Seventh Schedule of the Civil Aviation Regulations, this chapter prescribes the requirements of, and the parameters to be recorded by, the flight recorders.
- 1.2 General Aviation aircraft with an authorised MTOW of 5,700 kg and above shall follow the requirements in Scale P unless otherwise stated.
- 1.3 General Aviation aircraft with an authorised MTOW below 5,700 kg shall follow the requirements in Scale S unless otherwise stated.

2 Requirements -General

- 2.1 Flight recorders comprise two systems, a cockpit voice recorder (CVR) and a flight data recorder (FDR). The requirements for flight recorders are as follows:
 - (a) The use of engraving metal foil flight data recorders, photographic film data recorders and analogue data recorders using frequency modulation (FM) is not permitted;
 - (b) From 1 January 2005, all aeroplanes and helicopters which utilise data link communications and are required to carry a cockpit voice recorder, shall record on the flight data recorder the data link communications to and from the aeroplane. The minimum recording duration shall be equal to the duration of the CVR, and shall be readily correlated to the recorded cockpit audio. Sufficient information to derive the content of the data link communications message and, whenever practical, the time that the message was displayed to or generated by the crew shall be recorded;
 - (c) All aeroplanes and helicopters required to be equipped with a flight data recorder and a cockpit voice recorder, may alternatively be equipped with two combination recorders (FDR/CVR);
 - (d) Each flight recorder shall be painted with a distinctive orange or yellow colour and carry a reflective material to facilitate its location;

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- (e) Each flight recorder shall have a securely attached and automatically activated underwater locating device;
- (f) Flight recorders shall be constructed, located and installed so as to provide maximum practical protection for the recordings in order that the recorded information may be recovered, preserved and transcribed;
- (g) Flight recorders shall meet the prescribed crashworthiness and fire protection specifications (Industry crashworthiness and fire protection specification can be found in FAA TSO-123a and TSO-124a, or equivalent);
- (h) Each flight recorder shall receive its electrical power from a bus that provides the maximum reliability for operation of the recorders without jeopardizing service to essential or emergency loads;
- (i) An aural or visual means for pre-flight checking must be provided to ensure that the recorders are operating properly; and
- (j) Operational checks and evaluations of recordings from the flight data and cockpit voice recorder systems shall be conducted to ensure the continued serviceability of the recorders. Procedures for the inspections of the flight recorders are given under “Inspections of flight recording systems” of this chapter.

3 Requirements -Cockpit Voice Recorder (CVR)

- 3.1 The CVR installed in aeroplanes and helicopters as required by paragraph 4 and 5 of the Seventh Schedule of the Civil Aviation Regulations shall be capable of recording at least the last 30 minutes of its operation.
- 3.2 From 1 January 2005, the CVR installed in aeroplanes and helicopters as required by paragraphs 4 and 5 of the fifth Schedule of the Civil Aviation Regulations shall be capable of retaining the information recorded during at least the last two hours of its operation.
- 3.3 On aeroplanes and helicopters for which the Certificate of Airworthiness is first issued (in Mauritius or elsewhere) on or after 1 January 2001 and for which a CVR shall be installed as required by the Seventh Schedule of the Civil Aviation Regulations, the CVR shall be capable of retaining the information recorded during of at least the last two hours of its operation.
- 3.4 The CVR system is to be designed and installed so that it will record at least the following:

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- (a) voice communication transmitted from or received in the aeroplane by radio;
 - (b) aural environment on the flight deck;
 - (c) voice communication of flight crew members on the flight deck using the aeroplane's interphone system;
 - (d) voice or audio signals identifying navigation or approach aids introduced in the headset or speaker;
 - (e) voice communication of flight crew members using the passenger address system, if installed; and
 - (f) digital communications with Air Traffic Services, unless recorded by the FDR.
- 3.5 To aid in voice and sound discrimination, microphones in the cockpit are to be located in the best position for recording voice communications originating at the pilot and co-pilot stations, and voice communications of other crew members on the flight deck when directed to those stations. This can best be achieved by wiring suitable boom microphones to record continuously on separate channels.
- 3.6 The CVR shall be capable of recording on at least four tracks simultaneously. To ensure accurate time correlation between tracks, the recorder is to record in an in-line format. If a bi-directional configuration is used, the in-line format and track allocation should be retained in both directions. The preferred track allocation is as follows:
- (a) Track 1 – co-pilot headphones and live boom microphone;
 - (b) Track 2 – pilot headphones and live boom microphone;
 - (c) Track 3 – area microphone; and
 - (d) Track 4 – time reference plus the third and fourth crew members' headphone and live microphone, if applicable;

– for helicopters; time reference, main rotor speed or the flight deck vibration environment, the third and fourth crew members' headphone and live microphone, if applicable.
- Note : (1) Track 1 is located closest to the base of the recording head.
- (2) The preferred track allocation presumes use of current conventional magnetic tape transport mechanisms, and is specified because the outer edges of the tape have a higher risk of damage than the middle. It is not

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intended to preclude use of alternative recording media where such constraints may not apply.

- 3.7 Means shall be provided for an accurate time correlation between the FDR and CVR.
- 3.8 If the recorder has a bulk erasure device, the installation should be designed to prevent operation of the device during flight time or crash impact.
- 3.9 For helicopters not equipped with a FDR, at least the main rotor speed shall be recorded on one track of the cockpit voice recorder.

4 Requirements -Flight Data Recorder (FDR)

- 4.1 All aeroplanes having a maximum total weight authorised exceeding 5,700 kg subject to Paragraph 4 section 2 of the Seventh Schedule of the Civil Aviation Regulations shall be capable of recording at least the last 25 hours of its operation and the parameters in Table 1.
- 4.2 All aeroplanes having a maximum total weight authorised exceeding 5,700 kg subject to paragraph 4 section 2 of the Seventh Schedule of the Civil Aviation Regulations , for which the Certificate of Airworthiness is first issued (in Mauritius or elsewhere) on or after 1 January 2005 shall be capable of recording at least the last 25 hours of its operation and the parameters in table 2.
- 4.3 All aeroplanes having a maximum total weight authorised not exceeding 5,700 kg subject to Paragraph 4 section 2 of the Seventh Schedule of the Civil Aviation Regulations shall be capable of recording at least the last 30 minutes of its operation and the parameters in Table 3.
- 4.4 All helicopters having a maximum total weight authorised exceeding 2,700 kg subject to Paragraph 4 section 8 of the Seventh Schedule of the Civil Aviation Regulations shall be capable of recording at least the last 10 hours of its operation and the parameters in Table 4.
- 4.5 All helicopters having a maximum total weight authorized exceeding 2,700 kg subject to Paragraph 4 section 8 of the Seventh Schedule of the Civil Aviation Regulations , for which the Certificate of Airworthiness is first issued (in Mauritius or elsewhere) on or after 1 January 2005 shall be capable of recording at least the last 10 hours of its operation and the parameters in Table 5.
- 4.6 Documentation concerning the parameter allocation, conversion equations, periodic calibration and other serviceability/maintenance information should be maintained by the

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operator. The documentation must be sufficient to ensure that the accident investigation authority have the necessary information to read out the data in engineering units.

5 Requirement -Operation

5.1 When required to be installed,

- (a) The flight data recorder shall be operated from the time the first engine is started for the purpose of taking off and shall not be switched off during flight time.
- (b) The cockpit voice recorder shall be operated continuously from the start of the use of the first checklist (before starting engines for the purpose of flight) to the completion of the final checklist at the end of the flight.

5.2 Notwithstanding paragraph 5.1, flight recorders shall be de-activated upon completion of flight time following an accident or incident to preserve the flight recorder records. The recorders shall not be re-activated before their disposition as determined in accordance with regulation 57 of the Civil Aviation Regulations .

6 Inspection of flight recording systems

6.1 Prior to the first flight of the day, the built-in test features on the flight deck for the CVR, FDR and Flight Data Acquisition Unit, when installed, should be monitored.

6.2 Annual inspections should be carried out as follows:

- (a) the readout of the recorded data from the FDR and CVR should ensure that the recorder operates correctly for the nominal duration of the recording;
- (b) an annual examination of the recorded signal on the CVR should be carried out by re-play of the CVR recording. While installed in the aircraft, the CVR should record test signals from each aircraft source and from relevant external sources to ensure that all required signals meet intelligibility standards;
- (c) where practicable, during the annual examination, a sample of in-flight recordings of the CVR should be examined for evidence that the intelligibility of the signal is acceptable;
- (d) the analysis of the FDR should evaluate the quality of the recorded data to determine if the bit error rate is within acceptable limits and to determine the nature and distribution of the errors;

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- (e) a complete flight from the FDR should be examined in engineering units to evaluate the validity of all recorded parameters. Particular attention should be given to parameters from sensors dedicated to the FDR. Parameters taken from the aircraft's electrical bus system need not be checked if their serviceability can be detected by other aircraft systems; and
 - (f) the readout facility should have the necessary software to accurately convert the recorded values to engineering units and to determine the status of discrete signals.
- 6.3 Flight recorder systems should be considered unserviceable if there is a significant period of poor quality data, unintelligible signals, or if one or more of the mandatory parameters is not recorded correctly.
- 6.4 A report of the annual inspection shall be made available to the Authority for monitoring purposes.
- 6.5 Calibration of the FDR systems:
 - (a) the FDR system should be re-calibrated at least every five years to determine any discrepancies in the engineering conversion routines for the mandatory parameters, and to ensure that parameters are being recorded within the calibration tolerances; and
 - (b) when sensors that are dedicated to the FDR system provide the parameters of altitude and airspeed, there should be a re-calibration performed as recommended by the sensor manufacture, or at least every two years.

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TABLE 1

S/N	Parameter	Measurement Range	Recording Interval (seconds)	Accuracy limits (sensor input compared to FDR read-out)
1	Time (UTC when available, otherwise elapse time)	24hours	4	± 0.125% per hour
2	Indicated altitude	-300 m (-1000 ft) to maximum certificated altitude of aircraft +1500 m (+5000 ft)	1	± 30 m to ± 200m (± 100 ft to ± 700 ft)
3	Indicated airspeed	95 km/h (50 kt) to max V _{so} (<i>Note 1</i>) V _{so} to 1.2 V _D (<i>Note 2</i>)	1	±5% ± 3%
4	Magnetic heading	360°	1	± 2°
5	Vertical acceleration	- 3 g to + 6 g	0.125	± 1% of maximum range excluding datum error of ± 5%
6	Pitch attitude	± 75°	1	± 2°
7	Roll attitude	± 180°	1	± 2 degrees
8	Radio transmission Keying	On-off (one discrete)	1	
9	Power of each engine	Full range – sufficient inputs to determine power	1 (per engine)	± 2%
10	Trailing edge flap or cockpit control selection	Full range or each discrete position	2	± 5% or as pilot's indicator
11	Leading edge flap or cockpit control selection	Full range or each discrete position	2	± 5% or as pilot's indicator
12	Position of each thrust reverser position	Stowed, in transit, and reverse	1 (per engine)	
13	Ground spoiler/speed brake selection (<i>Note 3</i>)	Full range or each discrete position	1	± 2% unless higher accuracy uniquely required
14	Outside air temperature	Sensor range	2	± 2 degrees C

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S/N	Parameter	Measurement Range	Recording Interval (seconds)	Accuracy limits (sensor input compared to FDR read-out)
15	Autopilot/auto throttle/ AFCS mode and engagement status <i>(Note 3)</i>	A suitable combination of discrettes	1	
16	Lateral acceleration or sideslip angle	± 1 g	0.25	$\pm 1.5\%$ max range excluding datum error of $\pm 5\%$
17	Control column or / and pitch control surface position <i>(Note 4)</i>	Full range	1	$\pm 2\%$ unless higher uniquely accuracy
18	Control wheel or / and lateral control surface position <i>(Note 4)</i>	Full range	1	$\pm 2\%$ unless higher uniquely accuracy
19	Rudder pedal or / and yaw control surface position <i>(Note 4)</i>	Full range	1	$\pm 2\%$ unless higher uniquely accuracy
20	Pitch trim position <i>(Note 4)</i>	Full range	1	$\pm 3\%$ unless higher uniquely accuracy
21	Longitudinal Acceleration <i>(Note 5)</i>	± 1 g	1	$\pm 1.5\%$ max range excluding datum error of $\pm 5\%$
22	Radio Altitude <i>(Note 5)</i>	-6 m to 750 m (-20 ft to 2500 ft)	1	± 0.6 m (± 2 ft) or $\pm 3\%$ whichever is greater below 150 m (500 ft) and $\pm 5\%$ above 150 m (500 ft)
23	Glide path deviation	Signal range	1	$\pm 3\%$
24	Localizer deviation	Signal range	1	$\pm 3\%$
25	Marker beacon passage	Discrete	1	
26	Master warning	Discrete	1	
27	Landing gear squat switch status	Discrete	1	

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28	GPWS (ground proximity warning system)	Discrete	1
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S/N	Parameter	Measurement Range	Recording Interval (seconds)	Accuracy limits (sensor input compared to FDR read-out)
29	Angle of attack <i>(Note 5)</i>	Full range	0.5	As installed
30	Each hydraulic system (low pressure)	Discrete	2	
31	Landing gear or gear selector position	Discrete	4	As installed
32	NAV 1 and 2 frequency selection <i>(Note 6)</i>	Full range	4	As installed
33	DME 1 and 2 distance <i>(Note 6)</i>	0 to 370 km	4	As installed
34	Latitude and longitude <i>(Note 6)</i>	As installed	1	As installed
35	Ground speed <i>(Note 6)</i>	As installed	1	As installed
36	Drift angle <i>(Note 6)</i>	As installed	1	As installed

Notes:

1. V_{so} - stalling speed or minimum steady flight speed in the landing configuration.
2. V_D - design diving speed.
3. In the case of an aeroplane for which the individual Certificate of Airworthiness is first issued (whether in Singapore or elsewhere) on or after 1st April 1987.
4. For aeroplanes with mechanical control system “or” applies. For aeroplanes with non-mechanical control system “and” applies.
5. In the case of an aeroplane for which the individual Certificate of Airworthiness is first issued (whether in Singapore or elsewhere) on or after 1st January 1989.
6. If the equipment provided in the aeroplane are of such a nature as to enable these data to be recorded.

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If further recording capacity is available, the following additional information should be recorded:

- (a) Aeroplanes with operational information from electronic displays, the recording of the following information:
 - (i) Parameters selected by the flight crew relating to the desired flight path, e.g. barometric pressure setting, selected altitude, selected airspeed, decision height, and autoflight system engagement and mode indications if not recorded from another source.
 - (ii) Display system selection/status, e.g. SECTOR, PLAN, ROSE, NAV, WXR, COMPOSITE, COPY, etc.
 - (iii) Warnings and alerts.
 - (iv) The identity of displayed pages for emergency procedures and checklist.
- (b) Retardation information including brake application for use in the investigation of landing overruns and rejected take-off.
- (c) Additional engine parameters (EPR, N1, EGT, fuel flow, etc)

TABLE 2

Requirements for Flight Path and Speed:

1. Pressure Altitude
2. Indicated and Calibrated Airspeed
3. Air/ground status (landing gear air/ground sensor)
4. Total or Outside Air Temperature
5. Heading
6. Normal Acceleration

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7. Lateral Acceleration
8. Longitudinal Acceleration
9. Time or Relative Time Count
10. Drift Angle *
11. Wind Speed *
12. Wind Direction*
13. Latitude/Longitude*
14. Groundspeed*
15. Radio Altitude*

Requirements for Attitude

1. Pitch Attitude
2. Roll Attitude
3. Yaw or sideslip angle*
4. Angle of attack*

Requirements for Engine Power

1. Engine Power: Power on each engine and power lever position.
2. Start Levers / Cut-off levers positions
3. Thrust Reverse status*
4. Engine Thrust Command*
5. Engine Thrust Target*
6. Engine Bleed Valves positions*

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7. Engine Parameters*: EPR, N1, N2, N3, EGT, Fuel Flow, Indicated Vibration levels

Requirements for Configuration

1. Pitch Trim surface position
2. Flaps*: Trailing Edge Flaps position, cockpit control selection
3. Slats*: Leading Edge slats position, cockpit control selection
4. Landing Gear*: Landing Gear, Gear Selector position
5. Yaw Trim Surface position*
6. Roll Trim Surface position*
7. Cockpit Trim Control input position Pitch*
8. Cockpit Trim control input position Roll*
9. Cockpit trim control input position Yaw*
10. Ground Spoiler*: Spoiler position, spoiler selection
11. Speed Brake*: Speed Brake position, speed brake selection
12. De-icing and/or anti-icing systems selection*
13. Hydraulic Pressure (each system)*
14. Fuel Quantity*
15. AC Electrical Bus Status*
16. DC Electrical Bus Status*
17. APU Bleed Valve position*
18. Computed Center of Gravity*

Requirements for Operation

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MAURITIUS CIVIL AIRWORTHINESS REQUIREMENTS

1. Warnings
2. Primary Flight Control surface and Primary Flight Control pilot input: pitch axis, roll axis, yaw axis
3. Marker beacon passage
4. Each Navigation Receiver Frequency selection
5. Manual Radio Transmission keying and CVR/FDR synchronization reference
6. Autopilot/Autothrottle/AFCS mode and engagement status*
7. Selected Barometric setting*: Pilot and First Officer
8. Selected Altitude (all pilot selectable modes of operation)*
9. Selected Speed (all pilot selectable modes of operation)*
10. Selected Mach (all pilot selectable modes of operation)*
11. Selected Vertical Speed (all pilot selectable modes of operation)*
12. Selected Heading (all pilot selectable modes of operation)*
13. Selected Flight Path (all pilot selectable modes of operation)*: Course/DSTRK, Path Angle
14. Selected Decision Height*
15. EFIS display format*: Pilot and First Officer
16. Multi-function/Engine/Alerts display format*
17. GPWS/TAWS/GCAS status*: Selection of terrain display mode including pop-up display status, Terrain alerts, both cautions and warnings, and advisories, On/Off switch position.
18. Low pressure warning*: Hydraulic pressure, Pneumatic pressure.
19. Computer failure*
20. Loss of cabin pressure*

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MAURITIUS CIVIL AIRWORTHINESS REQUIREMENTS

21. TCAS/ACAS (Traffic Alert and Collision Avoidance System/Airborne Collision Avoidance System)*
22. Ice Detection*
23. Engine vibration warning*
24. Engine over temperature warning*
25. Engine low oil pressure warning*
26. Engine over speed warning*
27. Windshear warning*
28. Operational stall protection, stick shaker and pusher activation*
29. All cockpit flight control input forces*: Control wheel, Control Column, Rudder pedal cockpit input forces.
30. Vertical deviation*: ILS Glide path, MLS Elevation, GNSS approach path
31. Horizontal deviation*: ILS Localiser, MLS Azimuth, GNSS approach path
32. DME 1 and 2 distances*
33. Primary Navigation System References*: GNSS, INS, VOR/DME, MLS, Loran C, ILS
34. Brakes*: Left and Right brake pressure, Left and Right brake pedal position
35. Date*
36. Event Marker*
37. Head up Display in use*
38. Para Visual Display on*

NOTE: The parameters without an * are to be recorded. Those parameters designated by an * are to be recorded if an information source for the parameter is used by aeroplane systems and/or flight crew to operate the aeroplane.

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TABLE 3

S/N	Parameter	Measurement Range	Recording Interval (seconds)	Accuracy limits (sensor input compared to FDR read-out)
1	Time (UTC when available, otherwise elapse time)	24hours	4	± 0.125% per hour
2	Indicated altitude	-300 m (-1000 ft) to maximum certificated altitude of aircraft +1500 m (+5000 ft)	1	± 30 m to ± 200m (± 100 ft to ± 700 ft)
3	Indicated airspeed	95 km/h (50 kt) to max V _{so} (<i>Note 1</i>) V _{so} to 1.2 VD (<i>Note 2</i>)	1	±5% ± 3%
4	Magnetic heading	360°	1	± 2°
5	Vertical acceleration	- 3 g to + 6 g	0.125	± 1% of maximum range excluding datum error of ± 5%
6	Pitch attitude	± 75°	1	± 2°
7	Roll attitude	± 180°	1	± 2 degrees
8	Radio transmission Keying	On-off (one discrete)	1	
9	Power of each engine	Full range – sufficient inputs to determine power	1 (per engine)	± 2%
10	Trailing edge flap or cockpit control selection	Full range or each discrete position	2	± 5% or as pilot's indicator
11	Leading edge flap or cockpit control selection	Full range or each discrete position	2	± 5% or as pilot's indicator
12	Position of each thrust reverser position	Stowed, in transit, and reverse	1 (per engine)	
13	Ground spoiler/speed brake selection (<i>Note 3</i>)	Full range or each discrete position	1	± 2% unless higher accuracy uniquely required

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MAURITIUS CIVIL AIRWORTHINESS REQUIREMENTS

14	Outside air temperature Sensor range (<i>Note 3</i>)	2	± 2 degrees C
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Notes:

1. V_{so} -stalling speed or minimum steady flight speed in the landing configuration.
2. VD - design diving speed.
3. In the case of an aeroplane for which the individual Certificate of Airworthiness is first issued (whether in Singapore or elsewhere) on or after 1ST April 1987.

If further recording capacity is available, the following additional information should be recorded:

- (a) Aeroplanes with operational information from electronic displays, the recording of the following information:
 - (i) Parameters selected by the flight crew relating to the desired flight path, e.g. barometric pressure setting, selected altitude, selected airspeed, decision height, and autoflight system engagement and mode indications if not recorded from another source.
 - (ii) Display system selection/status, e.g. SECTOR, PLAN, ROSE, NAV, WXR, COMPOSITE, COPY, etc.
 - (iii) Warnings and alerts.
 - (iv) The identity of displayed pages for emergency procedures and checklist.
- (b) Retardation information including brake application for use in the investigation of landing overruns and rejected take-off.
- (c) Additional engine parameters (EPR, N1, EGT, fuel flow, etc)

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MAURITIUS CIVIL AIRWORTHINESS REQUIREMENTS

TABLE 4

S/N	Parameter	Measurement Range	Recording Interval (seconds)	Accuracy limits (sensor input compared to FDR read-out)
1	Time (UTC when available, otherwise elapse time)	24hours	4	± 0.125% per hour
2	Indicated altitude	-300 m (-1000 ft) to maximum certificated altitude of aircraft +1500 m (+5000 ft)	1	± 30 m to ± 200m (± 100 ft to ± 700 ft)
3	Indicated airspeed	95 km/h (50 kt) to max V _{so} (<i>Note 1</i>) V _{so} to 1.2 VD (<i>Note 2</i>)	1	±5% ± 3%
4	Magnetic heading	360°	1	± 2°
5	Vertical acceleration	- 3 g to + 6 g	0.125	± 1% of maximum range excluding datum error of ± 5%
6	Pitch attitude	± 75°	1	± 2°
7	Roll attitude	± 180°	1	± 2 degrees
8	Radio transmission Keying	On-off (one discrete)	1	
9	Power of each engine	Full range – sufficient inputs to determine power	1 (per engine)	± 2%
10	Main rotor speed	50 – 130%	0.5	±2%
11	Pilot input and/or control surface position-primary controls (collective pitch, longitudinal cyclic pitch, lateral cyclic pitch, tail rotor pedal) <i>Note 1</i>	Full range	1	±2% unless higher accuracy uniquely required.
12	Hydraulics, each system (low pressure)	Discrete	2	

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MAURITIUS CIVIL AIRWORTHINESS REQUIREMENTS

13	Outside air temperature <i>(Note 3)</i>	Sensor range	2	± 2 degrees C
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S/N	Parameter	Measurement Range	Recording Interval (seconds)	Accuracy limits (sensor input compared to FDR read-out)
14	Autopilot / autothrottle / automatic flight control system mode and engagement status	A suitable combination of discretes	1	
15	Stability augmentation system engagement	Discrete	1	
16	Main gearbox oil Temperature	As installed	2	As installed
17	Yaw acceleration or yaw rate	± 1 g	0.25	$\pm 1.5\%$ max range excluding datum error of $\pm 5\%$
18	Sling load force	0 to 200% of certified load	0.5	$\pm 3\%$ of max range
19	Longitudinal acceleration	± 1 g	0.25	$\pm 1.5\%$ max range excluding datum error of $\pm 5\%$
20	Lateral acceleration	± 1 g	0.25	$\pm 1.5\%$ max range
21	Radio Altitude	-6 m to 750 m (-20 ft to 2500 ft)	1	± 0.6 m (± 2 ft) or $\pm 3\%$ whichever is greater below 150 m (500 ft) and $\pm 5\%$ above 150 m (500 ft)
22	Glide path deviation	Signal range	1	$\pm 3\%$
23	Localizer deviation	Signal range	1	$\pm 3\%$
24	Marker beacon passage	Discrete	1	
25	Master warning	Discrete	1	
26	NAV 1 and 2 frequency selection <i>(Note 2)</i>	Full range	4	As installed

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27	DME 1 and 2 distance (Notes 2 and 3)	0 to 370 km	4	As installed
28	Latitude and longitude (Note 4)	As installed	2	As installed
29	Ground speed (Note 4)	As installed	2	As installed

S/N	Parameter	Measurement Range	Recording Interval (seconds)	Accuracy limits (sensor input compared to FDR read-out)
30	Landing gear or gear selector position	Discrete	4	As installed

Notes:

1. Helicopters with conventional control systems “or” applies. For helicopters with non-mechanical control systems “and” applies.
2. If signal available in digital form.
3. Recording of latitude and longitude from INS or other navigation system is a preferred alternative.
4. If signals readily available.

If further recording capacity is available, the following additional information should be recorded:

- (a) Helicopters with operational information from electronic displays, the recording of the following information:
 - (i) Parameters selected by the flight crew relating to the desired flight path, e.g. barometric pressure setting, selecting altitude, selected airspeed, decision height, and autoflight system engagement and mode indications.
 - (ii) Display system selection/status, e.g. SECTOR, PLAN ROSE, NAV, WXR, COMPOSITE, COPY, etc.
 - (iii) Warnings and alerts.
 - (iv) The identity of displayed pages for emergency procedures and checklist.
- (b) Additional engine parameters (EPR, N1, EGT, fuel flow, etc).

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MAURITIUS CIVIL AIRWORTHINESS REQUIREMENTS

Table 5

Requirements for Flight Path and Speed

1. Pressure Altitude
2. Indicated Airspeed
3. Outside Air Temperature
4. Heading
5. Normal Acceleration
6. Lateral Acceleration
7. Longitudinal Acceleration
8. Time or relative time count
9. Drift Angle*
10. Wind Speed*
11. Wind Direction*
12. Latitude/Longitude*
13. Radio Altitude*

Requirements for Attitude

1. Pitch Attitude
2. Roll Attitude
3. Yaw Rate

Requirements for Engine Power

Power Turbine Speed (Nf), engine torque, Gas generator speed (Ng), cockpit power control position

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1. Main rotor speed, rotor brake
2. Main gearbox oil pressure*
3. Main gearbox oil temperature*
4. Intermediate gearbox oil temperature*
- (5) Tail rotor gearbox oil temperature*
- (6) Engine exhaust gas temperature*
- (7) Turbine inlet temperature (T4)*

Requirements for Configuration

- (1) Landing gear or gear selector position*
- (2) Fuel Quantity*
- (2) Ice detector liquid water content*

Requirements for Operation

1. Hydraulics low pressure
2. Warnings
3. Pilot input and/or control output position: collective pitch, longitudinal cyclic pitch, lateral cyclic pitch, tail rotor pedal, controllable stabilator, hydraulic selection
4. Marker beacon passage
5. Navigation Receiver frequency selection
6. AFCS mode and engagement status*
7. Indicated sling load force*
8. Vertical deviation*: ILS Glide Path, MLS Elevation, GNSS approach path

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9. Horizontal deviation*: ILS Localiser, MLS Azimuth, GNSS approach path
10. DME 1 and 2 distances*
11. Altitude rate*
12. Ice detector liquid water content*
13. Helicopter health and usage monitoring system (HUMS)*: Engine data, Chip detectors, track timing, Exceedance discrettes, Broadband average engine vibration

NOTE: The parameters without an * are to be recorded. Those parameters designated by an * are to be recorded if an information source for the parameter is used by helicopter system and/or flight crew to operate the helicopter.

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CHAPTER 5

MASS CONTROL OF AIRCRAFT

1 General

Pursuant to regulation 28 of the Civil Aviation Regulations , this Chapter prescribes the requirements for weighing Mauritius aircraft including helicopters, the determination of the centre of gravity of such aircraft and preparation of Basic Weight Schedules and Weight and Balance Reports.

2 Definitions

2.1 Basic Mass

Basic Mass is the weight of the aircraft and all its basic equipment and that of the declared quantity of unusable fuel and unusable oil. In the case of turbine engined aircraft and aircraft of 5700 kg maximum total mass authorised (MTMA) or less it may also include the mass of usable oil.

2.2 Basic Equipment

Basic Equipment is the unconsumable fluids, and equipment which is common to all roles in which the operator intends to use the aircraft.

2.3 Variable Load

Variable Load is the weight of the crew and of items such as the crew's baggage, removal units and other equipment the carriage of which depends upon the role for which the operator intends to use the aircraft for the particular flight.

2.4 Aircraft Prepared for Service, or Operating Weight

The sum of the Basic Mass and the total Variable Load required for the particular role in which the operator intends to use the aircraft.

2.5 Disposable Load

Disposable Load is the weight of all persons and items of load, including fuel and other consumable fluids, carried in the aircraft other than the Basic Equipment and Variable Load.

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Note: To obtain the total loaded weight it is necessary to add to the Basic Mass the weights of the Variable and Disposable Load items to be carried for the particular role in which the aircraft is to be used.

2.6 **Authorised signatory**

A person nominated by an operator/owner and authorised by the Director of Civil Aviation, to certify the documents.

2.7 **Approved**

Approved by or on behalf of the Director of Civil Aviation in accordance with the pertinent requirements of the Regulations.

2.8 **Maximum Take-off Mass**

The maximum authorised mass of the aircraft and its contents, as specified in its appropriate approved manuals.

2.9 **Empty Mass**

The mass of the aircraft in empty condition as specified in its appropriate approved manuals. This includes all operating equipment that has a fixed location and is installed in the aircraft.

2.10 **Centre of Gravity**

An imaginary point about which the nose heavy and tail heavy moments are equal in magnitude.

2.11 **Removable equipment**

Removable equipment means items of equipment which are not included in the empty mass and are not mandatory for the type of operation being conducted.

2.12 **Limits of Centre Gravity**

Limits of Centre gravity means the most forward and the most rearward centre of gravity position within which an aircraft may be operated safely. These limits are specified in the certificate of airworthiness/flight manual of an aircraft.

3 **Weighing Requirements**

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- 3.1 All aircraft shall be weighed in Mauritius prior to the initial issue of a Mauritius Certificate of Airworthiness. Exemption for weighing may be granted for aircraft which were weighed overseas prior to their importation and for which any subsequent changes in weight have been computed and recorded, provided all the necessary weight and balance data for the aircraft are furnished to the Authority and such data are found to be accurate and adequate.
- 3.2 Aircraft exceeding 5700 kg MTMA shall be re-weighed within **two years** after the date of manufacture and thereafter at intervals not exceeding **five years**, and at such other times as the Authority may require. Other aircraft shall be weighed at such times as the Authority may require. Aircraft weighing shall be conducted in accordance with procedures acceptable to the Authority. Essential aspects of the conduct of weighing are given in Appendix 3.
- 3.3 When an aircraft is weighed, the condition of the aircraft (i.e. the equipment, the position of movable items and other items of load such as fluids in tanks) shall be recorded. The equipment installed at the time of weighing should not differ from that in the declared Basic Equipment list associated with the Basic Weight Schedule (see paragraph 4). Otherwise, in determining the Basic Weight and the corresponding centre of gravity position, corrections will have to be made for items that have been weighed but that are not Basic Equipment items, and for Basic Equipment items not installed in the aircraft during the weighing.
- 3.4 Weighing results and related calculations shall be recorded in a weighing report which shall be retained by the operator. When the aircraft is again weighed the previous weighing records must be retained with the aircraft records.
- 3.5 The operator shall maintain records of all known weight and centre of gravity changes which occur after the aircraft has been weighed and such records shall be retained by the operator.
- 4 Basic Mass Schedule**
- 4.1 A Basic Mass Schedule shall be provided for each aircraft. Each Schedule shall be identified by the aircraft type and model number, the nationality and registration marks and the aircraft serial number. The date of issue and the reference number of the Schedule shall be given and the Schedule shall be signed by a person suitably qualified and acceptable to the Authority. A statement shall be included stating that the Schedule supersedes all earlier issues.
- 4.2 The Schedule shall present the derivation of the Basic Mass and the centre of gravity from the most recent weighing report or Basic Mass Schedule or other acceptable

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MAURITIUS CIVIL AIRWORTHINESS REQUIREMENTS

information. The Schedule shall indicate the landing gear positions (retracted or extended) to which the derived centre of gravity position is related. The Schedule shall also include the current Basic Equipment list showing the weight and lever arm of each item or make reference to the document in which such a list is included.

- 4.3 The date and reference number of the most recent weighing report, Basic Mass Schedule or other acceptable information, upon which the Schedule is based, shall be given.
- 4.4 The Basic Mass Schedule may be in the form given in Appendix 2 to this Chapter. Variations in presentation are permitted, but must be acceptable to the Authority. In the case of helicopters, it may be necessary to present lever arms and moments about more than one axis, depending on the centre of gravity limits specified in the Flight Manual.
- 4.5 The datum which is defined in the Basic Mass Schedule may be different from the datum defined in the Certificate of Airworthiness or Flight Manual to which the centre of gravity limits relate. When a different datum is used it shall be adequately defined, its precise relationship to the datum in the Certificate of Airworthiness or Flight Manual shall be given, and any lever arms and moments which appear in any part of the Schedule shall be consistent with the datum so declared.
- 4.6 The Schedule shall be retained by the operator and where the Schedule has been revised the previous issue must be retained with the aircraft records.
- 4.7 Operators shall revise the Basic Mass Schedule when the weight and centre of gravity are known to have undergone changes in excess of a maximum figure, which has been agreed by the Authority as applicable to a particular aircraft type.

Note: The following changes in basic mass or centre of gravity position are considered significant and must be reported to the Authority:

- (a) Aeroplanes whose empty mass has changed by more than 0.5% of the maximum total mass authorised or whose basic centre of gravity position has changed by more than 0.5 % of the mean aerodynamic chord.
- (b) Helicopters whose empty mass has changed by more than 1% of the maximum total mass authorised or whose basic centre of gravity position has changed by more than 0.5 inch or 10% of the maximum permissible centre of gravity range whichever is the lesser.

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5 **Mass and Balance Report**

5.1 A Mass and Balance Report shall be produced for each Mauritius aircraft. A copy of each report shall be supplied to the Authority.

5.2 The Mass and Balance Report is intended to record the essential loading data to enable the particular aircraft to be correctly loaded and to include sufficient information for an operator to produce written loading instructions in accordance with the requirements of the Mauritius Civil Aviation Regulation .

5.3 The Mass and Balance Report shall include the following items:

(a) Reference number and date of issue.

(b) Type and model number of the aircraft and its nationality and registration mark.

(c) **Basic Mass**

The Basic Mass and centre of gravity of the aircraft as derived from the Basic Mass Schedule shall be presented. A copy of the Basic Mass Schedule, including the Basic Equipment list, and any referenced weighing report, shall be attached to the Report.

(d) **Datum definition**

A diagram or a description of the datums (e.g. in relation to the fuselage frame numbering system or other identifiable points) shall be included. See also paragraph 4.5.

(e) **Variable Load**

Information on the weight and lever arms appropriate to Variable Load items may be detailed for as many roles as the operator wishes and for every role the total weight and moment change shall be given. Weights of crew members may be assumed at not less than the weight shown in the Mauritius Civil Aviation Regulations, provided the aircraft has a total seating capacity of 12 or more persons. Otherwise the weight of each person must be found by weighing.

(f) **Loading Information**

This shall include all relevant information so that, knowing the disposable load which is intended to be carried, the weight and the position of the centre of gravity of the aircraft can be calculated. At least the following shall be given:

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- (1) The lever arm of the centre of gravity of an occupant of each seat.
 - (2) The lever arm of each compartment or area in the aircraft where disposable load, such as luggage or freight, may be placed.
 - (3) Any significant change in the centre of gravity of the aircraft (change in moment) which will result from a change in configuration, such as the retraction and extension of the landing gear.
 - (4) The lever arm of the centre of gravity of fuel and oil in each tank including the variation of the lever arm with the quantity loaded if this variation is significant.
 - (5) The maximum total usable capacities of the fuel and oil tanks and the weight of fuel and oil when the tanks are filled to their capacities assuming typical densities of these fluids.
- (g) A statement shall be given in the Schedule to the effect that pursuant to the Mauritius Civil Aviation Regulations, the commander shall satisfy himself before take-off that the load is of such weight, and is so distributed and secured that it may safely be carried on the intended flight.
- (h) A statement that the Report supersedes all earlier issues.
- 5.4 The weights, distances, moments and quantities may be given in any units provided that these are used consistently and agree with the markings and placards on the aircraft.
- 5.5 A copy of the Report shall be included in the Flight Manual of all aircraft not exceeding 5 700 kg MTMA. If a Flight Manual is not applicable, the Report shall be displayed or retained in the aircraft in a suitably identified stowage.
- 5.6 Operators shall revise the Mass and Balance Report when there is a change to any of the items in paragraph 5.3.
- 5.7 The Mass and Balance Report may be in the form given in Appendix 1 to this Chapter. Variations in presentation are permitted, but must be acceptable to the Authority.

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6. **DISPLAY AND PRESERVATION OF MASS AND CENTRE OF GRAVITY SCHEDULE**

A copy of the Mass and Centre of Gravity schedule shall be included in the flight manual if a flight manual is applicable. If not, it shall be displayed in the aircraft at a suitable and prominent place. All persons concerned with the loading of the aircraft shall be made aware of its content.

6.1 **COMPUTATION OF CENTRE OF GRAVITY**

6.2 For all flights, it shall be the responsibility of the pilot in command to ensure that the aircraft is satisfactorily loaded with respect to the total load, the distribution of the load and proper securing of the load in the aircraft. The distribution of the load shall be such that the centre of gravity position will remain within specified limits at the time of take off, during the flight and at the time of landing.

6.3 In cases where the responsibility for loading and computing the centre of gravity is delegated to suitably qualified and trained persons in the operator's organisation, the centre of gravity position computed by such persons shall be signed and dated, and same shall be submitted to the pilot and commander of the aircraft for scrutiny and acceptance.

7.0 **WEIGHING AND POSITIONING OF PASSENGERS/CARGO**

The weights of the crew members, passengers and freight shall be determined by actual weighing unless otherwise approved by the Director of Civil Aviation.

Subsequent to the weighing mentioned in the preceding paragraph, passengers shall be allotted specific seats, on the basis of which centre of gravity position was computed unless "free seating" in a particular type of aircraft is permitted.

8. **INSTRUCTIONS FOR SAFE LOADING**

8.1 During loading, it must be ensured that the aircraft floor loading limitations are not exceeded.

8.2 The load must be securely tied at specified places provided in the aircraft so that there is no possibility of load shifting in flight and disturbing the calculated centre of gravity position.

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CHAPTER 5

MASS CONTROL OF AIRCRAFT

APPENDIX 1

EXAMPLE OF A MASS AND BALANCE REPORT

SPECIMEN MASS AND BALANCE REPORT

Reference Number -	NAL/MBR/111
Date of Issue -	1 January 2004
Produced by -	New Aviation Ltd
Aircraft Type and Model -	Weighing-2A
Nationality and Registration Marks -	3B-WBR
Constructor -	BALANCE. Co Ltd.
Constructor's Serial Number -	999
Maximum Total Mass Authorised -	3320 kg
Centre-of-Gravity Limits -	Refer to Flight Manual reference Number FM/999

PART A - BASIC MASS

The basic mass of the aircraft as derived in the Basic Mass Schedule NAL/MBR/111 dated 31 December 2002 is - 2500 kg

The centre of gravity of the aircraft in the same condition at this weight and with the landing gear extended is - 127 in. aft of datum

The total moment about the datum in this condition in kg-in/100 is - 3175
Note:

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- (1) The datum is at fuselage station 0 situated 114 inches forward of the wing leading edge. This is the datum defined in the Flight Manual. All lever arms are distances in inches aft of datum.
- (2) The basic mass includes the weight of 11 kg unusable fuel and 2.2 kg unusable oil.

PART B - VARIABLE LOAD

The weight, lever arm and moment of items of Variable Load are shown below. The Variable Load depends upon the equipment carried for the particular role.

Item	Weight (kg)	Lever Arm inches	Moment kg/inches100
Pilot (one)		108	
De-icing fluid 1½ gallon	5.5	140	8
Life-jackets (7)	6.4	135	9
Row 1 passenger seats (two)	27.2	173	47
Row 2 passenger seats (two)	27.2	215	58
Row 3 passenger seats (two)	27.2	248	68
Table	3.6	256	9
One stretcher and attachments (in place of seats rows 2 and 3)	20.5	223	46
Medical Stores	6.8	250	17

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PART C - LOADING INFORMATION (DISPOSABLE LOAD)

The total moment change when the landing gear is retracted is 8.2 kg-in/100. The appropriate lever arms are:

Item	Weight (kg)	Lever Arm inches	Capacity Imp.Gallon
Fuel in tanks 1 and 2	620*	145	190
Engine oil	23*	70	5.6
Forward baggage		21	
Rear baggage		261	
Passengers in row 1 seats		171	
Passengers in row 2 seats		213	
Passengers in row 3 seats		246	
Patient in stretcher		223	

Fuel density 3.26 kg/gal and oil density 4.1 kg/gal.

In accordance with the Civil Aviation Regulations, it is a requirement that the pilot satisfies himself before take-off that the load is of such a weight, and is so distributed and secured, that it may safely be carried on the intended flight.

Note: To obtain the total loaded weight of aircraft, add to the Basic Weight the weights of the Variable and Disposable Load items to be carried for the particular role.

This Report was prepared on _____ (date) _____ and supersedes all previous issues.

Name and Designation _____

Signed: _____

On behalf of: _____

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or

Description	Weight	Arm	Moment (kg-in)
Aircraft basic weight as per Basic Weight Schedule NAL/BWS/245 dated 20 June 1988	2475	126	311850
Total of Basic Equipment items removed (list to be given)	-25	-	-650
Total of Basic Equipment items added (list to be given)	+50	-	+5000
New Basic Weight	2500	127	317500

Note: The datum is at fuselage station O situated 114 inches forward of the wing leading edge. This is the datum defined in the Flight Manual. All lever arms are distances in inches aft of datum.

Current Basic Equipment List (may be given on separate sheets and attached to Schedule)

Item	Weight	Arm
Two Marzell propeller type BL – H3Z30	57.6 each	76
Two engine driven 100 ampere alternative type GE-361	12.2 each	117
One 13 AH Ni-Cd battery CB-7	14	153
Etc	etc	etc

This Schedule was prepared on _____ (date) and supersedes all previous issues.

Name and Designation: _____

Signed: _____

On behalf of: _____

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MAURITIUS CIVIL AIRWORTHINESS REQUIREMENTS

CHAPTER 5

MASS CONTROL OF AIRCRAFT

APPENDIX 3

CONDUCT OF WEIGHING

The following aspects should be adhered to and included in company weighing procedures:

- (a) All weighing shall be supervised by a suitably qualified person who is acceptable to the Authority.
- (b) Weighing equipment should be suitable for the purpose. Evidence should be available, if necessary, to show that the equipment is regularly inspected and calibrated and its errors are within the tolerances specified by the equipment manufacturer or local weights and measure authority requirements.
- (c) The staff are trained and handling equipment is adequate to permit weighing to be made accurately and safely.
- (d) Unless otherwise agreed to by the Authority a weighing shall consist of two independent weighing made with the aircraft longitudinal datum horizontal. The load must be removed from the weighing equipment between the weighing. Any discrepancy in the weighing shall not exceed 0.2 per cent of the gross weight or 25 lbs whichever is greater. If this tolerance is exceeded further weighing should be performed until the results between two consecutive weighing agree within the tolerance.
- (e) A weighing report should be produced to provide a record of all measurements and calculations pertinent to the weighing. The report should include a list of equipment installed on the aircraft at the time of weighing together with the identity of the weighing equipment and calibration data.

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CHAPTER 5.1

FLIGHT MANUALS

1 General

1.1 Pursuant to the provision of Regulation 85(5) of the Mauritius Civil Aviation Regulations, the flight manual is part of the Certificate of Airworthiness and Mauritius aircraft are required to be operated in accordance with an approved Flight Manual or other acceptable data. This Chapter prescribes the requirements for such manuals.

2 Contents

2.1 Flight Manuals approved in accordance with the requirements of the State of Design of the aircraft are generally acceptable for approval.

2.2 Each Flight Manual shall contain the following information, including instructions where necessary, relating to:

- (a) Nationality and registration marks of the aircraft, together with its type and model number and the manufacturer's serial number.
- (b) Except where other means of providing the information are approved, the operating procedures, operational limitations and loading of the aircraft.
- (c) The performance data for the aircraft.
- (d) The date of approval or the latest revision status of the document.
- (e) The approval letter or certificate of the flight manual.

3 Amendment

3.1 Changes or amendments shall not be made to a Flight Manual without the approval of the Authority.

3.2 The Authority may direct the owner of operator of a Mauritius aircraft to change or amend a Flight Manual, where necessary, to maintain the airworthiness or safety standard of an aircraft. Such action may result from either:

- (a) A proposed modification to the aircraft or its equipment.

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- (b) A proposal by the operator or owner which affects the operation of the aircraft.
 - (c) Other occurrences affecting the airworthiness or safety of the aircraft.
- 3.3 A copy of all proposed changes and amendments, including those approved by the State of Manufacture of the aircraft, shall be supplied for approval by the Authority.
- 3.4 The Flight Manual shall be made available for examination by the Authority before a Certificate of Airworthiness is renewed and on request at other times.

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CHAPTER 5.2

TEST AND SPECIAL FLIGHTS

1 General

1.1 The Mauritius Civil Aviation Regulations prescribes the requirements in respect of operation of an aircraft without a valid Certificate of Airworthiness. The conditions for approval and conduct of such flights are stated in the Schedules to the Civil Aviation Regulations as 'A' Conditions and 'B' Conditions .

1.2 **This Chapter prescribes the requirements for:**

- (a) The certification of aircraft and conduct of flights to be made as Condition 'A' flights; and
- (b) Airworthiness flight tests.

Note: Flights made in accordance with Conditions 'B' will be approved separately.

2 Certification for Flight under 'A' Conditions

2.1 The aircraft shall be inspected by appropriately licensed aircraft maintenance engineers to determine whether it is fit for flight and a Certificate of Fitness for Flight as specified in paragraph 2.3 shall be issued on completion of the inspection.

2.2 The validity of the certificate shall not exceed seven days. It shall be issued in duplicate, the original shall be included with the technical log and the duplicate retained by the operator separately from the aircraft. The aircraft shall be re inspected and the certificate re-issued if the airworthiness condition of the aircraft is affected during the period of validity.

2.3 **The Certificate of Fitness for Flight shall include the following:**

- (a) A certification to the effect that the aircraft has been inspected and is fit for flight provided it is loaded in accordance with the approved Weight and Balance Report.
- (b) The approved data or schedules, etc., used for the inspection.

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- (c) A statement of the period of validity of the Certificate and that it ceases to be valid if the airworthiness condition of the aircraft is altered.
- (d) The name, licence number or approval designation of the person making the certification.

3 Airworthiness Flight Tests

3.1 Flight tests may be required in the following circumstances:

- (a) Prior to the issue of a Mauritius Certificate of Airworthiness.
- (b) Periodically to determine whether the handling characteristics, functioning and performance of an aircraft continues to comply with the requirements that were acceptable to the Authority when the aircraft was issued with a Mauritius Certificate of Airworthiness.
- (c) On completion of a modification or other work likely to affect the handling characteristics, functioning or performance of an aircraft.

3.2 Flight test schedules shall be prepared in conjunction with the Authority and must be acceptable to the Authority.

3.3 Schedules for flight tests required by paragraphs 3.1(a) and (b) shall, except where otherwise agreed, include tests to check:

- (a) The performance of the aircraft.
- (b) The handling characteristics of the aircraft. These tests will be based on the results of the test during type certification and the subsequent history of the type.
- (c) The functioning of aircraft controls, major systems and components in flight.
- (d) Other aspects required by the Authority.

3.4 Schedules for flight tests required by paragraph 3.1(c) shall:

- (a) in respect of modifications or other work outside the scope of manufacturer's documents, include tests to:
 - (i) determine whether the aircraft continues to comply with the airworthiness requirements observed for its type certification.

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- (ii) establish whether revision of the Flight Manual handling or performance data is necessary.
- (iii) determine the data for such revisions.
- (b) in respect of modifications or other work made in accordance with manufacturer's documents, approved maintenance manuals or completed subsequently to the final approval of work as specified in paragraph 3.4(a):
 - (i) state the flight tests required.
 - (ii) specify the procedures and standards to be observed.

4 CIRCUMSTANCES REQUIRING A TEST FLIGHT

- 4.1 (a) subsequent to an engine change
 - (i) on a twin engine aircraft, a test flight after an engine change may not be carried out provided satisfactory engine ground testing procedure subsequent to engine change has been approved by the Director of Civil Aviation. However test flight is necessary when two engines are changed.
 - (ii) on three engine aircraft, after a single engine change a test flight may not be carried out provided that satisfactory engine ground testing procedure subsequent to engine change has been approved by the Director of Civil Aviation. However, when more than one engine is changed a test flight will be necessary.
 - (iii) on a four engine aircraft, a test flight may not be carried out after one or two engine changes provided satisfactory engine ground testing procedure subsequent to engine change has been approved by the Director of Civil Aviation. However, if more than two engines are changed a test flight is necessary.

NOTE:

- (i) Engine change would mean removal of any engine and its replacement by:
 - (a) an overhaul engine
 - (b) an engine removed from any position of the same aircraft or any other aircraft or reinstallation of the engine in the same position.

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or

- (c) as defined in a flight testing programme agreed between the Director of Civil Aviation and the operator.

- 4.1. Operators of an aircraft shall for each type of aircraft operated by them shall specify in its approved system/quality control manual, the circumstances under which a flight test is to be performed. This shall not only include the circumstances laid down in paragraph 4.1 but also any other currently known procedures to be observed by the maintenance personnel shall be included.
- 4.2 Whenever the performance of an aircraft during test flight or at any other occasion is adversely commented upon by the flying crew the same shall be reported to the Director of Civil Aviation promptly along with the remedial measures envisaged to rectify the situation. An Appropriately licensed/approved person holding the responsible position in the organisation shall be nominated to determine whether or not the circumstance necessitate a further test flight.

5 CERTIFICATION BEFORE TEST FLIGHT

- 5.1 Before a test flight is carried out the documents covering the maintenance, repair, modification and inspection shall be completed in all respects and certified in accordance with the system approved by the Director of Civil Aviation and included in the operator's system manual.

6 PROCEDURE DURING TEST FLIGHT

- 6.1 The operators shall for each type of aircraft operated by them, prescribed detailed procedure to be followed during the test flight, in the approved to be followed during the test flight, in the approved test flight schedule. The test flight schedule. The test flight schedule will also be kept up date vis a vis manufacturers/Director of Civil Aviation requirements.
- 6.2 As far as practicable the test flight shall be conducted at maximum take off mass authorised for the type of aircraft being flight tested.

7 Flight Test Reports

- 7.1 A copy of flight test reports in an acceptable format shall be submitted to the Authority on completion of all airworthiness flight tests except those made in accordance with

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paragraph 3.4(b). A copy of all flight test reports shall be retained by the operator with the aircraft records.

8 **Flight Test Personnel and Facilities**

- 8.1 The qualifications and experience of flying staff and other persons engaged in flight tests, together with the facilities and equipment provided for the tests shall be acceptable to the Authority.

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CHAPTER 5.3

CONTROL SYSTEMS - DUPLICATE INSPECTIONS

1. INTRODUCTION

- 1.1 This chapter prescribed the procedures for duplicate inspections of control systems in aircraft namely flying controls, engine controls and associated control systems, the failure of which could jeopardise the safety of aircraft and its passengers.

2. DEFINITIONS

2.1 Control systems

A system by which the flight path, the attitude or propulsive force of an aircraft is changed, including the flight, engine and propeller controls, the related system controls and the associated operating mechanisms.

2.2 Duplicate inspection

An inspection which is first made and certified by one appropriately licensed/approved/authorised person and subsequently made and certified by another appropriately licenced/approved or authorised person.

3. PROCEDURES

- 3.1 Duplicate inspection of control systems in aircraft shall be made after initial assembly and before the first flight after overhaul repair, replacement, modification or adjustment.
- 3.2 The duplicate inspection shall be the final operation to establish the integrity and correct functioning of the control systems when all the work has been completed. It will also include verification that full, free and correct movement of controls is obtained throughout the control system, relative to the movement of controls from within the aircraft and that the control systems are correctly secured.
- 3.3 In some aircraft control systems it may not be possible after a complete assembly to inspect all parts because certain sections may have been progressively sealed off. In such cases, the condition, security and correct function of the covered portion of the system shall be established by the persons mentioned in para 3.4 below. If after the second check the control systems are disturbed in any way before the first flight, that part of the system which had been disturbed shall be rechecked, in duplicate by persons mentioned in para 3.4 below, before the aircraft flies.

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- 3.4 The following persons may carry out the first and/or second part of duplicate inspections for the purpose of complying with the above requirements:
1. Appropriately licensed aircraft maintenance engineers
 2. Persons approved for carrying out such inspections in an approved organisation
 3. Persons specially authorised by the Director of Civil Aviation to carry out such inspections.

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CHAPTER 6

APPROVAL OF WELDERS

1 General

- 1.1 Pursuant to regulation 13 of the Civil Aviation Regulation. This Chapter is applicable to persons who weld parts which are essential to the airworthiness of an aircraft where the making of a sound joint by the welding process depends largely on the competency of the operator.
- 1.2 Welders will be approved in accordance with the requirements of this Chapter and Appendix 1.
- 1.3 This Chapter prescribes the procedures for approving welders, and also prescribe the responsibilities of the approved welders and of the Approved Organisations employing them.

2 Approval of Welders

- 2.1 An approved organisation may employ, train, qualify and grant approval to welders to perform work under its scope of approval, subject to the following:
 - (a) It has an established system of training, qualifying, testing, approving, re-approving and monitoring the welders in its employ.
 - (b) It has a system of maintaining the training records of welders. qualification, testing and issue of approval and re-approval.
 - (c) Such system shall be approved by the Authority in the Approved organisation's exposition document.
- 2.2 Notwithstanding paragraph 2.1 (a), an Approved Organisation may be approved to utilise an external approved organisation for initial training, qualification and approval of welders. However, the re-approval of welder is the responsibility of the Approved Organisation and shall be in accordance with this Chapter.
- 2.3 Welder Approvals are granted with specific ratings of metal groups and welding processes and with restrictions prescribing the type of welding work that may be undertaken (e.g. sheet to sheet, tube to tube). The metal groups and welding processes are given in Appendix 1.

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- 2.4 Welder Approvals are granted with a maximum validity period of twelve months. The approval granted to a welder in the employ of an Approved Organisation will be invalidated automatically if the welder leaves that Organisation.
- 2.5 An applicant for the issue or re-issue of a welder's approval shall:
- (a) Be employed by an Approved Organisation who shall ensure that the applicant is able to read, write and converse in the English language and not suffering from any disability likely to affect his technical skill or judgement.
 - (b) Provide evidence of his qualifications and practical experience in welding.
 - (c) Satisfactorily complete the appropriate test samples and meet the examination requirements specified in Appendix 1.
- 2.6 The holder of a welder's approval is approved to certify for completion of work provided:
- (a) the approval is valid and appropriate for the type of material and welding process used.
 - (b) the work consists solely of welding.
 - (c) that where necessary the welding process followed and the material used comply with approved data or design documents specified for the work.
 - (d) the certification is only made in respect of the quality of the welding and of the fact that an approved process has been followed.

Note: An approved welder is not permitted to certify the welded parts unless approved as a person competent to issue a Certificate of Release to Service.

3 Procedures for the Issue of Approval

- 3.1 The Approved Organisation employing the welder shall make arrangements for the welder to prepare and weld test samples in accordance with the requirements specified in Appendix 1.
- 3.2 The Approved Organisation shall arrange to submit the test samples to an Approved Test Organisation for examination together with full particulars of the welder concerned, materials and welding processes used, test sample figure numbers and identification marks on the test samples.

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3.3 When the welder has made an application and after the test results furnished by the Approved Test Organisation are found satisfactory, the Approved Organisation may then issue a welder's approval to the welder for the materials and welding processes used and prescribing any restrictions.

4 **Procedures for the Renewal of Approval**

Note: Should approval be sought for a rating (material and welding process used) or restriction different from that already granted, the procedures for the issue of approval as detailed in paragraph 3 shall be followed.

4.1 The Approved Organisation employing the welder shall arrange for renewal examinations of the welder's competency for each of the approved rating/restriction combination.

4.2 To ensure continuity of a welder's approval the renewal examination should be carried out before the expiry date of the approval, but not more than two months before the expiry date. The examination should be scheduled so that the results can be known before the approval expires.

4.3 At each renewal examination, the Approved Organisation shall make arrangements for the welder to prepare and weld an appropriate test sample in accordance with the requirements specified in Appendix 1.

4.4 The Approved Organisation shall arrange to submit the test sample to an Approved Test Organisation for examination together with full particulars of the welder concerned, material and welding process used, test sample figure number and identification marks on the test sample.

4.5 When the welder has made an application and after the test results furnished by the Approved Test Organisation are found satisfactory, the Approved Organisation may then renew the welder's approval.

4.6 If the test results are unsatisfactory the Approved Organisation employing the welder shall arrange for the renewal examination to be repeated immediately and the test sample sent to an Approved Test Organisation for examination. After these unsatisfactory test results are known and before the results of the repeated renewal examination are known the welder shall not weld parts that are essential to the airworthiness of an aircraft. If the test results of the repeated renewal examination are satisfactory, the welder's approval may then be renewed.

Note: If, however, the test results of the repeated renewal examination are again unsatisfactory the welder's approval shall be suspended until further training

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and/or experience has been gained to the satisfaction of the Approved Organisation, and a further examination has been satisfactorily completed.

5 Test Reports from Approved Test Organisations

5.1 The Approved Test Organisations examining the test samples shall send a copy of all test reports to the Approved Organisation. The test reports shall detailed the test results and indicate also the date of receipt of the test samples and the date when testing is completed.

6 Records

6.1 An Approved Organisation employing approved welders shall maintain a register of the welders' approvals as well as the records required in paragraphs 6.2 and 6.3 and shall keep copies of all test reports.

6.2 In relation to each approval (rating/restriction combination) issued, records shall be kept to indicate:

- (a) the date of preparation of the test sample.
- (b) the name of the authorised person supervising the preparation.
- (c) the name of the Approved Test Organisation to which the test sample has been sent for examination.
- (d) the date the test sample has been sent to the Approved Test Organisation.
- (e) the date the test report was received.
- (f) the test report reference.

6.3 In relation to the renewal of approvals, records shall be kept for the information required in paragraph 6.2 and, in addition, to indicate:

- (a) the scheduled date for the next renewal examination.
- (b) the period of suspension of approval, if any.

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Note: Records for all renewal examinations, whether satisfactory or unsatisfactory, shall be kept.

6.4 All records shall be made available to the Authority on request.

7 Checks by the Authority

7.1 The Authority may select samples of approved welders' work at any time for additional check examination purposes.

8 Recognised standards

The three relevant aerospace welding AWS standards:

- AWS D17.1/D17.1M:2010 – Specification for fusion welding for aerospace applications
- AWS D17.2/D17.2M:2007 – Specification for resistance welding for aerospace applications
- AWS D17.3/D17.3M:2010 – Specification for friction stir welding of aluminum alloys for aerospace applications

and

- CSN EN 4632-001 – Aerospace series – Welded and brazed assemblies for aerospace constructions – Weldability and brazeability of materials – part 001: General requirements
- CSN EN 4677-001 – Aerospace series – Welded and brazed assemblies for aerospace constructions – Joints of metallic materials by electron beam welding
- CSN EN 4678 – Aerospace series – Weldments and brazements for aerospace structures – Joints of metallic materials by laser beam welding – Quality of weldments

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CHAPTER 6

APPROVAL OF WELDERS

APPENDIX 1

EXAMINATION REQUIREMENTS

1 Metal Groups and Welding Processes

1.1 Welder's approvals are granted for the following metal groups and welding processes:

Metal Group

- 1 -Aluminium alloys
- 2 -Magnesium alloys
- 3 -Low carbon steels
- 4 -Corrosion and heat resisting steels
- 5 -Nickel alloys
- 6 -Copper alloys
- 7 -Titanium alloys

Welding Processes

- 1 -Gas (oxy-acetylene, etc)
- 2 -Braze welding (oxy-gas)
- 3 -Metal-arc (flux coated consumable electrode)
- 4 TIG (tungsten-arc inert gas shielded)
- 5 -MIG (metal-arc inert gas shielded - consumable electrode)
- 6 -Plasma-arc

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1.2 Other metal groups and welding processes may be considered by the Authority.

2 Types of Test Samples

2.1 The standard test samples are shown in the following figures:

Figure 1 - Sheet to sheet butt weld

Figure 2 - Sheet to tube weld

Figure 3 - Tube to tube weld

The dimensions given in the figures are in millimetres and may be regarded as approximate.

Note : (1) Approval will be limited to welding material from the specified metal group using the specified process. The selection of test samples to be welded by the applicant will further determine any restrictions to an approval in respect of the type of work to be undertaken.

(2) On application to the DCA other test samples may be used if they would be more relevant to the work normally undertaken.

2.2 The test samples shall be prepared by the applicant under the direct supervision of a supervisor. The supervisor will examine the dimensions, preparation and fitting of the test samples, and ensure that the required materials and process are used and that the test samples are completed in accordance with the requirements of paragraph 3.

Note: The supervisor shall be a person authorised, in accordance with Chapter 3.2, by the Approved Organisation to supervise welders' preparation of test specimens.

2.3 Additional test samples may be used if the applicant is not satisfied with the quality of the weld. The test samples shall be submitted complete and suitably identified to an Approved Test Organisation for examination.

3 Welding of Test Samples

Note: Irrespective of the type of test samples, completed welds shall not be dressed, hammered or sand blasted. Light tapping with a hammer to remove scale deposits is acceptable. Flux shall be removed by standard procedures.

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3.1 Figure 1 Test Sample

The edges of the sheet to be welded may be chamfered when 1.5mm or thicker sheet is used. Edge preparation is not necessary for aluminium alloys thinner than 2.5mm. The welding shall be performed with the test piece flat and by forehand welding from one side only using the correct filler rod, flux or shielding gas as applicable.

3.2 Figure 2 Test Sample

A 12mm diameter hole shall be drilled in the centre of each end plate prior to welding. The end plates may be positioned by tack welds. The first weld shall be completed by working around the test piece with the end plate flat on the bench and the tube vertical. The second weld shall be completed by working under and over the test piece with the tube horizontal and not moved during the welding process.

3.3 Figure 3 Test Sample

The tubes shall be prepared, assembled in a jig and tack welded. The assembly is then to be removed from the jig and mounted in a vertical position with the 150mm long tube vertical and 75mm long tube (at 45 degrees) at the top. The assembly shall not be moved from this position until all welds are completed. The welding of the lower tube shall be made by working around the test piece and the other welds by overhead welding and working around the test piece.

4 Cutting Test Specimens

4.1 Test specimens shall be cut from test samples by an Approved Test Organisation in accordance with the details given in the appropriate figures.

5 Specimen Examination

5.1 Assessment of a weld shall be based on consideration of the sample weld as a whole, including the results obtained by visual, microscopical, and where applicable, mechanical testing. If any doubt exists regarding the quality of the weld, or any defect revealed is thought to be of a local character, further sections should be examined and final assessment shall be based on all the specimens examined.

Note: Figure 1 test specimens shall be subjected to tensile and bend tests. Figure 3 test specimens shall be subjected to tensile test.

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- 5.2 The micro test specimen shall be examined at suitable magnifications in the unetched and etched conditions. A list of suitable etching reagents is given in Table 1.
- 5.3 The presence of intergranular oxide films is considered to be detrimental to the weld due to their embrittling effect, but the extent of these films is very difficult to determine in etched specimens. If the area of intergranular oxide is only very slight and satisfactory results are obtained by mechanical testing, further sections of the weld shall be examined before a decision is reached.
- 5.4 Where fillet welds are concerned, unless complete fusion is required by the drawing, a certain degree of lack of fusion is permissible at the roots:
- (a) For fillet welds of 45° or more, the maximum lack of fusion which can normally be accepted is that revealed by a line of oxide extending from the root of the weld for a distance not greater than one-third of that between the root and the toes of the weld. Provided the amount of weld material used has been adequate, this method of assessment should ensure that the effective throat thickness of the weld is not less than the thickness of the sheets or tubes used for the specimens.
 - (b) For fillet welds at acute angles such as 30° , complete penetration in the root of tubular sections is difficult to achieve and there is a danger of collapse of the tube walls if excessive penetration is attempted. The presence of a fairly large cavity, or corresponding lack of fusion, is permissible at the root of such welds but there should be a bridge of weld metal and reasonable throat depth, showing satisfactory fusion to the basic metal.
- 5.5 **Sheet to Sheet Butt Welds**
- The section must be free from excess oxidation, burning cracks, cavitation, porosity, scale and slag. The specimen must show adequate penetration when the underside of the weld is examined. If excessive penetration occurs along the entire length of the weld the specimen must be rejected, but isolated excrescence on the underside are permissible, provided the weld itself is free from cavities, oxide films, and other defects.
- 5.6 **Tube to Sheet and Tube to Tube Welds**
- The specimen must show adequate penetration and freedom from excess oxidation, cracks, cavitation, porosity, scale and slag.

6 Mechanical Testing of Specimens

6.1 Tensile Test

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- 6.1.1 Tensile test specimens shall be tested to destruction in direct tension. The ultimate stress (calculated on the minimum area of cross section of the specimen, i.e. ignoring the increase in thickness due to welding) and the location of the break shall be recorded. Tube to tube weld specimens shall be broken in a tensile test machine fitted with suitable shackles and pins, the pins being passed through the top and bottom cross tubes of the specimens, so that the tensile load may be applied without bending the specimens.
- 6.1.2 A weld will be considered satisfactory when the failure occurs in the parent metal. A test piece failing at the toe of the weld or in the weld material can only be considered satisfactory if the ultimate stress is found to exceed the minimum tensile strength of the parent metal as given in the appropriate material specification, and if the fracture surfaces are free from defects such as cracking, blow holes, excessive porosity or inclusions. No evidence of lack of adhesion such as the peeling away of the filler metal shall be apparent.

6.2 Bend Test

- 6.2.1 Bend test specimen shall be tested in bending so that the weld lies along the centre line of the bend and the weld face (the side from which the welding was performed) is on the outside of the bend.
- 6.2.2 To ensure the close contact of the specimen to the bar about which it is bent, the side of the specimen away from the weld face should be dressed down by filing or grinding until the weld is level with the parent metal. The edges of the specimen in the vicinity of the weld should be given reasonable radii.
- 6.2.3 Austenitic steel specimens must be given the "weld decay" pickling test prescribed in the relevant specification or in accordance with British Standard 5903 prior to the bend test.
- 6.2.4 The angle and radius of bend shall be as specified in the following table:

Material	Angle of bend (degrees)	Radius of Bend (T=nominal thickness)
(a) Austenitic steels	90	3T
(b) Magnesium alloys	180	10T
(c) Aluminium alloys	180	5T
(d) Steels containing boron	180	3T
(e) Titanium alloys	180	5T
(f) Others	180	2T

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- Note: (1) In the event the bend test details exceed distortion limits of the parent material, the bend limitations of the parent material shall be used.
- (2) Special test requirements may be specified by the Authority.

6.2.5 A bend test will be considered satisfactory if the test specimen withstands the bending without developing cracks visible to the unaided eye.

Note: If interpretation of the bend test results is in doubt, comparison may be made with the bend test performance of a separate sample of the parent material from which the test specimens were prepared.

TABLE 1-ETCHING REAGENTS

Material	Reagent									
Carbon steels	Saturated solution of picric acid in ethyl alcohol (industrial spirit grade)									
	<table style="width: 100%; border: none;"> <tr> <td style="width: 60%;">Concentrated nitric acid</td> <td style="width: 20%;">2%)</td> <td style="width: 20%;"></td> </tr> <tr> <td>Ethyl alcohol (industrial spirit grade)</td> <td>98%)</td> <td>(V/V)</td> </tr> </table>	Concentrated nitric acid	2%)		Ethyl alcohol (industrial spirit grade)	98%)	(V/V)			
Concentrated nitric acid	2%)									
Ethyl alcohol (industrial spirit grade)	98%)	(V/V)								
Corrosion-resisting steels and nickel base alloys	<table style="width: 100%; border: none;"> <tr> <td style="width: 60%;">Ferric Chloride</td> <td style="width: 20%;">5g</td> <td style="width: 20%;"></td> </tr> <tr> <td>Concentrated hydrochloric acid</td> <td>50ml</td> <td></td> </tr> <tr> <td>Distilled water</td> <td>100ml</td> <td></td> </tr> </table>	Ferric Chloride	5g		Concentrated hydrochloric acid	50ml		Distilled water	100ml	
	Ferric Chloride	5g								
	Concentrated hydrochloric acid	50ml								
	Distilled water	100ml								
Concentrated nitric acid (used electrolytically)										
<table style="width: 100%; border: none;"> <tr> <td style="width: 60%;">Oxalic acid) used</td> <td style="width: 20%;">10g</td> <td style="width: 20%;"></td> </tr> <tr> <td>Distilled water) electrolytically</td> <td>90ml</td> <td></td> </tr> </table>	Oxalic acid) used	10g		Distilled water) electrolytically	90ml					
Oxalic acid) used	10g									
Distilled water) electrolytically	90ml									
<table style="width: 100%; border: none;"> <tr> <td style="width: 60%;">Phosphoric acid) used electrolytically</td> <td style="width: 20%;">85%)</td> <td style="width: 20%;"></td> </tr> <tr> <td>Glycerine) at 85 °</td> <td>15%</td> <td>(V/V)</td> </tr> </table>	Phosphoric acid) used electrolytically	85%)		Glycerine) at 85 °	15%	(V/V)				
Phosphoric acid) used electrolytically	85%)									
Glycerine) at 85 °	15%	(V/V)								
Aluminium alloys	<table style="width: 100%; border: none;"> <tr> <td style="width: 60%;">Concentrated nitric acid</td> <td style="width: 20%;">20%)</td> <td style="width: 20%;"></td> </tr> <tr> <td>Hydrofluoric acid (40%)</td> <td>2%)</td> <td>(V/V)</td> </tr> <tr> <td>Distilled water</td> <td>78%)</td> <td></td> </tr> </table>	Concentrated nitric acid	20%)		Hydrofluoric acid (40%)	2%)	(V/V)	Distilled water	78%)	
	Concentrated nitric acid	20%)								
Hydrofluoric acid (40%)	2%)	(V/V)								
Distilled water	78%)									
<table style="width: 100%; border: none;"> <tr> <td style="width: 60%;">Hydrofluoric acid (40%)</td> <td style="width: 20%;">0.5%)</td> <td style="width: 20%;"></td> </tr> <tr> <td>Distilled water</td> <td>99.5%)</td> <td>(V/V)</td> </tr> </table>	Hydrofluoric acid (40%)	0.5%)		Distilled water	99.5%)	(V/V)				
Hydrofluoric acid (40%)	0.5%)									
Distilled water	99.5%)	(V/V)								

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Magnesium	Concentrated nitric acid Distilled water	1%) 99%) (V/V)
Copper base alloys	Ferric Chloride Concentrated hydrochloric acid Distilled water	5g 50ml 100ml
Titanium alloys	Nitric acid Hydrofluoric acid Distilled water	19%) 1%) (V/V) 80%)

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CHAPTER 6.1

APPROVAL AND RESPONSIBILITIES OF NONDESTRUCTIVE TESTING OPERATORS

1 General

1.1 This Chapter prescribes:

- (a) The requirements for the grant of an approval to undertake nondestructive testing of aircraft, components or equipment.
- (b) The responsibilities of approved non-destructive testing operators in respect of inspections on parts of an aircraft or its components and equipment, the failure of which could jeopardise the safety of an aircraft.

2 Approvals may be granted to undertake and certify non-destructive inspections by the following methods:

- (a) Dye penetrant inspection involving the use of dip tanks, emulsifiers, and fluorescent dye penetrants.
- (b) Magnetic particle inspection.
- (c) Radiographic inspection.
- (d) Ultrasonic inspection.
- (e) Eddy current inspection.

3 An applicant for the grant or extension of a non-destructive testing approval shall:

- (a) be able to read, write and converse in English language.
- (b) comply with the visual acuity requirements, and not be suffering from any disability likely to affect his technical skill or judgement. Visual acuity shall be such that his natural or corrected near vision is adequate to carry out the various functions. An annual test is required to ensure that he has a reasonable standard of visual acuity and does not suffer from any colour perception deficiency.

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Note: A reasonable minimum standard of visual acuity would be the capability to read the J-1 letters of the standard Jaegers test type chart or an equivalent type test for near vision. The test for colour perception is not required of applicants for radiographic and eddy current approvals.

- (c) Have acceptable experience of at least one year dealing with the practical inspection of aircraft structures and components, or acceptable alternative training or experience. Specific practical experience and training shall be obtained where prescribed for a particular NDT method. Where practical aircraft experience is insufficient, the examination will include a supplementary paper on aircraft structures.
 - (d) Pass a written and/or oral examination to a standard approved by the Authority on the appropriate syllabus.
 - (e) Demonstrate that he has adequate practical proficiency in the relevant NDT test method.
 - (f) In lieu of (d) and (e) above the Authority is prepared to accept the following qualifications:
 - (i) The UK National Scheme in NDT (PCN Aerospace examinations or equivalent).
 - (ii) The Australian Institute for NDT scheme for aerospace qualifications.
 - (iii) The American Society for NDT recommended practice SNTTC1A, NAS 410, ISO 9712 and European Standard EN473 qualifications.
 - (iv) Completion of training schemes approved by the Authority.
- 4 Application for the Authority NDT examinations shall be made on DCA Form AWF 31 and submitted to the Airworthiness Division, Department of Civil Aviation, SSR International Airport Plaisance.. Specific details of the applicant's qualifications and practical experience shall be submitted with the application.
- 5 NDT Approvals normally will only be granted to qualified persons in appropriately approved organisations. The issue of NDT approvals will be made by a nominated Senior Officer of the organisation following consent from the Authority in respect of each applicant. Such approvals will continue in force provided the visual acuity of the holder is tested annually and complies with the requirements of paragraph 3(b).

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Note: From time to time, the holder may be required to submitted evidence to the Authority that sufficient usage of the NDT method is being obtained to retain familiarity and proficiency.

- 6 The specific experience training requirements for approved radiographic and ultrasonic operators are as follows:
 - (a) Practical experience shall include at least one year's work, using the particular method in the examination of aircraft structures, parts and components. For a radiographic approval, the experience must also include processing and interpretation of radiographic.
 - (b) A course of study on the particular inspection method acceptable to the Authority must have been completed successfully.

- 7 The practical examination to qualify for an approval will require a demonstration of using the particular NDT method. For a radiographic approval, the examination will include a practical test and an interpretation test consisting of the following:
 - (a)
 - (i) The development and recording of techniques for the examination of an aircraft part.
 - (ii) The practical application of the techniques.
 - (iii) The processing of radiographics.
 - (b)
 - (i) The co-relation of radiographs with a report.
 - (ii) Identification of various features of radiographs.
 - (c) Safety aspects and methods of preventing radiation hazards.

Note: Safety Precautions

In view of the serious consequences of excessive exposure of the human body X-radiation, it is recommended that the following precautions should be observed by operators:

- (a) Film badge monitoring and total radiation absorbed dose records to be kept.

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- (b) An annual blood count.
 - (c) Personnel dosimeter.
 - (d) A radiation intensity meter.
- 8 Pursuant to the Civil Aviation Regulation, an approved Non-Destructive Testing operator is approved to certify for the completion of NDT inspections on a Certificate of Release to Service or on an Approved Certificate, as appropriate, provided:
- (a) The inspection is made by or under the direct supervision of the approved operator.
 - (b) The approval is valid and appropriate for the method of inspection.
 - (c) Where relevant the inspection is made in accordance with approved data and design documents.
 - (d) The certification is made solely in respect of the results of the inspection.

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CHAPTER 6.1

**APPROVAL AND RESPONSIBILITIES OF NONDESTRUCTIVE TESTING
OPERATORS**

APPENDIX 1

SYLLABI OF NDT EXAMINATIONS

1 Dye Penetrant Inspection Syllabus

- 1.1 Principles of penetrant inspection.
- 1.2 Applicability; Types and characteristics of flaws, detectability of flaws, limitations on applicability to types of materials and types of flaws.
- 1.3 Penetrant Systems; Characteristics and basis of selection of types of penetrants, emulsifiers and developers; compatibility of penetrants.
- 1.4 Techniques of inspection; Advantages and limitations of the various methods of preparation; selection of methods of application of penetrant, emulsifier and developer; dwell times; temperature effects; re-running; interpretation of indications.
- 1.5 Equipment and control; Black lights and measurement of intensity; methods of control of contamination of penetrants, emulsifiers and developers; inspection area conditions.
- 1.6 The characteristics and terminology of defects arising from casting welding, heat treatment, fatigue and stress corrosion cracking.

2 Magnetic Particle Inspection Syllabus

- 2.1 Elementary theory of magnetism; Concepts of flux density, permeability, reluctance and the hysteresis loop.
- 2.2 Principles of magnetic particle testing; Theory, fields, current and demagnetization.
- 2.3 Method of magnetisation; Circular magnetisation by current flow, threading bar, induced current and longitudinal magnetisation by coil, magnetic flow.
- 2.4 Methods of establishment of flux density for inspection; The significant of reverse fields in coil magnetisation; characteristics of magnetisation by ac and dc.

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- 2.5 Test procedures by continuous and residual methods; the application of wet and dry magnetic particles.
- 2.6 Characteristics and section of types of magnetic particle indicators; Methods of preparation of and the control of concentration of wet bath indicators; measurement of black light intensity.
- 2.7 The Applicability and Limitations of the Methods; Types of flaws and the interpretation of indications; factors governing sensitivity characteristics and sources of non-relevant indications.

3 Radiographic Inspection Syllabus

- 3.1 Elementary theory; The properties, characteristics and generation of X and gamma rays including the electro-magnetic spectrum; monochromatic characteristic and bremsstrahlung radiation; propagation and inverse square law, absorption, scattering and the interaction of X-rays and matter.
- 3.2 Equipment; Principles of basic design and operation of X-ray generating equipment including the effects of voltage and amperage in the control of quality and intensity of radiation.
- 3.3 The principles of the method; the factors controlling sensitivity to the detection of cracking and corrosion including definition, contrast, alignment of the beam.
- 3.4 Basic technique; The relationship and interdependence of factors controlling definition and contrast including subject contrast, variation of absorption coefficient with quality of radiation, scatter, optimum film density, geometric unsharpness, focal spot size and geometric distribution in the beam, focus to object and focus to film distances.
- 3.5 The nature of X-ray; The properties and selection of films including characteristics curves, optimum density and film contrast amplification.
- 3.6 Screens; The principles, selection and use of metal and fluorescent screens.
- 3.7 The principles of film processing; The preparation, use and maintenance of film developing and fixing processes.
- 3.8 Exposure control; The preparation and use of exposure curves, the factors governing the selection of exposure including the voltage, milliamperage, film to focus distance and exposure time; the principles and use of filters; methods of minimising scattered radiation. Calculation for correct exposure. Relationship between SI units and non SI units in radiography.

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- 3.9 Viewers and optimum conditions.
- 3.10 Interpretation; Types of flaws and their interpretation, the significance of image quality indicators, the characteristics and terminology of flaws arising from casting, welding, heat treatment, fatigue, stress corrosion cracking; the recognition of image quality degradation or spurious images caused by faulty film processing or handling.
- 3.11 The advantages and limitations of the method.
- 3.12 Radiation hazards and safety.
- 3.13 Methods of recording, reporting and identification and filing of radiographs.
- 3.14 General knowledge of aircraft structures, methods of manufacture and interpretation of engineering drawings. Construction of fuselages, empennages, centre sections, mainplanes, undercarriages and control surfaces. Identification of areas and locations i.e. station numbers.

4 **Ultra-sonic Inspection Syllabus**

- 4.1 Basic properties and nature of sound; The acoustic spectrum; frequency wave length and velocity relationship; propagation; acoustic impedance, reflection and impedance, mismatch, refraction, Snell's law; intensity, the decibel; attenuation by absorption and diffraction; types of sound waves and their characteristics. longitudinal, transverse, surface, plate and standing; factors affecting wave velocity; mode conversion at boundaries, acoustic coupling.
- 4.2 Generation of Ultrasonic Waves; The piezoelectric effects; electro-acoustic transducers, crystal thickness and resonant frequency, sound beam geometry, near zone and far zone characteristics, band width, pulsed beams, relative efficiencies of crystal types as transmitters and receivers - quartz, barium titanate, lithium sulphate, lead zirconate.
- 4.3 Probe Design; The ringing of a crystal, damping and the need for a short pulse length; types of probes and their construction, transceiver, combined, separate, focused; the dead zone.
- 4.4 The basis of the methods; The pulse echo and through transmission systems, resonance testing, immersion and contact scanning, the relationship between travel time of a reflected pulse and the position of the reflecting boundary, arithmetic of scanning and identification of echoes.

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- 4.5 Instruments and equipment; The basic operation of the circuit of the pulse echo systems, the cathode ray tube, time base, pulse generation, pulse repetition frequency, amplifier gain, suppression, range, time delay, the significance of time base and receiver amplifier linearity, scale expansion; supplementary equipment, thickness gauge, flaw alarm, swept gain control, interface trigger, A, B and C scan presentations, rectified and unrectified trace.
- 4.6 Techniques: Surface preparation, the use of viscous couplants on rough surfaces, the necessity to remove uneven or poorly adhering paint and surface adherents such as heat treatment scale. The choice of transducer size and frequency as a function of the requirements of access, critical defect size, and minimal near zone length and beam divergence. The choice of shear wave refracted angle as a function of the geometry of the part under examination. The choice of overall test sensitivity and the use of standard reflectors and/or reference signals to confirm correct sensitivity. The IIW block, flat bottomed holes, the use of suppression and its effect on reflector area to signal height relationship. The use of defective parts or models containing artificial defect as test comparators. The estimation of defect size using comparative signal amplitude and surface plotting techniques. Factors governing amplitude of signals from defects. The reporting and recording of test results.
- 4.7 The characteristics and terminology of defects arising from casting, welding, heat treatment, fatigue, stress corrosion cracking.
- 4.8 A general knowledge of aircraft structures, methods of manufacture and interpretation of engineering drawings. Construction of fuselages, empennages, centre sections, mainplanes, undercarriages and controls surfaces. Identification of areas and locations i.e. station numbers.

5 **Eddy Current Inspection Syllabus**

- 5.1 Basic principles of the method.
- 5.2 Basic theory of electricity and magnetism and induced eddy currents: direct current including simple circuits, alternating current including simple circuits, Ohms Law, Faraday's Law, Lenz's Law, power formulae, induction, inductance, capacitance, reactance, impedance, frequency, resonance, phase relationships; magnetic effect of current flow; magnetic field intensity, hysteresis loop, permeability; inducing eddy currents by coil. Concepts, definitions and units of measurement.
- 5.3 Factors to consider in eddy current testing: factors affecting the eddy current field; effective depth of penetration and factors affecting penetration, test coil information from impedance, coupling and phase changes.

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- 5.4 Equipment and related applications: coil arrangements and types of coil; principles of probe design and construction principles; types of circuits including bridge, resonance and phase analysis, impedance change instruments. The selection, care, maintenance and calibration of equipment.
- 5.5 Techniques: probe characteristics and selection, probe field size to flaw size relationship. Factors affecting sensitivity including probe to test piece distance, angularity, edge effect contact pressure, conductive and non-conductive coating thickness, alloy composition variations, lift-off adjustment, signal/noise ratio, depth or skin effect. Design fundamentals of eddy current flaw standards and flaw detectability limitations.
- 5.6 Assessment of mechanical properties by the measurement of electrical conductivity; metallurgical factors affecting mechanical properties and electrical conductivity of heat treated aluminium alloys including alloy composition, size and distribution of precipitates. Variables affecting electrical conductivity measurements; thickness curvature, thickness of conducting and non-conducting coatings, temperature, precautions necessary for the assessment of heat affected aluminium alloys, e.g. fire damage. Conductivity standards.

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CHAPTER 11

**REQUIREMENTS FOR IMPLEMENTATION OF REDUCED VERTICAL
SEPARATION MINIMUM (RVSM).**

1. INTRODUCTION

1.1 Regulations 53 and 54 of the Civil Aviation Regulations requires that an aircraft shall be fitted with instrument and equipment, including radio apparatus and special equipment, as may be specified according to the use and circumstances under which the flight is to be conducted.

1.2 **Reduced Vertical Separation Minima** or **Minimum** (RVSM) is an aviation term used to describe the reduction of the standard vertical separation required between aircraft flying at levels between FL290 (29,000 ft.) and FL410 (41,000 ft.) from 2,000 feet to 1,000 feet (or between 8,900 metres and 12,500 metres from 600 metres to 300 metres in China). This therefore increases number of aircraft that can safely fly in a particular volume of airspace. The North Atlantic System Groups that implemented RVSM first determined that they were only implementing a change to one minimum from 2,000' to 1,000'; therefore, that minimum being singular the correct terminology is minimum not minima.

Historically, standard vertical separation was 1,000 feet from the surface to FL290, 2,000 feet from FL290 to FL410 and 4,000 feet above this. This was because the accuracy of the pressure altimeter used in aircraft to determine level decreases with height. However over time Air data computers (ADC) combined with altimeters have become more accurate and autopilots more adept at maintaining a set level, therefore it became apparent that for many modern aircraft, the 2,000 foot separation was too cautious. It was therefore proposed by ICAO that this be reduced to 1,000 feet.

Between 1997 and 2005 RVSM was implemented in all of Europe, North Africa, Southeast Asia and North America, South America, and over the North Atlantic, South Atlantic, and Pacific Oceans. The North Atlantic implemented initially in March 1997 at flight levels 330 through 370. The entire western hemisphere implemented RVSM FL290-FL410 on January 20, 2005.

Only aircraft with specially certified altimeters and autopilots may fly in RVSM airspace, otherwise the aircraft must fly lower or higher than the airspace, or seek special exemption from the requirements.

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1.3 Mauritius Airspace and neighbouring airspace is expected to become RVSM airspace between FL 290 and FL 410, inclusive of FL 290 and FL 410 in October, 2008.

2. APPLICABILITY

2.1 This MCAR is intended to provide necessary guidance for RVSM operations. It establishes an acceptable means, but not the only means, that can be used in the approval of aircraft and operators to conduct flight in airspace or on routes where Reduced Vertical Separation Minimum (RVSM) is applied. It lays down guidance and requirements on airworthiness, continuing airworthiness, and operations programs for RVSM operations.

2.2 Non RVSM approved aircraft intending to climb/descend through RVSM airspace and other operations such as humanitarian, maintenance, ferry flights and State/military aircraft shall be dealt with by DCA in coordination with the Air Traffic Management on case to case basis with limitations/ restrictions as may be considered necessary for relevant ATC airspace.

2.3 This MCAR is issued under the provisions of Regulation 135 of the Civil Aviation Regulation for information, guidance and compliance by the concerned operators operating through and within the RVSM airspace. The contents of this MCAR are consistent with the provisions of ICAO Annex 6 and ICAO Doc 9574 on the above subject.

3. DEFINITIONS

3.1 **Aircraft Group:** A group of aircraft that are of nominally identical design and build with respect to all details that could influence the accuracy of height keeping performance.

3.2 **Altimetry System Error (ASE):** The difference between the pressure altitude displayed to the flight crew when referenced to the International Standard Atmosphere ground pressure setting (1013.25 hPa /29.92 in. Hg) and free stream pressure altitude.

3.3 **Assigned Altitude Deviation (AAD):** the difference between the transponder Mode C altitude and the assigned altitude/ flight level.

3.4 **Automatic Altitude Control System:** Any system that is designed to automatically control the aircraft to a referenced pressure altitude.

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- 3.5 **Avionics Error (AVE):** The error in the processes of converting the sensed pressure into an electrical output, of applying any static source error correction (SSEC) as appropriate, and of displaying the corresponding altitude.
- 3.6 **Basic RVSM Envelope:** The range of Mach numbers and gross weights within the altitude ranges FL 290 to FL 410 (or maximum attainable) where an aircraft can reasonably be expected to operate most frequently.
- 3.7 **Flight Technical Error (FTE):** Difference between the altitude indicated by the altimeter display being used to control the aircraft and the assigned altitude/flight level.
- 3.8 **Full RVSM Envelope:** The entire range of operational Mach numbers, W/d, and altitude values over which the aircraft can be operated within RVSM airspace.
- 3.9 **Height keeping Capability:** Aircraft height keeping performance that can be expected under nominal environmental operating conditions, with proper aircraft operating practices and maintenance.
- 3.10 **Height keeping Performance:** the observed performance of an aircraft with respect to adherence to a flight level.
- 3.11 **Non-Group Aircraft:** An aircraft for which the operator applies for approval on the characteristics of the unique airframe rather than on a group basis.
- 3.12 **Residual Static Source Error:** The amount by which static source error (SSE) remains under-corrected or overcorrected after the application of SSEC.
- 3.13 **RVSM Airspace:** RVSM airspace is any designated airspace/route between FL 290 and FL 410 inclusive where aircraft are separated vertically by 1000 ft (300 m)
- 3.14 **Static Source Error:** The difference between the pressure sensed by the static system at the static port and the undisturbed ambient pressure.
- 3.15 **Static Source Error Correction (SSEC):** A correction for static source error.
- 3.16 **Total Vertical Error (TVE):** Vertical geometric difference between the actual pressure altitude flown by an aircraft and its assigned pressure altitude (flight level).
- 3.17 **W/δ:** aircraft weight, W, divided by the atmospheric pressure ratio, δ

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4. BASIC REQUIREMENTS

No person shall operate a Mauritius registered aircraft in airspace designated as Reduced Vertical Separation Minimum (RVSM) airspace unless;

- (a) The operator and the operator's aircraft comply with the requirements of this MCAR;
- (b) The operator is authorised by DCA to perform RVSM operations; and
- (c) The Operations Specifications of the Operating Permit are endorsed by DCA, which authorizes the operator to conduct RVSM operations.

5. APPROVAL REQUIREMENTS

5.1 Airspace where RVSM is applied should be considered special qualification airspace. Both the individual aircraft and the specific aircraft type or types that the operator intends to use will need to be approved by DCA before the operator conducts flights in RVSM airspace. Requirements of this MCAR shall be complied with for the approval of specific aircraft type or types and for airworthiness and operational approval.

5.2 Approval will encompass the following elements:

- (a) Airworthiness aspects (including continued airworthiness)
- (b) Operational requirements
- (c) Provision for height monitoring of operator's aircraft

5.3 Operator shall apply for RVSM approval to Regional Airworthiness Office.

5.4 On satisfactory compliance with the requirements given in this MCAR, the operator shall be given provisional approval for the specific aircraft. Approval may be regularized after the aircraft meets the Height Monitoring Performance using HMU/ GMU.

6. AIRWORTHINESS APPROVAL OF AIRCRAFT

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- 6.1 Each aircraft type that the operator intends to use in RVSM airspace should have received RVSM airworthiness approval from the regulatory authority of country of manufacture/ design including the approval of continued airworthiness program. DCA shall accept such RVSM approval and grant airworthiness approval to each aircraft on the compliance with the RVSM Data Packages.
- 6.2 RVSM Data Packages for each aircraft type/ group of aircraft shall be approved by the regulatory authority of country of manufacture/ design and may take the following form:
- 6.1.1 In-service Aircraft
- (i) Manufacturer's Service Bulletin
 - (ii) Aircraft Service Change
 - (iii) Supplemental Type Certificates
 - (iv) Airplane Flight manual
- 6.1.2 Aircraft manufactured as RVSM Complaint -AFM Statement of Compliance
- 6.2 The operator shall obtain approval from the State of Registry for each individual aircraft group and each individual aircraft to be used by the operator for RVSM operations.
- 6.3 Each aircraft of Mauritiann operators shall have the airworthiness and the operational approval from the DCA prior to it being approved for use by the operator in RVSM environment.
- 6.4 Each aircraft shall receive approval for continued airworthiness program prior to it being reviewed for operational approval.

7 OPERATIONAL APPROVAL

Operator is required to obtain DCA approval to operate in airspace designated as RVSM airspace and maintain high levels of height keeping performance.

- 7.1 The operator shall submit operational programs including the flight crew training as well as operations manuals and check list for approval;
- 7.2 Each aircraft type group utilised by an operator shall be capable of height keeping performance which does not exceed a mean Total Vertical Error of 25m (80ft). DCA may

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verify this by evaluating the Altimetry System Error (ASE) and Flight Technical Error (FTE) components of Total Vertical Error (TVE) separately;

- 7.3 The standard deviation about the mean TVE shall not exceed the following.
- (a) Standard Deviation (ft):
 $82 - 0.004Z^2$ where Z equals mean TVE for the aircraft type in fleet;
 - (b) Standard Deviation (m):
 $25 - 0.016Z^2$ where z equals mean TVE for the aircraft type in meters.
- 7.4 DCA while granting operational approval shall evaluate airworthiness documents for each aircraft type group. It is necessary for the operator to demonstrate height keeping performance for the aircraft type.
- 7.5 If in-service experience shows that the height keeping performance of a particular aircraft type utilized by the operator does not meet the requirements of paras 6.3 and 6.4, the operator shall take steps to improve performance to the required level. If the performance is not improved, operational approval for the aircraft type may be withdrawn.
- 7.6 A Minimum Equipment List (MEL) adopted from the Master Minimum Equipment List (MMEL) and relevant operational regulations should include items pertaining to the RVSM operations.
- 7.7 The requirements for the Flight Crew Training detailed in Annexure I shall be complied with.

8 AIRCRAFT SYSTEMS

- 8.1 The aircraft shall be equipped to meet the following minimum equipment for RVSM operations:
- 8.1.1 Two independent altitude measurement systems shall be installed. Each system shall be composed of the following elements
- (a) Cross-coupled static source/system, with ice protection if located in areas subject to ice accretion;
 - (b) Equipment for measuring static pressure sensed by the static source, converting it to pressure altitude and displaying the pressure altitude to the flight crew;

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- (c) Equipment for providing a digitally encoded signal corresponding to the displayed pressure altitude, for automatic altitude reporting purposes;
 - (d) Static source error correction (SSEC)/Position Error Correction (PEC), if needed to meet the performance criteria of paras 3.3, 3.4 or 3.6 of Annexure II attached, as appropriate; and
 - (e) Signals referenced to a pilot selected altitude for automatic control and alerting. These signals will need to be derived from altitude measurement system meeting the criteria of this MCAR, and in all cases, enabling the criteria of paras 8.1.3 and 8.2.6 to be met.
- 8.1.2 One secondary surveillance radar transponder (meeting TSO C112 standards) with an altitude reporting system that can be connected to the altitude measurement system in use for altitude keeping.
- 8.1.3 Airborne Collision Avoidance System (ACAS II) (meeting TSO C119b standards) to improve the safety level of flights operating within RVSM airspace.
- 8.1.4 An altitude alerting system that alerts the crew aurally and visually if displayed altitude deviates from the selected altitude by more than – 300 feet (for aircraft for which application for type certification was made on or before April 9, 1997) or – 200 feet (for aircraft for which application for type certification is made after April 9, 1997).
- 8.1.5 An automatic altitude control system shall be required which shall be capable of controlling altitude within tolerance band of – 15 metres (– 50 feet) about commanded altitude, when operated in the altitude hold mode in straight and level flight under non turbulent, non gust conditions.

8.2 Altimetry

8.2.1 System Composition

The altimetry system of an aircraft comprises all those elements involved in the process of sampling free stream static pressure and converting it to a pressure altitude output. The elements of the altimetry system fall into two main groups:

- (a) Airframe plus static sources.
- (b) Avionics equipment and/or instruments.

8.2.2 Altimetry System Outputs

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The following altimetry system outputs are significant for RVSM operations:

- (a) Pressure altitude (Baro -corrected) for display.
- (b) Pressure altitude reporting data.
- (c) Pressure altitude or pressure altitude deviation for an automatic altitude control device.

8.2.3 Altimetry System Accuracy

The total system accuracy shall satisfy the criteria of paras 3.3, 3.4 or 3.6 of Annexure II attached.

8.2.4 Static Source Error Correction

If the design and characteristics of the aircraft and its altimetry system are such that the criteria of para 3.3, 3.4 or 3.6 of Annexure II are not satisfied by the location and geometry of the static sources alone, then suitable SSEC shall be applied automatically within the avionics equipment of the altimetry system.

8.2.5 Altitude Reporting Capability

The aircraft altimetry system shall provide an output to the aircraft transponder as required by applicable operating regulations.

8.2.6 Altitude Control Output

- (a) The altimetry system shall provide a signal that can be used by an automatic altitude control system to control the aircraft to a selected altitude. The signal may be used either directly or combined with other sensor signals. If SSEC is necessary to satisfy the criteria of paras 3.3, 3.4 or 3.6 of Annexure II, then an equivalent SSEC may be applied to the altitude control signal. The signal may be an altitude deviation signal, relative to the selected altitude or a suitable absolute altitude signal.
- (b) Whatever the system architecture and SSEC system, the difference between the signal output to the altitude control system and the altitude displayed to the flight crew shall be kept to the minimum.

8.2.7 Altimetry System Integrity

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The RVSM approval process shall verify that the predicted rate of occurrence of undetected failure of the altimetry system does not exceed 1×10^{-5} per flight per hour. All failures and failure combinations whose occurrence would not be evident from cross cockpit checks and which would lead to altitude measurement /display errors outside the specified limits, need to be assessed against this value. Other failures or failure combinations need not be considered.

9 PROVISION FOR MONITORING OF OPERATORS AIRCRAFT

9.1 The operator shall provide a plan for participation in the monitoring program. This program should normally entail a check of at least a portion of the operator's aircraft by an independent height monitoring system.

9.2 Monitoring of aircraft height-keeping performance may be done by either a ground based Height Monitoring Unit (HMU) or a portable GPS Height Monitoring Unit (GMU), which is carried on board the aircraft. In regions with HMUs, aircraft operators may meet the monitoring requirements without any specific action on their part, other than ensuring that the aircraft undertakes a flight with the area of coverage of an HMU within the time period within which monitoring should take place. For monitoring with the portable GMUs, operators need to arrange for a monitoring flight. Regional Monitoring Agency (RMAs) will notify operators sufficiently in advance regarding the time scales when specific aircraft require monitoring.

9.3 A program to monitor or verify aircraft height keeping performance is a necessary element of RVSM approval process and RVSM implementation for at least the initial area where RVSM is implemented. Verification and monitoring program have the primary objective of observing and evaluating aircraft height keeping performance to gain confidence that airspace users are applying the airplane and/or operator approval process in an effective manner and that an equivalent level of safety will be maintained in when RVSM is implemented. It is anticipated that necessity for such programs may be diminished or possibly eliminated after confidence is gained that RVSM programs are working as planned.

10 PROCEDURE FOR GRANT OF AIRWORTHINESS APPROVAL

10.1 Grant of RVSM airworthiness approval

10.1.1 In the case of a newly built aircraft, the aircraft manufacturers obtain approval from the regulatory authority of the country of manufacture/design by submitting performance and analytical data supporting RVSM airworthiness approval. Compliance with the RVSM

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criteria shall be stated in the Aircraft Flight Manual including reference to the applicable build standard, related conditions, and limitations. The maintenance and repair manuals will give the associated airworthiness instructions.

- 10.1.2 In case of an aircraft already in service, the manufacturer shall submit the performance and analytical data to the regulatory authority of the country of manufacture/design. The data shall be supplemented with the service bulletin or its equivalent, that identifies the work to be done to achieve the build standard, continued airworthiness instructions, and an amendment to the aircraft flight manual stating related conditions and limitations. Approval by the regulatory authority indicates acceptance of that aircraft type and build standard as complying with the RVSM airworthiness criteria.
- 10.1.3 The combination of performance and analytical data, service bulletin(s) or equivalent, continued airworthiness instructions, and the approved amendment or supplement to the Aircraft Flight Manual is known as the RVSM approval data package.
- 10.1.4 For airworthiness approval of specific aircraft, an aircraft operator is required to apply to DCA. The application shall be supported by evidence that the aircraft has been inspected, and where necessary, modified in accordance with applicable Service Bulletins, and is of a type and build standard that meets the RVSM airworthiness criteria. The operator shall also confirm that the continued airworthiness instructions are available and that the approved Flight Manual amendment or supplement has been incorporated.

Note : For RVSM airspace where an operational approval is prescribed, airworthiness approval alone does not authorize flight in that airspace.

- 10.2 Contents of the RVSM approval data package -As a minimum, the data package will need to consist of the following items:
- (a) A statement of the aircraft group or non-group aircraft and applicable build standard to which the data package applies.
 - (b) Definition of the applicable flight envelope(s).
 - (c) Data showing compliance with the performance criteria of Annexure II and para 8 of this MCAR.
 - (d) The procedures to be used to ensure that all aircraft submitted for airworthiness approvals comply with RVSM criteria. These procedures will include the references of applicable service bulletin and the applicable approved aircraft flight manual amendment or supplement.

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- (e) The maintenance instructions that ensure continued airworthiness for RVSM approval.

These items are explained further in the following paragraphs.

10.3 Aircraft Groupings

10.3.1 For aircraft to be considered as members of a group for purposes of RVSM approval, the following conditions shall be satisfied.

- (a) Aircraft shall have been manufactured to a nominally identical design and be approved by the same Type Certificate (TC), TC amendment or supplemental TC, as applicable.

Note: For derivative aircraft it may be possible to utilise the data from the parent configuration to minimise the amount of additional data required to show compliance. The extent of additional data required will depend on the nature of the changes between the parent aircraft and the derivative aircraft.

- (b) The static system of each aircraft shall be installed in a nominally identical manner and position. The same SSE corrections shall be incorporated in all aircraft of the group.
- (c) The avionics units installed on each aircraft to meet the minimum RVSM equipment requirements of paragraph 7.1 of this MCAR shall be manufactured to the manufacturer's same specification and have the same part number.

Note: Aircraft that have avionic units that are of a different manufacturer or part number may be considered part of the group, if it is demonstrated that this standard of avionic equipment provides equivalent system performance.

- (d) The RVSM data package shall have been produced or provided by the airframe manufacturer or an approved design organisation.

10.3.2 Non-group Aircraft

If an airframe does not meet the conditions of paragraphs 10.3.1(a) to (d) to qualify as a member of a group, or is presented as an individual airframe for approval, then it must be considered as a non-group aircraft for the purposes of RVSM approval.

10.4 Flight Envelopes

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The RVSM operational flight envelope, is the Mach number W/d and altitude ranges over which an aircraft can be operated in cruising flights within the RVSM airspace. The RVSM operational flight envelope for any aircraft may be divided into two parts as explained below:

- 10.4.1 Full RVSM Flight Envelope: The full envelope will comprise the entire range of operational Mach number, W/d and altitude values over which the aircraft can be operated within RVSM airspace. Table 1 establishes the parameters to be considered.
- 10.4.2 Basic RVSM Flight Planning Envelope: The boundaries for the Basic envelope are the same as those for the full envelope except for the upper Mach boundary.

TABLE 1 - FULL RVSM ENVELOPE BOUNDARIES

	Lower Boundary is defined by	Upper Boundary is defined by
LEVEL	-FL 290	The lower of: -FL 410 -Aircraft maximum certified altitude - Altitude limited by; cruise thrust; buffet; other aircraft flight limitations.
Mach or Speed	The lower of: -Maximum endurance (holding speed) - Manoeuver speed	The lower of -M _{MO} /V _{MO} -Speed limited by cruise thrust; buffet; other aircraft flight limitations.
Gross weight	-The lowest gross weight compatible with operations in RVSM airspace.	-The highest gross weight compatible with operations in RVSM airspace.

10.5 Avionics Equipment

Avionics equipment shall be identified by function and part number. A demonstration shall show that the avionic equipment can meet the design criteria established when the equipment is operated in the environmental conditions expected to be met during RVSM operations.

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10.6 Compliance Procedure

The data package furnished by the manufacturer shall define the procedures, inspections and tests and the limits that will be used to ensure that all aircraft approved against the data package "conform to type"; that is all future approvals, whether of new build or in service aircraft meet the allowances developed.

10.7 Continued Airworthiness

10.7.1 The following items shall be reviewed and updated as applicable to RVSM

- (a) The structural repair manual with special attention to the areas around each static source, angle of attack sensors, and doors if their rigging can affect air flow around the previously mentioned sensors.
- (b) The Master Minimum Equipment List (MMEL)

10.7.2 The data package shall include details of any procedures that are not covered in above said para, but may be needed to ensure continued compliance with RVSM approval criteria.

Examples follow

- (a) For non-group aircraft where airworthiness approval has been based on flight test, the continuing integrity and accuracy of the altimetry system shall be demonstrated by ground and flight test of the aircraft and its altimetry system at intervals to be agreed with DCA. However, exemption from the flight test requirement may be granted if it can be demonstrated that the relationship between any subsequent airframe/system degradation and its effects on altimetry system accuracy is understood and that it can be compensated or corrected.
- (b) In-flight defect reporting procedures shall be defined for identification of altimetry system error sources. Such procedure shall cover acceptable differences between primary and alternate static sources, and others as appropriate.
- (c) For groups of aircraft, where approval is based on geometric inspection, periodic re-inspection shall be necessary and the intervals required should be specified.

10.8 Post Approval Modification

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Any variation/modification from the initial installation that affects RVSM approval should be referred to aircraft manufacturer and accepted by DCA.

11 CONTINUED AIRWORTHINESS (MAINTENANCE PROCEDURES)

11.1 General

- (a) The integrity of the design features necessary to ensure that altimetry systems continue to meet RVSM approval criteria shall be verified by scheduled tests and inspections in conjunction with an approved maintenance program. The operator shall review its maintenance procedures and address all aspects of continued airworthiness that may be relevant.
- (b) Adequate maintenance facilities shall be available to enable compliance with the RVSM maintenance procedures.

11.2 Maintenance Programs

Each operator requesting RVSM operational approval shall establish RVSM maintenance and inspection practices acceptable to DCA that shall include any required maintenance specified in the data package. These practices shall be included in the operator's approved maintenance programme.

11.3 Maintenance Documents

The following manuals/documents shall be reviewed, as appropriate:

- (a) Maintenance Manuals.
- (b) Structural Repair Manuals.
- (c) Standard Practices Manuals.
- (d) Illustrated Parts Catalogues.
- (e) Maintenance Schedule
- (f) MMEL/MEL

11.4 Maintenance Practices

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- 11.4.1 The aircraft altimetry and height keeping equipment shall be maintained in accordance with the manufacturer's approved procedures and servicing schedules.
- 11.4.2 The operator's maintenance program shall include, for each aircraft type, the maintenance practices stated in the applicable aircraft and component manufacturers' maintenance manuals. In addition, attention shall be given to the following items:
- (a) All RVSM equipment shall be maintained in accordance with the aircraft and component manufacturers' maintenance instructions and the performance criteria of the RVSM approval data package.
 - (b) Any modification or design change, which in any way affects the initial RVSM approval, shall be subject to a design review acceptable to DCA.
 - (c) Any repairs, not covered by approved maintenance documents, that may affect the integrity of the continuing RVSM approval, e.g. those affecting the alignment of pitot/static probes, repairs to dents or deformation around static plates, shall be subject to a design review acceptable to DCA.
 - (d) Built-in Test Equipment (BITE) testing shall not be used for system calibration unless it is shown to be acceptable by the aircraft manufacturer/design organization, and with the agreement of the DCA.
 - (e) An appropriate system leak check (or visual inspection where permitted) shall be accomplished following reconnection of a quick-disconnect static line.
 - (f) Airframe and static systems shall be maintained in accordance with the aircraft manufacturer's inspection standards and procedures.
 - (g) To ensure the proper maintenance of airframe geometry for proper surface contours and the mitigation of altimetry system error, surface measurements or skin waviness checks will need to be made, as specified by the aircraft manufacturer, to ensure adherence to RVSM tolerances. These checks should be performed following repairs, or alterations having an effect on airframe surface and airflow.
 - (h) The maintenance and inspection program for the autopilot will need to ensure continued accuracy and integrity of the automatic altitude control system to meet the height keeping standards for RVSM operations. This requirement will typically be satisfied with equipment inspections and serviceability checks.

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- (i) Whenever the performance of the installed equipment has been demonstrated to be satisfactory for RVSM approval, the associated maintenance practices shall be consistent with continued RVSM approval. Examples of equipment to be considered are
 - (i) Altitude alerting
 - (ii) Automatic Altitude Control System
 - (iii) Secondary Surveillance Radar altitude reporting equipment
 - (iv) Altimetry system.

11.4.3 Action for non-compliance aircraft –

Those aircraft positively identified as exhibiting height keeping performance errors that require investigation, shall not be operated in RVSM airspace until the following actions have been taken –

- (a) The failure or malfunction is confirmed and isolated; and
- (b) Corrective action is taken to comply with requirements for RVSM approval.

11.4.4 Maintenance Training

Additional training may be necessary to support RVSM approval. Areas needed to be highlighted for initial and recurrent training of relevant personnel are:

- (a) Aircraft geometric inspection technique.
- (b) Test equipment calibration and use of that equipment.
- (c) Any special instruction or procedures introduced for RVSM approval.

11.4.5 Test Equipment

- (a) Test equipment should have the capability to demonstrate continuing compliance with all the parameters established in the data package for RVSM approval.

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- (b) Test equipment should be calibrated using reference standards at periodic intervals acceptable to DCA. The approved maintenance program shall include an effective quality control program with the attention to the following:
 - (i) Definition of required test equipment accuracy.
 - (ii) Regular calibrations of test equipment traceable to a master standard. Determination of the calibration interval should be a function of the stability of the test equipment. The calibration interval should be established using historical data so that the degradation is small in relation to the required accuracy.
 - (iii) Regular audits of calibration facilities both in-house and outside.
 - (iv) Adherence to approved maintenance practices.
 - (v) Procedures for controlling operator errors and unusual environmental conditions which may affect calibration accuracy.

12. REPORTING ALTITUDE KEEPING ERRORS

Each operator shall develop a system of reporting each event in which the operator's aircraft has exhibited the height deviations which are in magnitude equal to or, greater than, the following criteria.

- (i) Total Vertical Error - 300 feet;
- (ii) Altimetry System Error - 245 feet; and
- (iii) Assigned Altitude Deviation -300 feet.

12. REMOVAL OR AMENDMENT OF AUTHORITY

DCA may amend Operations Specifications of the operator to revoke or restrict an RVSM authorisation if it is found that the operator is not complying, or is unable to comply with the requirements of this MCAR.

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CHAPTER 11

ANNEXURE 1

TRAINING PROGRAMMES AND OPERATING PRACTICES AND PROCEDURES

1. INTRODUCTION

Flight crews will need to have an awareness of the criteria for operating in RVSM airspace and be trained accordingly. The items detailed in paragraphs 2 to 6 of this Annexure shall be standardized and incorporated into training programs and operating practices and procedures. Certain items may already be adequately standardized in existing procedures. New technology may also remove the need for certain actions required of the flight crew. If this is so, then the intent of this guidance can be considered to be met.

Note: This document is written for all users of RVSM airspace, and as such is designed to present all required actions. It is recognized that some material may not be necessary for larger public transport operators.

2. FLIGHT PLANNING

During flight planning the flight crew shall pay particular attention to conditions that may affect operation in RVSM airspace.

These include, but may not be limited to.

- (a) verifying that the airframe is approved for RVSM operations,
- (b) reported and forecast weather on the route of flight;
- (c) minimum equipment requirements pertaining to height keeping and alerting, systems; and
- (d) any airframe or operating restriction related to RVSM approval.

3. PRE-FLIGHT PROCEDURES AT THE AIRCRAFT FOR EACH FLIGHT

The following actions shall be accomplished during the pre-flight procedure:

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- (a) Review technical logs and forms to determine the condition of equipment required for flight in the RVSM airspace. Ensure that maintenance action has been taken to correct defects to required equipment;
- (b) During the external inspection of aircraft, particular attention shall be paid to the condition of static sources and the condition of the fuselage skin near each static source and any other component that affects altimetry system accuracy. This check shall be accomplished by a qualified and authorized person other than the pilot (e.g. a flight engineer or ground engineer);
- (c) Before takeoff, the aircraft altimeters shall be set to the QNH of the airfield and shall display a known altitude, within the limits specified in the aircraft operating manuals. The two primary altimeters shall also agree within limits specified by the aircraft operating manual. An alternative procedure using QFE may also be used. Any required functioning checks of altitude indicating systems shall be performed.

Note: The maximum value for these checks cited in operating manuals should not exceed 23m (75ft).

- (d) Before take-off, equipment required for flight in RVSM airspace shall be operative, and any indications of malfunction shall be resolved.

4. PROCEDURES PRIOR TO RVSM AIRSPACE ENTRY

The following equipment shall be operating normally at entry into RVSM airspace:

- (a) Two primary altitude measurement systems.
- (b) One automatic altitude-control system.
- (c) One altitude-alerting device.

Note: Dual equipment requirements for attitude-control systems will be established by regional agreement after an evaluation of criteria such as mean time between failures, length of flight segments and availability of direct pilot-controller communications and radar surveillance.

- (d) Operating Transponder. An operating transponder may not be required for entry into all designated RVSM airspace. The operator shall determine the requirement for an operational transponder in each RVSM area where operations are intended.

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The operator shall also determine the transponder requirements for transition areas next to RVSM airspace.

Note: Should any of the required equipment fail prior to the aircraft entering RVSM airspace, the pilot shall request a new clearance to avoid entering this airspace;

5. IN-FLIGHT PROCEDURES

5.1 The following practices shall be incorporated into flight crew training and procedures:

- (a) Flight crews shall comply with any aircraft operating restrictions, if required for the specific aircraft group, e.g. limits on indicated Mach number, given in the RVSM airworthiness approval.
- (b) Emphasis shall be placed on promptly setting the sub-scale on all primary and standby altimeters to 1013.2 (hPa) /29.92 in.Hg when passing the transition altitude, and rechecking for proper altimeter setting when reaching the initial cleared flight level;
- (c) In level cruise it is essential that the aircraft is flown at the cleared flight level. This requires that particular care is taken to ensure that ATC clearances are fully understood and followed. The aircraft shall not intentionally depart from cleared flight level without a positive clearance from ATC unless the crew are conducting contingency or emergency manoeuvres;
- (d) When changing levels, the aircraft shall not be allowed to overshoot or undershoot the cleared flight level by more than 45 m (150 ft);

Note: It is recommended that the level off be accomplished using, the altitude capture feature of the automatic altitude-control system, if installed.

- (e) An automatic altitude-control system shall be operative and engaged during level cruise, except when circumstances such as the need to re-trim the aircraft or turbulence require disengagement. In any event, adherence to cruise altitude shall be done by reference to one of the two primary altimeters. Following loss of the automatic height keeping function, any consequential restrictions will be observed.
- (f) Ensure that the altitude-alerting system is operative;

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- (g) At intervals of approximately one hour, crosschecks between the primary altimeters shall be made. A minimum of two will need to agree within ± 60 m (± 200 ft). Failure to meet this condition will require that the altimetry system be reported as defective and notified to ATC;
 - (i) The usual scan of flight deck instruments shall suffice for altimeter cross checking on most flights.
 - (ii) Before entering RVSM airspace, the initial altimeter cross check of primary and standby altimeters shall be recorded.

Note: Some systems may make use of automatic altimeter comparators.

- (h) In normal operations, the altimetry system being used to control the aircraft shall be selected for the input to the altitude reporting transponder transmitting information to ATC.
 - (i) If the pilot is advised in real time that the aircraft has been identified by a height monitoring system as exhibiting a TVE greater than ± 90 m (± 300 ft) and/or an ASE greater than ± 75 m (± 245 ft) then the pilot should follow established regional procedures to protect the safe operation of the aircraft. This assumes that the monitoring system will identify the TVE or ASE within the set limits for accuracy.

If the pilot is notified by ATC of an assigned altitude deviation which exceeds ± 90 m (± 300 ft) then the pilot should take action to return to cleared flight level as quickly as possible.

5.2 Contingency procedures after entering RVSM airspace are:

5.2.1 The pilot shall notify ATC of contingencies (equipment failures, weather) which affect the ability to maintain the cleared flight level, and co-ordinate a plan of action appropriate to the airspace concerned.

Examples of equipment failures, which shall be notified, to ATC are:

- (a) failure of all automatic altitude-control systems aboard the aircraft;
- (b) loss of redundancy of altimetry systems,
- (c) loss of thrust on an engine necessitating descent; or

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- (d) any other equipment failure affecting the ability to maintain cleared flight level (CFL);

5.2.3. The pilot should notify ATC when encountering greater than moderate turbulence.

5.1.4. If unable to notify ATC and obtain an ATC clearance prior to deviating from the assigned CFL, the pilot shall follow the established contingency procedures and obtain ATC clearance as soon as possible.

6. **POST FLIGHT**

6.1. In making technical log entries against malfunctions in height-keeping systems, the pilot shall provide sufficient detail to enable maintenance to effectively troubleshoot and repair the system. The pilot shall detail the actual defect and the crew action taken to try to isolate and rectify the fault.

6.2. The following information shall be recorded when appropriate:

- (a) Primary and standby altimeter readings.
- (b) Altitude selector setting.
- (c) Subscale setting on altimeter.
- (d) Autopilot used to control the aeroplane and any differences when the alternate system was selected.
- (e) Differences in altimeter readings, if alternate static ports selected.
- (f) Use of air data computer selector for fault diagnosis procedure.
- (g) The transponder selected to provide altitude information to ATC and any difference noted when an alternative transponder was selected.

7. **SPECIAL EMPHASIS ITEMS: FLIGHT CREW TRAINING**

7.1 The following items shall also be included in flight crew training programmes:

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- (a) knowledge and understanding of standard ATC phraseology used in each area of operations and relevant AIP and NOTAM information pertaining to the route to be flown;
- (b) importance of crew members cross checking to ensure that ATC clearances are promptly and correctly complied with;
- (c) use and limitations in terms of accuracy of standby altimeters in contingencies. Where applicable, the pilot shall review the application of SSEC/PEC through the use of correction cards;

Note: Such correction data shall be readily available on the flight deck

- (d) problems of visual perception of other aircraft at 300 m (1,000 ft) planned separation during darkness, when encountering local phenomena such as northern lights, for opposite and same direction traffic, and during turns; and
- (e) characteristics of aircraft altitude capture systems which may lead to overshoots.
- (f) relationship between the aircraft's altimetry, automatic altitude control and transponder systems in normal and abnormal conditions.
- (g) any airframe operating restrictions, if required for the specific aircraft group, related to RVSM airworthiness approval.

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CHAPTER 11

ANNEXURE II

RVSM PERFORMANCE

1 General

The objectives set out by the ICAO Review of the General Concept of Separation Panel (RGCSP) have been translated into airworthiness standards by assessment of the characteristics of altimetry system error (ASE) and automatic altitude control.

2 RVSM Flight Envelopes

For the purposes of RVSM approval, the aircraft flight envelope may be considered as two parts; the Basic RVSM flight planning envelope and the Full RVSM flight envelope (referred to as the Basic envelope and the Full envelope respectively), as defined and explained in para 10.4 of this MCAR. For the Full envelope, a larger ASE is allowed.

3 Altimetry System Error

3.1 To evaluate a system against the ASE performance statements established by RGCSP, it is necessary to quantify the mean and three standard deviation values for ASE, expressed as ASE mean and ASE3SD. To do this, it is necessary to take into account the different ways in which variations in ASE can arise. The factors that affect ASE are:

- (a) Unit to unit variability of avionics equipment.
- (b) Effect of environmental operating conditions on avionics equipment.
- (c) Airframe to airframe variability of static source error.
- (d) Effect of flight operating conditions on static source error.

3.2 Assessment of ASE, whether based on measured or predicted data will need to consider sub-paragraphs (a) to (d) of 3.1. The effect of item (d) as a variable can be eliminated by evaluating ASE at the most adverse flight condition in an RVSM flight envelope.

3.3 The criteria to be met for the Basic envelope are:

- (a) At the point in the envelope where the mean ASE reaches its largest absolute value that value should not exceed 25 m (80 ft);

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- (b) At the point in the envelope where absolute mean ASE plus three standard deviations of ASE reaches its largest absolute value, the absolute value should not exceed 60 m (200 ft).

3.4 The criteria to be met for the Full envelope are:

- (a) At the worst point in the Full envelope where the mean ASE reaches its largest absolute value, the absolute value should not exceed 37 m (120 ft).
- (b) At the point in the Full envelope where the mean ASE plus three standard deviations of ASE reaches its largest absolute value, the absolute value should not exceed 75 m (245 ft).
- (c) If necessary, for the purpose of achieving RVSM approval for a group of aircraft (see para 10 of the MCAR), an operating limitation may be established to restrict aircraft from conducting RVSM operations in parts of the Full envelope where the absolute value of mean ASE exceeds 37 m (120 ft) and/or the absolute value of mean ASE plus three standard deviations of ASE exceed 75 m (245 ft). When such a limitation is established, it should be identified in the data submitted to support the approval application, and documented in appropriate aircraft operating manuals. However, visual or aural warning/indication associated with such a limitation need not be provided in the aircraft.

3.5 Aircraft types for which an application for type certification is made after 1 January 1997, should meet the criteria established for the Basic envelope in the Full RVSM envelope.

3.6 The standard for aircraft submitted for approval as non-group aircraft, as defined in para 10.7.2 of the MCAR, is as follows:

- (a) For all conditions in the Basic envelope:
 - | Residual static source error + worst case avionics | < 50 m (160 ft)
- (b) For all conditions in the Full envelope:
 - | Residual static source error + worst case avionics | < 60 m (200 ft)

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Note. Worst case avionics means that a combination of tolerance values, specified by the aircraft constructor for the altimetry fit into the aircraft, which gives the largest combined absolute value for residual SSE plus avionics errors.

4. **Altitude Keeping**

An automatic altitude control system is required capable of controlling altitude within ± 20 m (± 65 ft) about the selected altitude, when the aircraft is operated in straight and level flight under non turbulent non-gust conditions.

Note: Automatic altitude control systems with flight management system/ performance (Management system inputs allowing variations up to ± 40 m (± 130 ft) under non-turbulent, non-gust conditions, installed in aircraft types for which an application for type certification was made prior to January 1, 1997, need not be replaced or modified.

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CHAPTER

12

REQUIREMENTS FOR OPERATION OF AIRCRAFT IN MNPS AIRSPACE

1. INTRODUCTION

- 1.1 Regulation 53 and the Sixth Schedule of the Civil Aviation regulations state that every airplane shall be fitted with instrument and equipment, including radio apparatus and special equipment, as may be specified according to the use and circumstances under which the flight is to be conducted.
- 1.2 The concept of Minimum Navigation Performance Specification (MNPS) was introduced on a world wide basis in 1977 after establishing criteria for MNPS in the North Atlantic Air Navigation Meeting. The objective of MNPS Airspace is to enable operators to derive maximum economic benefit from the improvement in the capabilities of latest navigation equipment while ensuring safety of operations.
- 1.3 The Civil Aviation Regulations lays down the requirements concerning operations and airworthiness approval of navigation equipment in MNPS activities. The requirements stipulated in this Civil Aviation Regulations must be complied with by operators intending to operate their airplanes in MNPS airspace.
- 1.4 The MCAR is issued under the provisions of Regulation 135 of the Civil Aviation Regulations for information, guidance and compliance by the concerned operators operating air transport services to, through and within the MNPS airspace. The contents of this MCAR are consistent with the provisions of ICAO Annex 6 and Doc 7030 on the subject.

2. DEFINITIONS :

NAT MNPS (North Atlantic Minimum Navigation Performance Specification)

The vertical dimensions of the MNPSA is between FL 285 and FL 420 (i.e. in terms of normally used cruising levels from FL 290 to FL 410 inclusive)

The lateral dimension includes the following control areas:

REYKJAVIK (to the North Pole)

SHANWICK AND GANDER OCEANIC

SANTA MARIA OCEANIC North of 27 degree N

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NEW YORK OCEANIC North of 27 degrees N but excluding the area West of 60 degrees W and south of 38 degrees 30 minutes N

NAT Doc 001T13.5N/6 --- ICAO Guidance and information material concerning Air Navigation in NAT region refers.

3. REQUIREMENTS:

3.1 No person shall operate a Mauritian registered aircraft in air space designated as Minimum Navigation Performance Specifications (MNPS) air space unless:

- a) The operator is authorised by the DCA to perform such operations.
- b) The aircraft has approved navigation performance capability to improve MNPS in the horizontal plain through the mandatory carriage and use of navigation equipment as per requirements set forth in NAT Doc 001/T13.5 N/6 and North Atlantic Air Space Operations Manual.

3.2 Presently MNPS requirements are applicable in the North Atlantic Airspace (NAT). However, MNPS requirements may be imposed in any other airspace by the ATS providers. Specifications may not be exactly similar to that of NAT-MNPS. To meet, the accuracy requirements for navigation in the particular MNPS Airspace, appropriate equipment shall be installed for such operations. Individual approval is required for each aircraft and the operator to operate in each MNPS airspace as and when such areas are notified and operator wishes to operate in such airspace.

4. AIRCRAFT SYSTEM/EQUIPMENT REQUIREMENTS:

4.1 In order to consider each aircraft for DCA approval for unrestricted operation in the MNPSA, an aircraft shall be equipped with the following types of Long Range Navigation System (LRNS)

- a) Two Inertial Navigation Systems (INS)
or

Two navigation systems using the inputs from one or more Inertial Reference Systems (IRS) or any sensor system complying with MNPS

- b) Each LRNS must be capable of providing a continuous indication to the flight crew of the aircraft position relative to track

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- c) It is essential that the navigation system employed for the provision of steering guidance is capable of being coupled to the auto-pilot.

Note: Current Inertial Navigation Systems have demonstrated the capability of meeting NAT MNPS. Dual Navigation Systems which have been installed, operated and maintained in accordance with Appendix C of FAR 121 or JAR specifications or any other specifications acceptable to DCA can be approved for operation in NAT MNPS airspace.

- d) In case RVSM operations are required to be conducted in MNPS airspace, the following additional equipment shall also be installed.
- i) Two fully serviceable independent primary altitude measurement systems;
 - ii) One automatic altitude-control system;
 - iii) One altitude-alerting device; and
 - iv) A functioning Mode-C SSR Transponder.
- e) Carriage of standby navigation equipment shall be governed by ICAO Annex 6 Part I and Part II - Chapter 7
- f) Any other equipment which meets MNPSA accuracy criteria and is acceptable to DCA may be installed.

5. OPERATIONAL REQUIREMENT :

- 5.1 Each operator shall develop MNPSA operational procedures. The crew training guidance information may be taken from the North Atlantic MNPS Airspace Operations Manual published by UK National Air Traffic Services.
- 5.2 The operating crew shall be adequately trained and kept proficient for operation of aircraft in MNPS airspace and shall be fully aware of the procedures to be followed. During operations in MNPS airspace if there is any failure, the pilot shall inform the concerned ATC immediately and comply with their instructions.
- 5.3 Each operator shall have a system of evaluation and recording Inertial Navigation System radial errors and ensure that such defects when reported are duly rectified.

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6. MAINTENANCE REQUIREMENTS :

- 6.1 All equipment/systems as mentioned in paragraph 4 shall be maintained in accordance with the manufacturers approved maintenance program.
- 6.2 Aircraft Maintenance Engineers(AME) shall scrutinize the Flight Reports for pilot reported Inertial Navigation System radial errors or failures and ensure that such defects are promptly rectified.

7. MINIMUM EQUIPMENT LIST (MEL)

Each operator shall reflect requirements of minimum navigation systems for MNPSA as indicated in para 4 above in their MEL.

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CHAPTER 13

**AIRWORTHINESS AND MAINTENANCE REQUIREMENTS FOR CAT II & CAT IIIA
OPERATIONS**

1. INTRODUCTION

The existing Instrument Landing Systems (ILS) installed at SSR International Airport meet the Category I (Cat I) level requirement that permits landings up to Runway Visual Range (RVR) of 600m and above. In bad weather conditions similar to those that prevail in winter season in some parts of the world when RVR is below 600m, aircraft can not land or takeoff. It is therefore necessary to develop the capability to operate flights meeting the requirements of Cat II or Cat III operations and lay down necessary regulatory requirements for such operations. In order to ensure safe operations even during poor weather/poor visibility conditions, individual aircraft deployed for carrying out Cat II or Cat III (A)(B)(C) operations shall required to be specifically approved by DCA. This part of the MCAR provides an acceptable means but not the only means for obtaining airworthiness and maintenance approval of each aircraft for Cat II or Cat III(A)(B)(C) operations and low visibility takeoff.

Category I

A precision instrument approach and landing with a decision height not lower than 200 feet (61 m) above touchdown zone elevation and with either a visibility not less than 2,625 feet (800 m) or a runway visual range not less than 1,800 feet (550 m). An aircraft equipped with an Enhanced Flight Vision System may, under certain circumstances, continue an approach to CAT II minimums.

Category II

Category II operation: A precision instrument approach and landing with a decision height lower than 200 feet (61 m) above touchdown zone elevation but not lower than 100 feet (30 m), and a runway visual range not less than 1,150 feet (350 m).

Category III is subdivided

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Category III A

A precision instrument approach and landing with:

- (a) a decision height lower than 100 feet (30 m) above touchdown zone elevation, or no decision height; and
- (b) a runway visual range not less than 655 feet (200 m).

Category III B

A precision instrument approach and landing with:

- (a) a decision height lower than 50 feet (15 m) above touchdown zone elevation, or no decision height; and
- (b) a runway visual range less than 2,625 feet (800 m) but not less than 165 feet (50 m).

Category III C

A precision instrument approach and landing with no decision height and no runway visual range limitations. A Category III C system is capable of using an aircraft's autopilot to land the aircraft and can also provide guidance along the runway surface.

In each case a suitably equipped aircraft and appropriately qualified crew are required. For example, Cat IIIC requires a fail-operational system, along with a Landing Pilot (LP) who holds a Cat IIIC endorsement in their logbook, Cat I does not. A [Head-Up Display](#) which allows the pilot to perform aircraft maneuvers rather than an automatic system is considered as fail-operational. Cat I relies only on altimeter indications for decision height, whereas Cat II and Cat III (A)(B)(C) approaches use radar altimeter to determine decision height.

This MCAR is issued under the provisions Regulation 46 of the Civil Aviation Regulations for information, guidance and compliance by operators seeking approval for Cat II or Cat III operations.

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2. **DEFINITIONS**

Auto Land System

The system which provides automatic control of the aeroplane during approach & landing.

Alert height (AH)

An alert height is a height above the runway based on the characteristics of the airplane and its fail operational automatic landing system, above which a Category-III (A)(B)(C) approach would be discontinued and a missed approach initiated if a failure occurred in one of the redundant parts of the automatic landing system, or in the relevant ground equipment.

Decision altitude/height: (DA/H)

A specified altitude or height (A/H) in the precision approach at which a missed approach must be initiated if the required visual reference to continue the approach has not been established.

Note 1 Decision altitude (DA) is referenced to mean sea level (MSL) and decision height (DH) is referenced to the threshold elevation.

Note 2. The required visual reference means that section of the visual aids or of the approach area which shall have been in view for sufficient time for the pilot to have made an assessment of the aircraft position and rate of change of position, in relation to the desired flight path.

Runway Visual Range (RVR)

The range over which the pilot of an aircraft on the centre line of a runway can see the runway surface markings or the lights delineating the runway or identifying its centerline.

3. **APPLICABILITY**

The requirements spelt out in this MCAR are applicable for aircraft intended to be used for Cat II or Cat III (A)(B)(C) operations.

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4. GENERAL REQUIREMENTS

- (i) The aircraft shall have been duly type certified by the regulatory authority of the country of manufacture and meeting the design code followed by EASA of Europe or Civil Aviation Authority (CAA) of UK or Federal Aviation Administration (FAA) of USA or any other authority acceptable to DCA.
- (ii) The aircraft shall be multiengine, duly equipped with an automatic landing system, which provides automatic control of the aircraft during approach and landing. The aircraft shall have been certified for Cat II/Cat III(A)(B)(C) operations by the regulatory authority of the country of manufacture.
- (iii) Each aircraft intended to be operated for Cat II/Cat III(A)(B)(C) operations shall be identified by registration number, make and model of the aircraft and requires approval by DCA for such operations.
- (iv) The operator intending to carry out Cat II/Cat III(A)(B)(C) operations shall seek approval for the same.
- (v) The operator shall prepare a Cat II or Cat III (A)(B)(C) manual for each type of aircraft.
- (vi) The manual must contain the registration number, make and model of the aircraft to which it applies, detailed procedures, instructions, limitations and maintenance program to ensure continued serviceability, accuracy, reliability, characteristics in case of failures and degree of redundancy of the systems necessary for the Cat II/ Cat III (A)(B)(C) operations and shall be approved by DCA.
- (vii) The manual may form part of the Quality Control Manual. Any amendment to the approved manual requires DCA approval.
- (viii) The instruments and equipment required for Cat II/Cat III (A)(B)(C) operations for each type and model of the aircraft shall be listed by the operator in the manual prepared for obtaining DCA approval for above operations.
- (ix) The manual shall also contain a flight schedule for checking the performance of the aircraft in case the aircraft has not performed Cat II/Cat III (A)(B)(C) operations for a period of thirty days.

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5. PROCEDURE FOR SEEKING APPROVAL FOR CAT II OR CAT IIIA OPERATIONS:

Each operator seeking approval of aircraft for Cat II/Cat III(A)(B)(C) operations shall comply with the requirements in respect of Manuals, Instruments, Equipment & Maintenance.

Application for approval:

An applicant seeking approval of aircraft for Cat II/Cat III(A)(B)(C) operations, shall submit the application on a prescribed format along with the Cat II/Cat III(A)(B)(C) manual to the Department of Civil Aviation. A copy of the application is enclosed at Appendix-A.

6. APPROVAL OF INSTRUMENTS AND EQUIPMENT

(a) **General**

Before presenting an aircraft for approval of Cat II/Cat III (A)(B)(C) operations, it must be shown by furnishing necessary documents that, since the beginning of the 12th calendar month before the date of submission, the following checks had been carried out:

- (i) The ILS localizer and glide slope equipment shall have been bench checked according to the Manufacturer's stipulations.
- (ii) The altimeters and the static pressure systems shall have been tested and inspected in accordance with the procedure given in Appendix B of this circular or as per manufacturers recommendations or any other equivalent procedure acceptable to DCA.
- (iii) All other instruments and items of equipment required for Cat II/Cat III (A)(B)(C) operations shall have been maintained/ bench checked as per manufacturers requirements .

(b) **Flight Control Guidance System**

All components of flight control guidance system must have been approved for Cat II/IIIA operations as applicable under type or supplemental type certification procedures. In addition, subsequent changes to make, model or design of these components must be approved by regulatory authority of the country of

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manufacture. Related systems or devices such as the auto throttle and computed missed approach guidance system must be approved in the same manner, if they are to be used for Cat II/Cat III(A)(B)(C) operations.

(c) Radio Altimeter

A radio altimeter must meet the performance criteria as specified in "Minimum performance Standards - Airborne Low Range Radar Altimeter" given in RTCA/DO-155 dated 1.11.1974 and any subsequent amendments issued thereafter from time to time or manufacturer's requirements for Cat II/Cat III (A)(B)(C) operations or any other procedure acceptable to DCA.

(d) The operator shall ensure that any modification to systems and components approved for Cat II&III(A)(B)(C) operations are not affected when incorporating software changes, service bulletins, etc. Any change to system, components shall have been approved by the manufacturer and the regulatory authority of the country of manufacture.

7. MAINTENANCE REQUIREMENTS:

The maintenance program shall ensure that the airborne equipment is maintained at an acceptable level of performance, reliability, and availability, consistent with the Maintenance Review Board (MRB) or equivalent requirements.

- (i) Maintenance of the aircraft shall be carried out by an approved firm holding required approval in accordance with the procedures, instructions and limitations contained in the manual specifically prepared by the operator for Cat II/ Cat III(A)(B)(C) operations and approved by DCA.
- (ii) The instruments & equipment required for Cat II / Cat III(A)(B)(C) operations shall have been inspected and maintained in accordance with the maintenance programme contained in the approved manual.
- (iii) The operator shall ensure that tests, bench checks, overhaul, snag rectification of instruments and equipment listed in the manual are carried out by persons holding current ratings. In case the work is carried out by an outside party the operator shall ensure that such outside party is also approved by the regulatory authority of the country / DCA to undertake such work.
- (iv) Each operator shall keep a current copy of the Manual prepared for Cat II or Cat III (A)(B)(C) operations at its principal base of maintenance and night halt stations.

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8. MAINTENANCE PROGRAM

Each operator shall develop a maintenance program for Cat II / Cat III (A)(B)(C) operations:

8.1 The maintenance program developed by the operator must contain the following:

- (a) A list of each instrument and item of equipment required for Cat II / Cat IIIA operations.
- (b) A maintenance schedule that provides for the performance of inspections under sub paragraph (e) of this paragraph within three calendar months after the date of the previous inspection. The inspection must be performed by licensed AMEs/approved persons, except that each alternate inspection may be replaced by a functional flight check. This functional flight check must be performed by a pilot holding at least a Cat II / Cat III(A)(B)(C) pilot authorization for the type of aircraft checked.
- (c) A maintenance schedule for the instrument and item of equipment as listed in (a) that provides for bench check every 12 months in case the manufacturer has not given any scheduled maintenance programme. However, in case the manufacturer has provided a scheduled maintenance programme, the same may be followed.
- (d) A maintenance schedule that provides for the performance of a test and inspection of each static pressure system in accordance with Appendix B to this MCAR or any equivalent method acceptable to DCA within 12 calendar months after the date of the previous test and the inspection. However, in case the manufacturer has provided a scheduled maintenance programme, the same may be followed.
- (e) The procedures for the performance of the periodic inspections and functional flight checks to determine the ability of each listed instrument and item of equipment specified in the manual of this circular to perform as approved for Cat II or Cat III(A)(B)(C) operations including a procedure for recording functional flight checks.
- (f) A procedure for assuring that the pilot is informed of all defects in listed instruments and items of checks.
- (g) A procedure for assuring that the condition of each listed instrument and item of equipment upon which maintenance is performed is at least equal to its Cat II or Cat III(A)(B)(C) approval condition before it is returned to service for Cat II or Cat III(B)(C) operations.

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- (h) A procedure for an entry in the maintenance records that shows the date, airport indicating satisfactory Cat II & III(A)(B)(C) approaches and reasons for each unsatisfactory Cat II / Cat III(A)(B)(C) operation because of a malfunction of a listed instrument or item of equipment. All such malfunctions shall be analyzed and appropriate preventive action taken to avoid recurrence. The operator shall submit a monthly return to DCA giving required data of number of satisfactory /unsatisfactory approaches made in each month and the total number of unscheduled removals of avionics components required for Cat II&IIIA operations.
 - (a) Every operator shall establish a specific maintenance program in order to be able to check and demonstrate the full capability of the aircraft to perform Cat II/Cat III (A)(B)(C) operations. A reliability program shall be developed/extended to monitor, track and control the maintenance status of the aircraft to achieve successful Cat II/ Cat III(A)(B)(C) landings.
 - (b) The reliability program shall establish a specific procedure to govern maintenance capability of the operator to conduct Cat II/Cat III(A)(B)(C) operations in the following conditions:
 - (i) Confirmed defect with corrective action carried out.
 - (ii) Unconfirmed defect but with corrective actions
 - (iii) Aircraft dispatch under MEL conditions.
 - (iv) Unable to correct defect and not under MEL conditions.
 - (v) Unable to perform the required test.
 - (i) Establish a procedure defining upgrading/downgrading capability so as to assist the dispatch of aircraft. The dispatch policy shall be based on the minimum equipment list (MEL) as it governs the basic criteria for operations. The dispatch criteria and status of aircraft must be recorded in the tech log/flight report book with reference to MEL. Any release of aircraft under MEL shall be intimated to the flight dispatch so that the flight crew is aware of the current aircraft status and its capability for CAT II/Cat III (A)(B)(C) operations while accepting the aircraft.
 - (j) Whenever the aircraft is released under MEL a prominent placard shall be displayed in the cockpit and provisions for release of the aircraft under MEL to be strictly adhered to.

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8.2 Test equipment and standards:

The operators shall submit a program for maintenance/ calibrations of line (RAMP) test equipment, shop (bench) test equipment and listing of all primary and secondary standards utilised during maintenance / calibrations of such equipment which relates to Cat II/ Cat III (A)(B)(C) operations. Tractability to a national standard or the manufacturers calibration standards shall be maintained at all times. This shall be submitted to DCA for determination of its adequacy. Emphasis be given to standards associated with ILS receivers, flight directors, autopilot couplers, auto throttles and altimeter systems and maintenance techniques and procedures of associated redundant systems.

8.3 Training of Maintenance Personnel

Each operator has to establish an initial and recurrent training program acceptable to DCA for personnel performing maintenance work on Cat II/Cat III(A)(B)(C) airborne systems and equipment. Recurrent training shall be accomplished at least annually or when a person has not been involved in the maintenance of aircraft approved for Cat II & III(A)(B)(C) operations. The training shall include classroom and hands on aircraft training leading to a certification for Cat II & III(A)(B)(C) approval. Training record of such personnel have to be kept current and made available to DCA for inspection on demand.

- 9 Escalation of maintenance cycle of twelve calendar months for checks, tests and inspections can be considered provided the operator provides necessary justification with documentary proof for such proposal.
- 10 Approval accorded to operators shall be deemed to be invalid if any of the requirements are not satisfied during the course of operation.
- 11 Notwithstanding the above, DCA may specify any additional requirements or waive off any requirements if considered necessary.

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APPENDIX A

1. Name of the operator:
2. Aircraft type, model & Registration Number:
3. Whether certified for Cat II/Cat III (A)(B)(C) operations (enclosed necessary documents)
4. Type of approval required: Cat II/Cat III(A)(B)(C)
5. List of Equipment required for Cat II/Cat III(A)(B)(C) operations:
6. Enclose copy of the manual for Cat II /Cat III (A)(B)(C) operations:
7. Bench check status of the instruments and equipment required for Cat II/ Cat III (A)(B)(C) operations during last twelve months:
8. Training status of personnel for certifying Cat II/ Cat III (A)(B)(C) instruments and equipment:

I hereby certify that the requirements as laid down in the Mauritius Civil Airworthiness Requirements for obtaining maintenance approval for Cat II/Cat III (A)(B)(C) operation has been complied with.

Quality Assurance Manager

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CHAPTER 13

APPENDIX B

ALTIMETER SYSTEM TEST AND INSPECTION

Each person performing the altimeter system tests and' inspections shall comply with the following:

1. Static pressure system:

- (i) Ensure freedom from entrapped. moisture and restrictions.
- (ii) Determine that leakage is within the tolerances established by the manufacturer
- (iii) Determine that the static port heater, if installed, is operative.
- (iv) Ensure that no alterations or deformations of the airframe surface have been made that would affect the relationship between air pressure in the static pressure system and true ambient static air pressure for any flight condition

2. Altimeter:

2.1 Test by an appropriately rated repair facility in accordance with the following subparagraphs. Unless otherwise specified, each test for performance may be conducted with the instrument subjected to vibration. When tests are conducted with the temperature substantially different from ambient temperature of approximately 25 degrees C., allowance shall be made for the variation from the specified condition.

(i) SCALE ERROR.

With the barometric pressure scale at 29.92 inches of mercury, the altimeter shall be subjected successively to pressures corresponding to the altitude specified in Table I up to the maximum normally expected operating altitude of the airplane in which the altimeter is to be installed. The reduction in pressure shall be made at a rate not in excess of 20,000 feet per minute to within approximately 2,000 feet of the test point. The test point shall be approached at a rate compatible with the test equipment. The altimeter shall be kept at the pressure corresponding to each test point for at least I minute, but not more than 10 minutes, before a reading is taken. The error at all test points must not exceed the tolerances specified in Table 1.

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(ii) HYSTERESIS.

The hysteresis test shall begin not more than 15 minutes after the altimeter's initial exposure to the pressure corresponding to the upper limit of the scale error test prescribed in subparagraph (i); and while the altimeter is at this pressure, the hysteresis test shall commence. Pressure shall be increased at a rate simulating a descent in altitude at the rate of 5,000 to 20,000 feet per minute until within 3,000 feet of the first test point (50 percent of maximum altitude). The test point shall then be approached at a rate of approximately 3,000 feet per minute. The altimeter shall be kept at this pressure for at least 5 minutes, but not more than 15 minutes, before the test reading is taken. After the reading has been taken, the pressure shall be increased further, in the same manner as before, until the pressure corresponding to the second test point (40 percent of maximum altitude) is reached. The altimeter shall be kept at this pressure for at least 1 minute, but not more than 10 minutes, before the test reading is taken. After the reading has been taken, the pressure shall be increased further, in the same manner as before, until atmospheric pressure is reached. The reading of the altimeter at either of the two test points shall not differ by more than the tolerance specified in Table II from the reading of the altimeter for the corresponding altitude recorded during the scale error test prescribed in subparagraph (i).

(iii) AFTER EFFECT

Not more than 5 minutes after the completion of the hysteresis test prescribed in subparagraph (ii), the reading of the altimeter (corrected for any change in atmospheric pressure) shall not differ from the original atmospheric pressure reading by more than the tolerance specified in Table II.

(iv) FRICTION.

The altimeter shall be subjected to a steady rate of decrease of pressure approximating 750 feet per minute. At each altitude listed in Table III, the change in reading of the pointers after vibration shall not exceed the corresponding tolerance listed in Table III.

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(v) **CASE LEAK.**

The leakage of the altimeter case, when the pressure within it corresponds to an altitude of 18, 0010 feet; shall not change the altimeter reading by more than the tolerances. shown in Table II

(vi) **BAROMETRIC SCALE ERROR**

At constant atmospheric pressure, the barometric pressure scale shall be set at each of the pressures (falling within its range of adjustment) that are listed in Table IV, and shall cause the pointer to indicate the equivalent altitude difference shown in Table IV with a tolerance of 25 feet.

2.2 Altimeters which are of the air data computer type with associated computer systems, or which incorporate air data correction internally, may be tested in a manner and to specifications developed by the manufacturer which are acceptable to the Administrator.

3. Automatic Pressure Altitude Reporting Equipment and ATC Transponder System Integration Test.

The test must be conducted by an appropriately rated person under the conditions specified in paragraph (a). Measure the automatic pressure altitude at the output of the installed ATC transponder when interrogated on Mode C at a sufficient number of test points to ensure that the altitude reporting equipment, altimeters, and ATC transponders perform their intended functions as installed in the aircraft. The difference between the automatic reporting output and the altitude displayed at the altimeter shall not exceed 125 feet.

4. **Records:**

Comply with the provisions of this chapter as to content, form, and disposition of the records. The person performing the altimeter tests shall record on the altimeter the date and maximum altitude to which the altimeter has been tested and the persons approving the airplane for return to service shall enter that data in the airplane log or other permanent record.

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TABLE 1 ALTITUDE V PRESSURE

ALTITUDE (FEET)	EQUIVALENT PRESSURE (INCHES IN MERCURY)	TOLERANCE + (FEET)
-1000	31.018	20
0	29.921	20
500	29.385	20
1,000	28.856	20
1,500	28.335	25
2,000	27.821	30
3,000	26.817	30
4,000	25.842	35
6,000	23.978	40
8,000	22.225	60
10,000	20.577	80
12,000	19.029	90
14,000	17.577	100
16,000	16.216	110
18,000	14.942	120
20,000	13.750	130
22,000	12.636	140
25,000	11.104	155
30,000	8.885	180
35,000	7.041	205
40,000	5.538	230
45,000	4.355	255
50,000	3.425	280

TABLE II

TEST	TOLERANCE FEET
Case Leak Test	+100
Hysteresis Test	
First Test Point (50% of max altitude)	75
Second Test Point (40% of max altitude)	30
After Effect Test	

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TABLE III FRICTION

ALTITUDE (FEET)	TOLERANCE (FEET)
1000	+70
2000	70
3000	70
5000	70
10000	80
15000	90
20000	100
25000	120
30000	140
35000	160
40000	180
50000	250

TABLE IV PRESSURE ALTITUDE DIFFERENCE

PRESSURE (INCHES OF HG)	ALTITUDE DIFFERENCE (FEET)
28.10	-1727
28.50	-1340
29.00	-863
29.50	-392
29.92	0
30.50	+531
30.90	+893
30.99	+974

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CHAPTER 14

AIRCRAFT LEASING ARRANGEMENTS

A. AIRWORTHINESS AND OPERATIONAL CONTROL OF FOREIGN AIRCRAFT LEASED BY MAURITIAN OPERATORS

1. INTRODUCTION

- 1.1 In the recent years, the practice of operating aircraft on leased with or without crew has become prevalent in the industry. National regulations of the contracting States require that the airworthiness authority should ensure that every aircraft on their registry, including those leased out to an operator conducting flights under the authority of another State, operate in compliance with the regulations of the State of Registry. However, in discharging this responsibility, practical problems arise because the leased aircraft mostly operate in distant areas where the State of Registry finds it difficult to conduct their safety inspections. Compliance with the safety standards of the State of Registry may, therefore, diminish and violations of their regulations may occur. These may remain unknown to the State of Registry with the result the enforcement action to prevent such violations is unlikely to be taken with respect to operations of such leased aircraft. Unless clear guidelines and requirements for control of airworthiness and operational aspects of such aircraft are laid down, it may create complex legal, safety, enforcement and practical problems for both the State of Registry of the aircraft and the State of Operator because of possible uncertainty as to which State is responsible for the safe operation and airworthiness of the aircraft and as to which State's regulations are required to be complied with. The problems associated with leased aircraft operations may become more serious if the lessee has little or no previous experience in aviation industry.
- 1.2 ICAO has become increasingly aware of the foregoing problems and accordingly it was decided to amend the Chicago Convention in order to permit the transfer of certain functions and duties from the State of Registry to the State of Operator in case of lease, charter, interchange or similar arrangement of aircraft. Accordingly, Article 83 bis was approved by the Assembly which inter alia stipulates that when an aircraft registered in a Contracting State is operated pursuant to an agreement for the lease, charter or interchange of the aircraft or any similar arrangements by an operator who has his principal place of business or, if he has no such place of business, his permanent residence in another Contracting State, the State of Registry may, by agreement with such other State, transfer to it all or part of its functions and duties as State of Registry in respect of that aircraft under Articles 12, 30, 31 and 32 (a) of the Chicago Convention. The State of Registry shall be relieved of responsibility in respect of the functions and duties transferred. Article 83 bis which entered into force on 20th June, 1997, provides for the possibility of transferring certain functions and duties from the State of Registry to the State of the Operator, which can enhance safety in leased aircraft operations.

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1.2 Mauritius has ratified Article 83 bis and has accordingly made necessary regulatory provisions for its implementation vide regulation 133 of the Civil Aviation Regulations, for transfer of responsibility for airworthiness and operational control of leased aircraft operations. ICAO has carried out a study on aircraft leasing and prepared guidelines on the implementation of Article 83 bis to assist States in developing transparent and effective policies in this regard, which were circulated to States on 14th May, 1999. These guidelines have been kept in view while preparing this Civil Aviation Requirement laying down requirements for maintenance, operation and safety oversight of leased aircraft for operation by or on behalf of Mauritius operators.

2. APPLICABILITY

This Civil Aviation Requirement is applicable to all aircraft being subject to a lease and engaged in public transport operations by or on behalf of Mauritius operators.

3. DEFINITIONS

(a) **Dry Lease :**

The lease of an aircraft without crew is normally referred to as a Dry Lease. A dry lease requires that the aircraft is registered in the State of Operator.

(b) **Wet Lease :**

The lease of an aircraft with flight crew provided is normally referred to as a Wet Lease.

4. MAXIMUM PERMISSIBLE AGE OF AIRCRAFT FOR IMPORT INTO MAURITIUS

4.1 The maximum permissible age and cycles/flying hours of an aircraft that a Mauritian operator can import for operations shall be as follows:

(a) Pressurised aircraft to be imported shall not exceed the following criteria :

(i) 15 years of age since manufacture

(ii) 75 percent of design economic life

(iii) 45,000 pressurisation cycles

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Pressurised aircraft for exclusive use of cargo operations which are more than 15 years old but not exceeding 20 years since manufacture may be permitted for **import** provided it has been inspected by DCA representative and found to be of satisfactory airworthiness standard.

- (b) In the case of unpressurised aircraft, the decision will be on a case to case basis and on a complete examination of the records of the aircraft being procured. However, DCA, Mauritius would normally not allow import of aircraft, which are more than 20 years old.

5. REQUIREMENTS RELATING TO OPERATIONS WITH AIRCRAFT TAKEN ON DRY LEASE

- 5.1 All aircraft intended to be operated by a Mauritian operator under dry lease agreement must be registered in Mauritius and entered in the operating permit of the operator. The aircraft must hold valid certificate of registration and certificate of airworthiness issued by DCA Mauritian.
- 5.2 The Mauritius registration of the aircraft shall be valid so long as the lease is in force and the aircraft is maintained and operated in accordance with the regulations of DCA Mauritius, the terms and conditions specified in the operator's permit and the operator's maintenance control and operations manuals.
- 5.3 The Mauritius operator shall be responsible for complete airworthiness and operational control over the aircraft with all the attendant responsibilities.
- 5.4 The leased aircraft shall be subjected to airworthiness certification, maintenance and inspection procedures prescribed by DCA Mauritius as in the case of any other Mauritius registered aircraft.
- 5.5 In order that the Mauritian operator could exercise effective maintenance and airworthiness control of the aircraft, it is necessary to know the history of the aircraft. The lessor should, therefore, provide history cards of all components.
- 5.6 The Mauritian operator wishing to operate the dry leased aircraft, shall provide complete maintenance programme of the aircraft to the DCA for approval including the issue of flight release, maintenance policy, MEL, storage lives of components and other items as stipulated in the Civil Aviation Regulations, the AOCR and the MCAR. The Mauritian operator shall adopt a maintenance programme based on the Maintenance Planning Document (MPD) and the MRB, suitably modified keeping in view the Mauritian operating environment, experience and facilities available.

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- 5.7 The operator shall train his engineers and flight crew to the satisfaction of DCA and shall obtain necessary approvals or endorsements before they are allowed to maintain or operate the aircraft. The training programme should be approved by DCA prior to sending the engineers and crew for training.
- 5.8 The Mauritian operator importing aircraft on lease shall ensure that all the Airworthiness Directives, modifications and inspections declared mandatory by DCA, Mauritius are complied with even if their compliance is not mandatory in the country from where the aircraft is imported.
- 5.9 The leased aircraft shall be fitted with the instruments and equipments in accordance with the Civil Aviation Regulations, besides the requirements of the country of manufacture. Specifically, the operator must ensure that the aircraft is equipped with ACAS, EGPWS, floor path lighting, fire blocking material, Transponder, Emergency Locator Transmitter (water and impact activated), appropriate type of DFDR/SSFDR, CVR and such other equipment as made mandatory by DCA.
- 5.10 In accordance with regulation 59 installations of flight recorders (CVR and DFDR/SSFDR) is mandatory. Installation of these recorders does not serve the desired purpose unless the operators have facilities for retrieving and analysing the stored information. The flight recorder data is being extensively utilised for accident/incident prevention. For this purpose, operators should have computerised programmes and facilities to detect exceedances of the flight parameters from the laid down limits by analysing the DFDR/SSFDR data. All operators should, therefore, develop the facilities for read out and analysis of the data of flight recorders which should be approved by DCA.
- 5.11 The Mauritian operator should ensure that the ground equipment such as battery cart, trestles, tools, special tools specific to the aircraft/engines for carrying out the inspections and schedules within the country are available with him before start of the operations.
- 5.12 The operator should establish his own ancillary shops for investigation of failed components, repair and overhaul of the rotables installed on the aircraft. In case the operator is unable to establish such allied shops, it may set up shops in collaboration with other operators or it may utilise the services of other approved shops. If the operator has plan to send defective components abroad, it should be ensured that complete defect investigation report is obtained from the overhaul/repair agency and submitted to DCA.
- 5.13 All flight crew shall be in possession of current appropriate licences with IR on type and valid proficiency checks. They shall also fully familiarise themselves with the routes they intend to fly. They shall operate under the operational control of the Mauritian operator.
- 5.14 The operator shall have an operations manual for the type of leased aircraft. All the flight crew shall be made thoroughly familiar by the operator with the contents of the manual before

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they start flying the aircraft type. The manual shall be updated from time to time incorporating the latest instructions and operating procedures, which shall also be brought to the notice of each crew member.

- 5.15 All safety regulations promulgated by DCA shall be complied with.
- 5.16 If the operator has to use foreign licenced crew or engineers for a limited period, it shall be done with the prior approval of the competent authority and only after grant of validation/approval of current foreign licences held by the flight crew or engineers and necessary security clearance. Such foreign crew and engineers shall also comply with the conditions stipulated in subsequent Para 6 for wet lease operations.
- 5.17 The cabin crew shall successfully undergo the DCA approved training as laid down in the Civil Aviation Regulations and AOCR.
- 5.18 The flight dispatchers shall undergo the DCA approved training course successfully as laid down in Regulation 39 of the Civil Aviation Regulations and the AOCR.
- 5.19 The commercial staff shall be adequately trained for the preparation of load and trim sheet and proper loading of the aircraft, as laid down in the AOCR.
- 5.20 Dry leasing of an aircraft type not presently in service with any Mauritian operator will require training of DCA personnel also so as to enable DCA to exercise airworthiness and operational control on the new type of aircraft. The lessee will, therefore, arrange training of at least two DCA officers at the facilities of the aircraft manufacturer or any other approved agency with whom he has made arrangement to train its personnel.

6. REQUIREMENTS FOR OPERATION WITH AIRCRAFT TAKEN ON WET-LEASE

- 6.1 Operation of foreign aircraft leased by Mauritian operators is normally permitted on wet lease basis. Import of aircraft for domestic air transport operations on wet lease basis shall not be permitted except in emergency situations and circumstances mentioned below :
 - (i) Existing aircraft of an operator is grounded for maintenance/inspection checks or due to any other unforeseen reasons. In such cases, wet leasing shall be permitted only for the duration of grounding of aircraft.
 - (ii) Existing aircraft is involved in some accident/incident resulting in reduction in capacity of the operator.

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- (iii) There is reduction of capacity due to expiry of lease and delay in finalisation of new lease agreement.
 - (iv) For revival of sick operators who should have an agreement with the lessor initially for wet lease for a period not exceeding six months and thereafter automatic conversion to dry lease for the remaining period of lease.
 - (v) Short term induction of capacity required to meet emergency situation such as natural calamity, industrial unrest or any other similar situation.
- 6.2 The Aeronautical Authority of the State of Registry of the aircraft proposed to be imported on wet lease by a Mauritian operator shall enter into an agreement with DCA Mauritius to transfer all or part of the duties and functions pertaining to Articles 12, 30, 31 and 32(a) of the Chicago Convention to enhance surveillance and safety of operations keeping in view the guidelines and the model agreement prepared by the ICAO Secretariat on the implementation of Article 83 bis and circulated to States vide ICAO letter EC 2182, LE 4/55-99/54 dated 14th May, 1999. The specific responsibilities to be transferred and the particular aircraft to which they will apply shall be included in the agreement.
- 6.3 The State of Registry shall confirm that their legislation enables them to divest themselves of the functions and duties which are the object of the transfer agreement.
- 6.4 There should be a well defined agreement between the lessee and lessor stipulating that the Mauritian operator and DCA Mauritius will have the authority to exercise airworthiness and operational control on the wet lease aircraft operations.
- 6.5 The Mauritian operator intending to use wet leased foreign aircraft must hold a current operating permit issued by DCA Mauritius for the type of operations.
- 6.6 The operating conditions in Mauritius are more demanding because weather conditions, hilly terrain around the airport
- 6.6.1 The foreign licenced Pilot-in-Command, shall have a minimum of 500 hours flying experience as PIC on the type in case of fixed wing aircraft and 250 hours in case of rotary wing aircraft.
 - 6.6.2 The flight crew should undergo medical examination at the periodicity prescribed in the Civil Aviation Regulations and the AOCR.
 - 6.6.3 The flight crew should undergo periodic refresher course at least once in a year.

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- 6.6.4 The flight crew should comply with the Flight and Duty Time Limitations of the Mauritian operator and in no case exceed the FDTL laid down by DCA.
- 6.6.5 The flight crew shall follow the weather minima of the Mauritian operator as approved by DCA.
- 6.6.6 The flight crew and maintenance engineers will operate and maintain the aircraft of Mauritian operator under the authorisation granted by DCA.
- 6.6.7 The crew will be subjected to pre-flight medical examination as per the requirements laid down by DCA, and shall comply with the provisions of the Civil Aviation Regulations.
- 6.6.8 It will be the responsibility of the operator to give thorough briefing to the foreign crew, about the Civil Aviation Regulations and requirements, standard departure and arrival procedures at SSR International airport and Plaine Corail, Airport, standard operating procedures, prohibited areas and precautions to be exercised while operating.
- 6.6.9 Before the foreign crews are scheduled to operate flights, they should undergo thorough briefing about the special operating procedures applicable to the operation and also undergo a minimum of one satisfactory route check to each such airport.
- 6.6.10 The flight crew and the maintenance personnel shall comply with the instructions issued by the operator and the DCA. In case of any violation, their validation or approval to operate or maintain the aircraft in Mauritius may be withdrawn.
- 6.6.11 The Flight Operations Inspectors and other officers authorised by DCA may carry out random inspection/check of the operations.
- 6.6.12 Operations of the leased aircraft shall be subjected to normal surveillance by the operator and DCA and also monitoring of flight recorder data to detect exceedances of limits of operating flight parameters and take necessary preventive measures.
- 6.6.13 In case of any violation or accident/incident attributable to crew proficiency, the validation granted to foreign crew for operating aircraft of the operator may be withdrawn.
- 6.6.14 The foreign crew and maintenance engineers can be deployed by the operators for operating and maintaining aircraft only after they are cleared by the security agencies and on issue of validation or approval by DCA.

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- 6.6.15 Pilots of more than 65 years age shall not be deployed for commercial air transport operations.
- 6.6.16 The cabin crew shall undergo training in accordance with the requirements laid down in Civil Aviation Regulations and the AOCR. If the operator wishes to use some cabin crew of the foreign operators, they should undergo the differences training necessary to meet the requirements of DCA. The cabin crew should be trained and approved on the aircraft type.
- 6.6.17 The commercial staff shall be adequately trained for the preparation of load and trim sheet and proper loading of the aircraft.
- 6.6.18 It will be the responsibility of the operator to provide pre-flight briefing and conducting pre-flight medical examination of the crew.
- 6.6.19 The flight crew shall ensure reporting of all incidents/accidents to DCA in accordance with Mauritian rules and regulations.
- 6.6.20 The flight crew should be fully proficient to communicate in English language with the Air Traffic Control Units; they will have to show proof of the English Language proficiency.

7. GENERAL REQUIREMENTS

- 7.1 For leased aircraft operations in Mauritius, the aircraft should have been type certificated by Federal Aviation Administration of USA or EASA Airworthiness Authority of Europe or Civil Aviation Authority of UK or any other authority acceptable to DCA.
- 7.2 The lessee shall provide to DCA information as stipulated in Annexure-1 about the aircraft proposed to be leased.
- 7.3 An operator shall not continue to utilise a pilot as a pilot-in-command on a route unless, within the preceding 12 months, the pilot has made at least one trip between the terminal points of that route as a pilot member of the flight crew, or as an observer on the flight deck and meets the route and airport qualifications stipulated in AOCR.
- 7.4 The lessee shall provide a copy of the lease agreement to DCA. The operator shall confirm that the lease agreement does not contain any provision which will be binding to DCA Mauritius.

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- 7.5 The lessor shall give an undertaking in the lease agreement that he will comply with all the applicable rules and requirements of this MCAR.
- 7.6 DCA may refuse import or operation of any aircraft under lease if reasonable doubt exists regarding airworthiness of the aircraft.
- 7.7 Aircraft operated under wet lease shall be endorsed on the permit of the operator. Leased aircraft operations shall be endorsed in the Operations Specifications of the operator.
- 7.8 DCA may withdraw permission for operation of a particular aircraft in Mauritius under lease agreement if during service it is found that safety of the aircraft operations is in doubt or the requirements of this MCAR or any other safety rules and regulations are not being complied with.
- 7.9 DCA may stipulate such additional requirements as may be considered necessary from time to time to do so with a view to ensure and enhance the safety of operations, which shall be complied with.

B. OTHER TYPES OF LEASING ARRANGEMENTS

For any other types of leasing arrangements, as defined in ICAO Doc 9760, not described above such as wet leases between Mauritian AOC holders, dry leases with Mauritius registered aircraft, reference should be made for additional and supplemental requirements in the Airworthiness Notice AN 01/2015 on Aircraft Leasing Arrangements for all requirements to be complied with.

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CHAPTER 14

ANNEXURE - I

INFORMATION TO BE SUPPLIED ABOUT LEASED AIRCRAFT

- i. The aircraft type and serial number;
- ii. Date of manufacture;
- iii. Registration details;
- iv. Total aircraft flying hours/cycles logged since new.
- v. Cycles/hours logged by each engine since new and last overhaul;
- vi. Status of compliance of mandatory modifications/service Bulletins;
- vii. The areas of previous operation;
- viii. Details of maintenance programme followed and approved by the airworthiness authority of the State of Registry;
- ix. Name and address of the owner/operator;
- x. Details of accidents/incidents, if any;
- xi. Details of repairs carried out;
- xii. TBOs and lives of all lived components;
- xiii. History cards of all components; and
- xiv. A statement from the owner/operator that the aircraft fully complies with the airworthiness requirements of the State of Registry.

Date:

Authorised Signatory

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CHAPTER 15

EXEMPTION PROCEDURE FOR NON-COMPLIANCES WITH AIRCRAFT REGULATIONS.

1. INTRODUCTION

The provision of the Civil Aviation Regulations apply to, whole of Mauritius, and to persons on, aircraft registered in Mauritius wherever they may be and also to, and to persons on, all aircraft for the time being in or over Mauritius except otherwise specified.

In consonance with the above, all persons/ aircraft are expected to comply with the rules/ regulations stipulated in the Civil Aviation Regulations. However, there may be situations wherein it may not be possible to comply with the regulations because of exceptional circumstances, physical constraints, non-availability of specified equipment etc. which may warrant exemption from the Civil Aviation Regulations.

To cater to such circumstances, Article 13 of the Civil Aviation Act 1974 provides the Minister responsible for aviation the power to exempt any aircraft, person or an organization from the provisions of the Civil Aviation Act and the Civil Aviation Regulations, either wholly or partially, subject to such conditions, if any, as may be specified in such order which may be of a general or specific nature. In addition, the Director of Civil Aviation and other authorized officers of the DCA have inherent or delegated powers under Regulation 4 of the Civil Aviation Regulation for granting exemption from specific provisos of the Civil Aviation Regulations.

This MCAR is issued under Regulation 135 of the Civil Aviation Regulations and stipulates the procedures for application and grant of exemptions for non-compliance of Aircraft Regulations.

2. PROCEDURE FOR SEEKING EXEMPTIONS

- 2.1 A person/ organization seeking exemption shall submit separate application for each exemption in the prescribed proforma to the DCA. (Appendix I).
- 2.2 The application for exemption shall clear state the reasons for seeking exemption and be supported with the reasons for non-compliance, safety assessment reports, along with means of mitigation and indication as to when compliance can be expected.
- 2.3 An application for a standard exemption shall include:

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- i. the applicant's name and current mailing address.
 - ii. the relevant provisions of rules for which the exemption is sought.
 - iii. the category under which exemption sought (temporary/ permanent) and justifiable reasons why the applicant needs the exemption. The reasons provided should be detailed and self-explanatory.
 - iv. the period for which the exemption is required.
 - v. whether the exemption will affect a particular kind of operation, the details thereof;
 - vi. The action plan for rectification and review of non-compliance for temporary exemption, including the mitigation measures adopted for ensuring the safety during the exemption period.
 - vi. If a permanent exemption is sought, the applicant has to indicate the mitigation measures adopted to reduce the risk arising due to noncompliance after carrying out a safety assessment.
 - viii. Undertaking by the person/ organization that he shall annually review the conditions or mitigation measures and any other resultant non-compliance in particular when any significant changes in the activity are proposed.
- 2.4 The applicant should provide adequate information in the prescribed proforma for consideration for granting exemptions with supporting documents. Failure to provide adequate information may delay processing/ refusal of the application.

3 GRANT OF EXEMPTION UNDER ARTICLE 13 OF THE CIVIL AVIATION ACT

- 3.1 Exemptions under article 13 of the Civil Aviation Act can only be granted by the Minister responsible for Civil Aviation.
- 3.2 The Director of Civil Aviation shall forward the application for approval by the Minister along with his recommendations after technical evaluation of the application by the concerned division of the Department. The recommendation for allowing exemptions may contain conditions/ limitations for the person/ organization to follow while operating under the exemption. In all cases, before recommending exemption, it shall be ascertained that an equivalent level of safety is maintained.

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4. **GRANT OF EXEMPTION UNDER THE CIVIL AVIATION REGULATIONS OTHER THAN THE CIVIL AVIATION ACT**
- 4.1 Exemptions under the Civil Aviation Regulation other than the Civil Aviation Act of 1974 shall be granted by the Director of Civil Aviation or any authorised officer specified in the Civil Aviation Regulations.
- 4.2 The concerned Division shall carry out a technical evaluation of the application for grant of exemption. The exemption, if granted, may contain conditions/ limitations for the person/ organization to follow while operating under the exemption. In all cases, before granting exemption, it shall be ascertained that an equivalent level of safety is maintained.
- 5 The exemption, once approved, shall be included in the relevant manuals. (Operations Manual/ Quality Manual)
- 6 Exemptions of 'temporary' nature shall be reviewed annually by the person/ organization with respect to the conditions or mitigation measures.
- 7 On removal of the exemption the holder shall notify the same to the DCA.
- 8 DCA may refuse the requests for exemptions which do not have adequate justification for non-compliance.

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APPENDIX I

APPLICATION FOR AN EXEMPTION

1	DETAILS OF APPLICANT	
1.1	Name of Applicant/ Organization and Address	
1.2	License/ Approval Number	
2	DETAILS OF EXEMPTION SOUGHT	
2.1	Relevant provisions of Rule/ CAR/ procedures for which exemption is sought.	
2.2	Reasons why the exemption is needed. (The reasons provided should be detailed and self explanatory)	
2.3	Nature of exemption (Temporary/ Permanent)	
2.4	Period for which exemption is required.	
2.5	if the exemption will affect a particular kind of operation, the details thereof	
2.6	for temporary exemption, the action plan for rectification and review of noncompliance, including the mitigation measures adopted for ensuring the safety during the exemption period.	
2.7	for permanent exemption, the mitigation measures	

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	adopted to ensure safety of aircraft operation. Complete safety assessment report shall be enclosed.	
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I hereby certify that the forgoing information is correct in every respect and no relevant information has been withheld. I also undertake the responsibility for annually reviewing the conditions or mitigation measures and any other resultant non-compliance in particular when any significant changes in the nature of operation are proposed.

SIGNATURE OF APPLICANT

DATE.....NAME.....
(in capital letters)

POSITION HELD.....
(with official seal)

- Note:**
- (i) *It is an offence to make any false representation with the intent to deceive, for the purpose of procuring exemption*
 - (ii) *Application not completed in all respect and not accompanied with relevant enclosures is likely to be rejected.*

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CHAPTER 16

RETURN TO SERVICE OF AIRCRAFT ITEMS -RECOVERED FROM THE AIRCRAFT INVOLVED IN ACCIDENTS/INCIDENTS OR AIRCRAFT NO LONGER IN SERVICE.

1. INTRODUCTION

This Requirement is issued to give the guidance of establishing the acceptability of aircraft items recovered from the aircraft involved in an accident/incident and states the conditions to be met before such items may be returned to service.

This Department when in receipt of request seeking permission for use of aircraft instrument/equipments from the aircraft, which has been involved in an accident/incident or no longer in service. Though such items may not manifest any visual evidence of damage, distortion or change of characteristics a serious airworthiness hazard could result from their use without special precautions being taken as detailed in the MCAR.

2 ESTABLISHING THE ORIGINS OF RECOVERED ITEMS

2.1 When an aircraft has been involved in an accident/incident, the title to the salvage may pass from the insured owner to other person (e.g. aircraft insurers) and this salvage may be offered for sale either complete or as separate aircraft item in an “as is where is” condition. For an aircraft which no longer is in service the owner will normally provide any available records for the parts.

While some of the items may be totally unaffected by the accident/incident which caused the aircraft to be declared as salvage, it is essential to obtain clear evidence that this is the case. If such evidence cannot be obtained, the item may not be returned to service.

2.2 All such items must therefore be subjected to an assessment and inspection by a competent person/agency in the light of adequate knowledge of the circumstances of the accident, subsequent storage and transport conditions, and with evidence of previous operational history obtained from valid airworthiness records, before overhaul and re- installation can be considered.

2.3 If the crash load has been above the proof strength, the residual strain remains which may reduce the effective strength of the item or otherwise impair its functioning. Loads higher than this may of course damage the item. Further, a reduction in the strength may be caused by virtue of change of a material characteristic following overheat from a fire. It is therefore considered utmost important to establish that the items neither cracked,

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distorted nor overheated. The degree of distortion may be difficult to assess if the precise original dimensions are not known, in which case there is no option but to reject the item. Any evidence of overheating would call for a laboratory investigation.

The standard procedure appropriate to items removed for overhaul following service life may not therefore be considered sufficient for the items from the salvage aircraft. If the information in the manufacturer manual or other technical publication is insufficient to deal with the situation detailed above then the manufacture must be consulted for guidance.

- 2.4 For parts obtained from an aircraft no longer in service, depending on the condition of the storage or otherwise, special care should be taken while recovering parts subjected to environmental action.

3 INFORMATION REQUIRED FROM AVIATION INSURERS AND OWNERS

Aviation insurers and other persons who obtain title to salvage parts may supply to salvage purchasers the details of the accident/incident leading to aircraft or aircraft item, being declared as salvage. It is also common practice for aviation insurer to pass over the airworthiness records to the salvage purchaser. Whilst such information and records are an essential part of the assessment, where return to service is considered, they are not a guarantee that the item is acceptable for reinstallation.

No operator should use any item/equipment of the aircraft, which has been involved in an accident/incident or from an aircraft no longer in service without observing the above detailed procedures and the permission of the DCA. The operator should forward their request seeking permission for use of item/equipment of the accidental aircraft or from an aircraft not in service to the Department of Civil Aviation ensuring the above procedure.

- 3.1 The DCA will authorize only parts for which the history can be easily be traced, all other parts will have to be scrapped.

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CHAPTER 16.1

DISPOSITION OF UNSALVAGEABLE AIRCRAFT PARTS AND MATERIALS

1 PURPOSE

This document provides information and guidance to persons involved in the sale, maintenance, or disposal of aircraft parts. It provides information and guidance to prevent unsalvageable aircraft parts and materials from being sold as serviceable parts and materials. It provides one means, but not the only means, of complying with the requirements for control of rejected parts and materials.

2 BACKGROUND

It is common practice for possessors of aircraft parts to dispose of unsalvageable parts and materials by selling, discarding, or transferring such items. In some instances, these items have reappeared for sale and in the active parts inventories of the aviation community. Misrepresentations of the status of parts and material and the practice of making such items appear serviceable have resulted in the use of unsalvageable nonconforming parts and materials.

3 TYPES OF PARTS AND MATERIALS THAT MAY BE MISREPRESENTED

Persons disposing of unsalvageable aircraft parts and materials should consider the possibility of such parts and materials later being misrepresented and sold as serviceable parts and materials. Caution should be exercised to ensure that the following types of parts and materials are disposed of in a manner that does not allow them to be returned to service:

- (a) Parts with non repairable defects, whether visible or not to the naked eye.
- (b) Parts that are not within the specifications set forth by the approved design, and cannot be brought into conformance with applicable specifications.
- (c) Parts and materials for which further processing or rework cannot make them eligible for certification under a recognized certificate holder's system.
- (d) Parts subjected to unacceptable modification or rework that is irreversible.

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- (e) Life limited parts that have reached or exceeded their life limits, or have missing or incomplete records.
- (f) Parts that cannot be returned to airworthy condition due to exposure to extreme forces or heat.
- (g) Principal structural elements (PSE) removed from a high cycle aircraft for which conformity cannot be accomplished by complying with the applicable aging aircraft airworthiness directives.

4 METHODS TO PREVENT MISREPRESENTATION OF UNSALVAGEABLE PARTS AND MATERIALS

- (a). Persons disposing of unsalvageable aircraft parts and materials should, when appropriate, mutilate those parts and materials prior to release. Mutilation should be accomplished in such a manner that the parts become unusable for their original intended use. Mutilated parts should not be able to be reworked or camouflaged to provide the appearance of being serviceable, such as by replating, shortening and rethreading long bolts, welding, straightening, machining, cleaning, polishing, or repainting.
 - (1) Mutilation may be accomplished by one or a combination of the following procedures, but is not limited to:
 - (a) Grinding.
 - (b) Burning.
 - (c) Removal of a major lug or other integral feature.
 - (d) Permanent distortion of parts.
 - (e) Cutting a hole with cutting torch or saw.
 - (f) Melting.
 - (g) Sawing into many small pieces.
 - (2) The following procedures are examples of mutilation that are often less successful because they may not be consistently effective:
 - (a) Stamping (such as a stamped "R" on a part).

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- (b) Spraying with paint.
 - (c) Hammer marks.
 - (d) Identification by tag or markings.
 - (e) Drilling small holes.
 - (f) Sawing in two pieces. Persons who rework unsalvageable parts and materials may be highly skilled technicians and have been known to rejoin parts cut in two pieces in such a manner that the mutilation proves difficult to detect.
- (b) Persons disposing of unsalvageable aircraft parts and materials may choose to release those parts for legitimate non flight uses, such as for training and education, research and development, or for non aviation applications. In such instances, mutilation may not be appropriate. The following methods should be used to prevent misrepresentation:
- (1) Permanently marking or stamping the parts, subparts, and material as "NOT SERVICEABLE." (Ink stamping is not an acceptable method) ;
 - (2) Removing original part number identification;
 - (3) Removing data plate identification;
 - (4) Maintaining a tracking or accountability system, by serial number or other individualized data, to record transferred unsalvageable aircraft parts and materials; and
 - (5) Including written quality assurance procedures concerning disposition and disposal of such parts and materials in any agreement or contract transferring such parts and materials.

NOTE: Unsalvageable or expired life limited parts and materials should not be released to any person or organization that may end up placing the parts and materials back in actual use, due to the criticality of part and material failure and the potential safety threat.

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- (c) Organizations handling unsalvageable or expired life limited aircraft parts and materials should establish secure areas in which to segregate such items from active serviceable inventories and to prevent unauthorized access. Caution should be exercised to ensure that these parts and materials receive the appropriate final disposition.
- (d) Manufacturers producing approved aircraft parts should maintain records of serial numbers for "retired" life limited or other critical parts. In such cases, the owner who mutilates applicable parts is encouraged to provide the original manufacturer with the data plate and/or serial number and final disposition of the part.
- (e) All purchasers of aircraft parts and materials should ensure that misrepresented unsalvageable parts and materials are not received into active inventory. The following are examples of conditions to be alert for when receiving parts:
 - (1) "New" parts showing signs of rework.
 - (2) Used parts showing signs of unapproved or inappropriate repair.
 - (3) Parts with poor workmanship or signs of rework in the area of the part number or serial number inscription.
 - (4) Used parts lacking verifiable documentation of history and FAA approval.
 - (5) Parts with prices "too good to be true."
 - (6) Questionable part numbers, fraudulent or suspicious Technical Standard Order or Manufacturer Approval markings and/or re identification, stamp overs or vibro etching on the data plate.
 - (7) Parts delivered with photocopied or missing maintenance release tags.
 - (8) Parts with a finish that is inconsistent with industry standards (e.g., discoloration, inconsistencies, resurfacing).
 - (9) New parts sold with maintenance release tags reflecting a status other than new.
 - (10) Parts with poor documentation exhibiting incomplete or inconsistent part identity information.

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- (11) Intact "scrap" unsalvageable parts offered in bulk weight for prices higher than for mutilated parts with identical weight and content.

5 SUSPECTED UNAPPROVED PART(s)

Suspected unapproved parts should be reported to the DCA