澳門特別行政區
REGIÃO ADMINISTRATIVA ESPECIAL DE MACAU
民航局
AUTORIDADE DE AVIAÇÃO CIVIL
CIVIL AVIATION AUTHORITY

AC
No. : AC/AW/011R02
Date : 01 June 2020

AERONAUTICAL CIRCULAR
CIVIL AVIATION AUTHORITY – MACAO, CHINA

SUBJECT:

Macao Aviation Requirements

MAR-145 Approved Maintenance Organisations

EFFECTIVE DATE:

01 June 2020

CANCELLATION:

This AC supersedes the following ACs:

- AC/AW/011R01 dated 31 October 2014

GENERAL:

The President of Civil Aviation Authority – Macao, China, in exercise of his power under Paragraph 89 of the Air Navigation Regulation of Macao (ANRM) and Article 35 of the Statutes of Civil Aviation Authority, approved by the Decree-Law 10/91/M, established this Aeronautical Circular (AC).

1 Reissue of MAR-145 Approved Maintenance Organisations

1.1 The MAR-145 Approved Maintenance Organisations Issue 5, attached to this AC, prescribes the requirements to be met by organisations seeking for approval to perform and release to service maintenance on Macao registered aircraft used for Commercial Air Transport or any aircraft component intended for fitment to such aircraft.

1.2 The MAR-145 was firstly issued on 18 September 1998 and comes into force on 01 October 1998. The document was subsequently amended on 31 May 2002, 15 October 2003, 30 June 2006, 07 November 2008 and 31 October 2014.

1.3 The MAR-145 Issue 5 was developed based on European Aviation Safety Agency (EASA) Part 145 published in Commission Regulation No. 1321/2014 of 26 November 2014 incorporated with amendment up to Commission Regulation No. 2015/1536 and the related Acceptable Means of Compliance and Guidance Materials incorporated with amendment up to ED Decision 2017/016/R.

1.4 All changes have been stated in the Preambles of MAR-145.

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2 Amendment to the current ANRM

2.1 Paragraph 2 of the ANRM shall be revised as follow:

"…

Maintenance means the performance of tasks on an aircraft, engine, propeller or associated part required to ensure the continuing airworthiness of an aircraft, engine, propeller or associated part including any one or combination of overhaul, inspection, replacement, defect rectification, and the embodiment of a modification or repair.

…"

"…

Repair means the restoration of an aircraft, engine, propeller or associated part to an airworthy condition in accordance with the appropriate airworthiness requirements after it has been damaged or subjected to wear.

…"

- END

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Macao Aviation Requirements

MAR-145

Approved Maintenance Organisations

Issue 5

Approved by:

President
AACM

Latest revision of this document is available in the following website:

www.aacm.gov.mo

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Foreword

1. The content of this document is based on the European Aviation Safety Agency (EASA) Part 145 published in Commission Regulation No. 1321/2014 of 26 November 2014 incorporated with amendment up to Commission Regulation No. 2015/1536 and the related Acceptable Means of Compliance and Guidance Materials incorporated with amendment up to ED Decision 2017/016/R.
2. Amendments are incorporated into the print text by means of a 'Revision' or a complete 'Re-issue'.

Preambles

This MAR-145 was originally issued on 18 September 1998 and became effective on 1 October 1998.

MAR-145 superseded Macao Airworthiness Requirement F-1, Issue 1, dated 29 July 1995.

The preambles are intended to be a summarised record of the main changes introduced by each amendment of MAR-145.

ISSUE 1 dated 18 September 1998
New requirement for maintenance organisations involved in maintenance of aircraft with either a Transport Category (Passenger) or Transport Category (Cargo) Certificate of Airworthiness and operated for commercial air transport with an effectivity date of 1 October 1998.

ISSUE 2 dated 31 May 2002

- The introduction of a standard and limitation regarding sub-contracting – MAR 145.1(e) and AMC 145.75(b) refers;
- the introduction of more detail on quality systems – MAR 145.65(b) and GM 145.65(c)1 refers;
- more detail on maintenance data – MAR 145.45 refers;
- more detail on continuation training and Certification Authorisation Procedure – MAR 145.35 refers;
- the introduction of a new MAR 145.100 addressing the revocation of MAR–145 approval certificates and;
- Introduces Issue 3 of Authorised Release Certificate AACM Form One;
- Introduces standard qualification for non-destructive test personnel via amended MAR 145.30(e)
- Other minor changes also incorporated.

ISSUE 3 dated 15 October 2003

- Changes to the text of MAR 145.60 and the addition of a new sub paragraph requiring an internal occurrence reporting structure to assess and extract occurrences to be reported under MAR 145.60(a).
- Requirement of safety policy via MAR 145.65(a) and MAR 145.70(a)(2) and provides better focus on problems of inaccurate maintenance data, procedures and practices.
- Amendment to AMC 145.65(b) to address the need for procedures to detect and rectify maintenance errors that may endanger the safe operation of an aircraft.
- MAR 145.47 requiring a system for planning maintenance tasks taking into account resources and human performance limitations and addresses shift changeovers,
- Amendment to MAR 145.30(e) and its associated AMC concerning the competence of maintenance personnel to include the requirement for an understanding of the application of human factors principles.
- The Maintenance Human Factors training syllabus has been introduced GM 145.30(e)
- Amendment to MAR 145.5 to include definitions of “Human Factors” and “Human Performance”.

ISSUE 3 REV. 1 dated 30 June 2006

- Amendment to MAR 145.30 and 145.35 due to the introduction of MAR-66, a new requirement on licensing of aircraft maintenance engineers

ISSUE 3 REV. 2 dated 07 November 2008

- Change of reference material for occurrence reporting
- Correction of typing mistake

ISSUE 4 dated 30 November 2014

- Restructured the document as "Requirement, Acceptable Means of Compliance and Guidance Material (AMC & GM)"
- Amended MAR 145.1 to replace "Transport Category" with "Commercial Air Transport Category"
- Addressed the implementation of Safety Management System (SMS) in MAR 145.3(e)
- Updated existing definitions under MAR 145.5
- Amended scope, application requirements and terms of approval under MAR 145.10, MAR 145.15 and MAR 145.20
- Updated the requirements with more details for facility, office accommodation and working environment in MAR 145.25
- Revised the personnel responsibility and competence requirements under 145.30
- Updated details for various conditions of using certifying staff under MAR 145.30(j)
- Updated the requirements on certifying staff and support staff in whole section under MAR 145.35 in conjunction with amended MAR-66 regulations
- Updated the requirements for equipment, tools and material in MAR 145.40 (a)
- Added new section MAR 145.42 to address the acceptance of components in conjunction with applicable aeronautical circular issued by the authority
- Updated the scope of applicable maintenance data under MAR 145.45 (b)
- Detailed the requirements of work card in MAR 145.45
- Updated the requirements to issue Certificate of Release to Service (CRS) in MAR 145.50
- Specified the minimum requirements for all details of maintenance records carried out under MAR 145.55(a)
- Extended the duration of retention for maintenance records and any associated maintenance data in MAR 145.55(c)
- Elaborated the requirements for storage and handling of maintenance records under MAR 145.55(c)
- Updated the requirements for occurrence reporting in MAR 145.60
- Updated the requirements on Safety and Quality Policy, Maintenance Procedures and Quality System in MAR 145.65
- Updated the requirements on Maintenance Organisation Exposition (MOE) in MAR 145.70
- Updated requirements for continued validity of Approved Maintenance Organisation (AMO) in MAR 145.90
- Added new provision for classifications of findings in MAR 145.95 and the responsibility of AMO after receipt of notification of findings
- Under Section 2, Interpretative Explanatory Material (IEM) is replaced by Guidance Material (GM)

- Section 2, Acceptable Means of Compliance (AMC) and GM aligns with the corresponding amendments of MAR-145 requirements.
- Section 3, Appendix aligns with supplementary information of MAR-145 requirements

ISSUE 5 Dated 01 June 2020

- Editorial changes and wording/typo corrections throughout the whole MAR-145
- Deleted the provision regarding the acceptance of an organisation on the basis of an approval granted by another National Aviation Authority under MAR 145.10(c)
- Deleted MAR 145.3 to align with EASA Part-145
- Amended MAR 145.5 to add definition of 'Critical maintenance task' and 'Maintenance records', and amended the definition of 'Maintenance', 'Modification', 'Pre-flight inspection', 'Repair' and 'Support Staff'
- Replace the term 'Large aircraft' with 'Complex motor powered aircraft' throughout the whole MAR-145 to align with EASA Part-145
- Amended MAR 145.30(h)(2)(ii) to delete the reference of MAR 145.30(h)(i) as the definition of 'Support Staff' has been added to MAR 145.5 Definition
- Amended MAR 145.30(j)(5) to align with EASA Part-145
- Added new paragraph MAR 145.48 'Performance of Maintenance'
- Updated MAR 145.50(c) to align with EASA Part-145
- Amended MAR 145.55(c)(1)
- Updated MAR 145.55(c)(3) to change period of retained maintenance records from 'two years' to 'three years' to align with EASA Part-145
- Deleted MAR 145.65(b)(3) and (b)(4) as the requirements have been addressed by the new paragraph MAR 145.48 to align with EASA Part-145
- Added new paragraph MAR 145.65(d) regarding safety management system
- Amended MAR 145.70(a)(6) to add 'scope of approval' to align with EASA Part-145
- Amended MAR 145.70 (a)(16) to align with EASA Part-145
- Deleted Section 2 Paragraph 3.2.2 and 3.2.3
- Deleted GM 145.10(c) to align with the updated requirement
- Amended AMC 145.15(a)
- Added new paragraph GM 145.30(c)
- Added new paragraph to AMC 3 145.30(e) regarding CDCCL training guidance
- Added new paragraph to AMC 4 145.30(e) regarding EWIS training guidance
- Amended GM 1 145.30(e) to add 'Critical maintenance tasks and error-capturing methods' to the training syllabus
- Amended GM 2 145.30 (e) to replace 'critical task' with 'critical maintenance task'
- Amended AMC 145.30(f) to align with EASA Part-145
- Added new paragraph to AMC 145.40(b)(3) to align with EASA Part-145
- Amended AMC 145.45(b) to align with EASA Part-145
- Added GM 145.48, AMC1 145.48(b), AMC2 145.48(b), AMC3 145.48(b), AMC4 145.48(b), AMC 145.48(c), GM 145.48(c) and GM 145.48(d) to align with EASA Part-145
- Amended AMC2 145.50(d) to align with EASA Part-145
- Amended the note of AMC 145.50(e) to align with EASA Part-145
- Amended GM 145.65(c)(1)2 the 'audit plan' to align with EASA Part-145
- Amended AMC 145.70(a) to align with EASA Part-145 and MAR-66

- Updated the Effectivity of Appendix No.2. Updated the related form number.
- For the sake of consistency, the reference number for the following form(s) and certificate(s) will be updated:

Description	**Existing ref. no.**	**Updated ref. no.**
Authorised Release Certificate (AACM Form 1)	AACM Form One Issue 4	AW/CERT/001
Application for Grant/Renewal/Variation of MAR-145 Maintenance Organisation Approval	AACM Form Two Issue 1	AW/APP/016
Details of Nominated Personnel to be Accepted (AACM Form 4)	AACM Form Four Issue 3	AW/APP/015

Section 1. Requirements

1. General

This Section 1 contains the Requirements for Approved Maintenance Organisations.

2. Presentation

2.1. The requirements of MAR-145 are presented in full page format on loose pages, each page is identified by the date of issue and revision under which it is issued or amended.

2.2. Sub-headings are in bold typeface

2.3. Explanatory Notes not forming part of the requirements appear in smaller typeface.

2.4. New, amended and corrected text is indicated by a marginal line.

MAR 145.1 General

(See GM 145.1)

(a) No aircraft with either a Commercial Air Transport Category (Passenger) or Commercial Air Transport Category (Cargo) Certificate of Airworthiness and used for Commercial Air Transport may fly unless a certificate of release to service has been issued by an organisation for maintenance carried out on the aircraft or an aircraft component intended for fitment to such an aircraft.

(b) No organisation may certify for release to service an aircraft with either a Commercial Air Transport Category (Passenger) or Commercial Air Transport Category (Cargo) Certificate of Airworthiness and used for Commercial Air Transport unless approved in accordance with this MAR-145. Except where stated otherwise in subparagraph (e), no organisation may maintain such an aircraft unless either appropriately approved in accordance with this MAR-145 or working under the quality system of an appropriately approved MAR-145 maintenance organisation.

NOTE: A MAR-145 approval is not required for the pre-flight inspection

(c) No organisation may certify for release to service an aircraft component intended for fitment to an aircraft with either a Commercial Air Transport Category (Passenger) or Commercial Air Transport Category (Cargo) Certificate of Airworthiness and used for Commercial Air Transport unless approved in accordance with this MAR-145. Except where stated otherwise in subparagraph (e), no organisation may maintain such an aircraft component unless either appropriately approved in accordance with this MAR-145 or working under the quality system of an appropriately approved MAR-145 approved maintenance organisation.

(d) A maintenance organisation approval may be granted for maintenance activity varying from that for an aircraft component to that for a complete aircraft or any combination thereof.

(e) An organisation working under the quality system of an appropriately approved MAR-145 maintenance organisation is limited to the work scope permitted by the MAR 145.65(b) procedures and may not carry out a base maintenance check of an aircraft or a complete workshop maintenance check or overhaul of an engine or engine module.

MAR 145.5 Definitions

(See GM 145.5)

For the purpose of this MAR-145 the following definitions shall apply:

'AACM' means the Civil Aviation Authority-Macao, China.

'Accountable manager' means the manager who has corporate authority for ensuring that all maintenance required by the customer can be financed and carried out to the standard required by the AACM. The accountable manager may delegate in writing to another person in the organisation, such person then becoming the accountable manager for the purpose of this MAR-145.

'Aircraft' means any machine that can derive support in the atmosphere from the reactions of the air other than reactions of the air against the earth's surface.

'Aircraft component' means any assembly/item/component/part of an aircraft up to and including a complete powerplant and/or any operational/emergency equipment.

'ANRM' means the Air Navigation Regulation of Macao

'AOC' means Air Operator Certificate.

'Approved by the AACM' means approved by the AACM directly or in accordance with a procedure approved by the AACM.

'Approved standard' means a manufacturing/design/maintenance/quality standard approved by the AACM.

'Certifying staff' means personnel responsible for the release of an aircraft or a component after maintenance.

'Commercial Air Transport' has the meaning assigned to it by Paragraph 2(4), Part I of Air Navigation Regulation of Macao.

'Continuing airworthiness' means all of the processes ensuring that, at any time in its operating life, the aircraft complies with the airworthiness requirements in force and is in a condition for safe operation.

'Critical maintenance task' means a maintenance task that involves the assembly or any disturbance of a system or any part on an aircraft, engine or propeller that, if an error occurred during its performance, could directly endanger the flight safety.

'Human factors' means principles which apply to aeronautical design, certification, training, operations and maintenance and which seek safe interface between the human and other system components by proper consideration of human performance.

'Human performance' means human capabilities and limitations which have an impact on the safety and efficiency of aeronautical operations.

'Inspection' means the examination of an aircraft/aircraft component to establish conformity with an approved standard.

'Complex motor powered aircraft' means:

(i) an aeroplane:

- with a maximum certificated take-off mass exceeding 5 700 kg, or
- certificated for a maximum passenger seating configuration of more than nineteen, or
- certificated for operation with a minimum crew of at least two pilots, or
- equipped with (a) turbojet engine(s) or more than one turboprop engine, or

(ii) a helicopter certificated:

- for a maximum certificated take-off mass exceeding 3 175 kg, or
- for a maximum passenger seating configuration of more than nine, or
- certificated for operation with a minimum crew of at least two pilots, or

(iii) a tilt rotor aircraft;

'Location' means a place from which an organisation carries on activities or wishes to carry on activities for which a MAR-145 approval is required.

'Maintenance' means the performance of tasks on an aircraft, engine, propeller or associated part required to ensure the continuing airworthiness of an aircraft, engine, propeller or associated part including any one or combination of overhaul, inspection, replacement, defect rectification, and the embodiment of a modification or repair.

'Maintenance data' means any information necessary to ensure that the aircraft or aircraft component can be maintained in a condition such that airworthiness of the aircraft, or serviceability of operational and emergency equipment as appropriate, is assured.

'Maintenance records' means records that set out the details of the maintenance carried out on an aircraft, engine, propeller or associated part.

'MAR-145 certification authorisation' means the authorisation issued to certifying staff by the MAR-145 approved maintenance organisation and which specifies the fact that they may sign MAR 145.50 certificates of release to service within the limitations stated in such authorisation on behalf of the MAR-145 approved maintenance organisation.

'Modification' means a change to the type design of an aircraft, engine or propeller

Note: a modification may also include the embodiment of the modification which is a maintenance task subject to a maintenance release

'Organisation' means either an organisation registered as a legal entity in any jurisdiction whether or not within Macao or a natural person. Such an organisation may be located at more than one location and may hold more than one MAR-145 approval.

'Overhaul' means the restoration of an aircraft/aircraft component by inspection and replacement in conformity with an approved standard to extend the operational life.

'Pre-flight inspection' means the inspection carried out before flight to ensure that the aircraft is fit for the intended flight.

'Quality policy' means the overall intentions and direction of an organisation as regards quality, as approved by the accountable manager.

'Repair' means the restoration of an aircraft, engine, propeller or associated part to an airworthy condition in accordance with the appropriate airworthiness requirements after it has been damaged or subjected to wear.

'Support staff' means those staff holding a MAR-66 aircraft maintenance licence in category B1, B2 and/or B3 with the appropriate aircraft ratings, working in a base maintenance environment while not necessarily holding certification privileges

MAR 145.10 Scope

(See AMC 145.10 & GM 145.10)

(a) Pursuant to paragraph 8 of the Air Navigation Regulation of Macao (ANRM), this MAR-145 prescribes the requirements to be met by an organisation to qualify for the issue, variation or renewal of an approval for the maintenance of aircraft and aircraft components.

(b) An organisation which is located, in whole or in part, within Macao will be granted approval in respect of any such location within Macao when in compliance with this MAR-145.

(c) An organisation which is located, in whole or in part, outside of Macao specified in paragraph (b) will only be granted approval in respect of any such location outside of Macao if the AACM is satisfied that there is a need for such approval to maintain aircraft/aircraft components at that location and when in compliance with this MAR-145.

MAR 145.15 Application

(See AMC 145.15)

(a) An application for the issue, renewal and variation of a maintenance organisation approval shall be made in a form and manner acceptable to the AACM and submitted with the required documentations such as the maintenance organisation exposition or amendment thereto.

(b) An applicant who meets the requirements of this MAR-145 and has paid any applicable fees prescribed by the AACM is entitled to a maintenance organisation approval.

MAR 145.20 Terms of Approval

(See AMC 145.20)

The grant of approval is indicated by the issue of an approval certificate to the organisation by the AACM. The approval certificate will specify the extent of approval. The MAR-145 approved maintenance organisation shall specify the scope of work deemed to constitute approval in its maintenance organisation exposition (Appendix 1 contains a table of all classes and ratings).

MAR 145.25 Facility Requirements

(See AMC 145.25)

The organisation shall ensure that:

(a) Facilities are provided appropriate for all planned work, ensuring in particular, protection from the weather elements. Specialised workshops and bays are segregated as appropriate, to ensure that environmental and work area contamination is unlikely to occur.

(1) For base maintenance of aircraft, aircraft hangars are both available and large enough to accommodate aircraft on planned base maintenance;

(2) For component maintenance, component workshops are large enough to accommodate the components on planned maintenance.

(b) Office accommodation is provided for the management of the planned work referred to in paragraph (a), and certifying staff so that they can carry out their designated task in a manner that contributes to good aircraft maintenance standards.

(c) The working environment including aircraft hangars, component workshops and office accommodation is appropriate for the task carried out and in particular special requirements observed. Unless otherwise dictated by the particular task environment,

the working environment must be such that the effectiveness of personnel is not impaired:

(1) Temperatures must be maintained such that personnel can carry out required tasks without undue discomfort.

(2) Dust and any other airborne contamination are kept to a minimum and not be permitted to reach a level in the work task area where visible aircraft/component surface contamination is evident. Where dust/other airborne contamination results in visible surface contamination, all susceptible systems are sealed until acceptable conditions are re-established.

(3) Lighting is such as to ensure each inspection and maintenance task can be carried out in an effective manner.

(4) Noise shall not distract personnel from carrying out inspection tasks. Where it is impractical to control the noise source, such personnel are provided with the necessary personal equipment to stop excessive noise causing distraction during inspection tasks.

(5) Where a particular maintenance task requires the application of specific environmental conditions different to the foregoing, then such conditions are observed. Specific conditions are identified in the maintenance data.

(6) The working environment for line maintenance is such that the particular maintenance or inspection task can be carried out without undue distraction. Therefore where the working environment deteriorates to an unacceptable level in respect of temperature, moisture, hail, ice, snow, wind, light, dust/other airborne contamination, the particular maintenance or inspection tasks must be suspended until satisfactory conditions are re-established.

(d) Secure storage facilities are provided for aircraft components, equipment, tools and material. Storage conditions ensure segregation of serviceable aircraft components and material from unserviceable aircraft components, material, equipment and tools. The conditions of storage are in accordance with the manufacturer's instructions to prevent deterioration and damage of stored items. Access to storage facilities must be restricted to authorised personnel.

MAR 145.30 Personnel Requirements

(See AMC 145.30 & GM 145.30)

(a) The MAR-145 approved maintenance organisation shall appoint an accountable manager who has corporate authority for ensuring that all maintenance required by the customer can be financed and carried out to the standard required by MAR-145 requirements. The accountable manager shall:

(1) Ensure that all necessary resources are available to accomplish maintenance in accordance with MAR 145.65(b) to support the organisation approval.

(2) Establish and promote the safety and quality policy specified in MAR 145.65(a).

(3) Demonstrate a basic understanding of the MAR-145 requirements.

(4) Ensure an implementation of a Safety Management System.

The accountable manager shall submit his/her credentials on AACM Form 4 to AACM for acceptance.

(b) The MAR-145 approved maintenance organisation shall nominate a person or group of persons, whose responsibilities include ensuring that the MAR-145 approved maintenance organisation complies with MAR-145 requirements. Such person(s) shall ultimately be responsible to the accountable manager.

(1) The person or persons nominated shall represent the maintenance management structure of the organisation and be responsible for all functions specified in MAR-145 requirements.

(2) The person or persons nominated shall be identified and their credentials submitted on AACM Form 4 to the AACM for acceptance.

(3) The person or persons nominated shall be able to demonstrate relevant knowledge, background and satisfactory experience related to aircraft or aircraft component maintenance and demonstrate a working knowledge of MAR-145 requirements.

(4) Procedures shall make clear who deputises for any particular person in the case of lengthy absence of the said person.

(c) The accountable manager under paragraph (a) shall appoint a person with responsibility for monitoring the quality system, including the associated feedback system as required by MAR 145.65(c). The appointed person shall have direct access to the accountable manager to ensure that the accountable manager is kept properly informed on quality and compliance matters. The appointed person with responsibility for monitoring the quality system shall submit his/her credentials on AACM Form 4 to AACM for acceptance.

(d) The MAR-145 approved maintenance organisation shall have a maintenance man-hour plan showing that the organisation has sufficient staff to plan, perform, supervise, inspect and quality monitor the organisation in accordance with the approval. In addition the organisation shall have a procedure to reassess work intended to be carried out when actual staff availability is less than the planned staffing level for any particular work shift or period.

(e) The MAR-145 approved maintenance organisation shall establish and control the competence of personnel involved in any maintenance, management and/or quality audits in accordance with a procedure and to a standard agreed by the AACM. In addition to the necessary expertise related to the job function, competence must include an understanding of the application of human factors and human performance issues appropriate to that person's function in the organisation.

(f) The MAR-145 approved maintenance organisation shall ensure that personnel who carry out and/or control a continued airworthiness non-destructive test of aircraft structures and/or aircraft components are appropriately qualified for that particular non-destructive test in accordance with the EN4179 or equivalent Standard recognised by the AACM. Personnel who carry out any other specialised task shall be appropriately qualified in accordance with any existing standard(s) recognised by the AACM. By derogation to this paragraph those personnel specified in paragraphs (g) and (h)(1) and (h)(2), qualified in MAR-66 category B1 or B3 may carry out and/or control colour contrast dye penetrant tests.

(g) Any MAR-145 approved maintenance organisation maintaining aircraft, except where stated otherwise in paragraph (j), shall in the case of aircraft line maintenance, have appropriate aircraft type rated certifying staff qualified as category B1, B2, B3, as appropriate, in accordance with MAR-66 and MAR 145.35.

In addition such MAR-145 approved maintenance organisation may also use appropriately task trained certifying staff holding the privileges described in MAR 66.20(a)(1) and MAR 66.20(a)(3)(ii) and qualified in accordance with MAR-66 and

point MAR 145.35 to carry out minor scheduled line maintenance and simple defect rectification. The availability of such certifying staff shall not replace the need for category B1, B2, B3 certifying staff, as appropriate. However, such MAR-66 category B1 and B2, B3 staff need not always be present at the line station during minor scheduled line maintenance or simple defect rectification.

(h) Any MAR-145 approved maintenance organisation maintaining aircraft, except where stated otherwise in paragraph (j) shall:

(1) In the case of base maintenance of complex motor powered aircraft, have appropriate aircraft type rated certifying staff qualified as category C in accordance with MAR-66 and MAR 145.35. In addition the MAR-145 approved maintenance organisation shall have sufficient aircraft type rated staff qualified as category B1, B2 as appropriate in accordance with MAR-66 and MAR145.35 to support the category C certifying staff.

i. B1 and B2 support staff shall ensure that all relevant tasks or inspections have been carried out to the required standard before the category C certifying staff issues the certificate of release to service.

ii. The MAR-145 approved maintenance organisation shall maintain a register of any such B1 and B2 support staff.

iii. The category C certifying staff shall ensure that compliance with paragraph (i) has been met and that all work required by the customer has been accomplished during the particular base maintenance check or work package, and shall also assess the impact of any work not carried out with a view to either requiring its accomplishment or agreeing with the operator to defer such work to another specified check or time limit.

(2) In the case of base maintenance of aircraft other than complex motor powered aircraft have either:

i. Appropriate aircraft type rated certifying staff qualified as category B1, B2, B3, as appropriate, in accordance with MAR-66 and MAR145.35 or,

ii. Appropriate aircraft rated certifying staff qualified in category C assisted by support staff.

(i) Any MAR-145 approved maintenance organisation maintaining aircraft components must have appropriate aircraft component certifying staff qualified and acceptable to AACM.

(j) By derogation to paragraphs (g) and (h), in relation to the obligation to comply with MAR-66, the MAR-145 approved maintenance organisation may use certifying staff qualified in accordance with the following provisions:

(1) For MAR-145 approved maintenance organisation facilities located outside Macao, certifying staff may be qualified in accordance with the national aviation regulations of the State in which the organisation facility is registered, subject to the AACM being satisfied that such regulations result in a standard of qualification comparable with MAR-66 and the conditions specified in Appendix 4 to MAR-145.

(2) For line maintenance carried out at a line station of an organisation which is located outside of Macao, certifying staff may be qualified in accordance with the national aviation regulations of the State in which the line station is based, subject to the AACM being satisfied that such regulations result in a

standard of qualification comparable with MAR-66 and the conditions specified in Appendix 4 to MAR-145.

(3) For a repetitive pre-flight airworthiness directive which specifically states that the flight crew may carry out such airworthiness directive, the MAR-145 approved maintenance organisation may issue a limited MAR-145 certification authorisation to the aircraft commander on the basis of the flight crew licence held. However, the MAR-145 approved maintenance organisation shall ensure that sufficient practical training has been carried out to ensure that such aircraft commander can accomplish the airworthiness directive to the required standard.

(4) In the case of aircraft operating away from a supported location the MAR-145 approved maintenance organisation may issue a limited MAR-145 certification authorisation to the commander on the basis of the flight crew licence held subject to being satisfied that sufficient practical training has been carried out to ensure that the commander can accomplish the specified task to the required standard. The provisions of this paragraph shall be detailed in an exposition procedure.

(5) In the following unforeseen cases, where an aircraft is grounded at a location other than the main base where no appropriate certifying staff is available, the MAR-145 approved maintenance organisation contracted to provide maintenance support may issue a one-off certification authorisation:

i. To one of its employees holding equivalent type authorisations on aircraft of similar technology, construction and systems; or

ii. To any person with not less than 5 years maintenance experience and holding a valid ICAO aircraft maintenance licence rated for the aircraft type requiring certification provided there is no organisation appropriately approved under MAR-145 at that location and the contracted MAR-145 approved maintenance organisation obtains and holds on file evidence of the experience and the licence of that person.

All such cases as specified in this subparagraph shall be reported to the AACM within 7 days of the issuance of such certification authorisation. The contracted MAR-145 approved maintenance organisation issuing the one-off authorisation shall ensure that any such maintenance that could affect flight safety is rechecked by an appropriately approved MAR-145 maintenance organisation.

MAR 145.35 Certifying Staff and Support Staff

(See AMC 145.35)

(a) In addition to the appropriate requirements of MAR 145.30 (g) and (h), the MAR-145 approved maintenance organisation shall ensure that certifying staff and support staff have an adequate understanding of the relevant aircraft and/or aircraft component(s) to be maintained together with the associated organisation procedures. In the case of certifying staff, this shall be accomplished before the issue or re-issue of the MAR-145 certification authorisation.

i. “Support staff” means those staff holding a MAR-66 aircraft maintenance licence in category B1, B2 and/or B3 with the appropriate aircraft ratings, working in a base maintenance environment while not necessarily holding certification privileges.

ii. "Relevant aircraft and/or aircraft components", means those aircraft or aircraft components specified in the particular MAR-145 certification authorisation.

iii. "Certification authorisation" means the authorisation issued to certifying staff by the organisation and which specifies the fact that they may sign certificates of release to service within the limitations stated in such authorisation on behalf of the MAR-145 approved maintenance organisation.

(b) Excepting those cases listed in point MAR-145.30 (j) and MAR 66.20(a)3(ii) the MAR-145 approved maintenance organisation may only issue a certification authorisation to certifying staff in relation to the basic categories or sub-categories and any type rating listed on the aircraft maintenance licence as required by MAR-66, subject to the licence remaining valid throughout the validity period of the authorisation and the certifying staff remaining in compliance with MAR-66.

(c) The MAR-145 approved maintenance organisation shall ensure that all certifying staff and support staff are involved in at least 6 months of actual relevant aircraft or aircraft component maintenance experience in any consecutive 2-year period.

For the purpose of this paragraph "involved in actual relevant aircraft or aircraft component maintenance" means that the person has worked in an aircraft or aircraft component maintenance environment and has either exercised the privileges of the MAR-145 certification authorisation and/or has actually carried out maintenance on at least some of the aircraft type systems specified in the MAR-145 certification authorisation.

(d) The MAR-145 approved maintenance organisation shall ensure that all certifying staff and support staff receive sufficient continuation training in each 2 year period to ensure that such staff have up-to-date knowledge of relevant technology, organisation procedures and human factor issues.

(e) The MAR-145 approved maintenance organisation shall establish a programme for the continuation training for certifying staff and support staff, including a procedure to ensure compliance with the relevant paragraphs of MAR 145.35 as the basis for issuing MAR-145 certification authorisations under MAR-145 to certifying staff, and a procedure to ensure compliance with MAR-66.

(f) Except where any of the unforeseen cases of MAR 145.30 (j)(5) apply, the MAR-145 approved maintenance organisation shall assess all prospective certifying staff for their competence, qualification and capability to carry out their intended certifying duties in accordance with a procedure as specified in the maintenance organisation exposition prior to the issue or re-issue of a MAR-145 certification authorisation.

(g) When the conditions of paragraphs (a), (b), (d), (f) and, where applicable, paragraph (c) have been fulfilled by the certifying staff, the MAR-145 approved maintenance organisation shall issue a MAR-145 certification authorisation that clearly specifies the scope and limits of such authorisation. Continued validity of the MAR-145 certification authorisation is dependent upon continued compliance with paragraphs (a), (b), (d) and where applicable, paragraph (c).

(h) The MAR-145 certification authorisation must be in a style that makes its scope clear to the certifying staff and any authorised person who may require to examine the authorisation. Where codes are used to define scope, the organisation shall make a code translation readily available. "Authorised person" means the officials of the AACM and/or the agency who has responsibility for the oversight of the maintained aircraft or aircraft component.

(i) The person responsible for the quality system shall also remain responsible on behalf of the MAR-145 approved maintenance organisation for issuing MAR-145

certification authorisations to certifying staff. Such person may nominate other persons to actually issue or revoke the MAR-145 certification authorisations in accordance with a procedure as specified in the maintenance organisation exposition.

(j) The MAR-145 approved maintenance organisation shall maintain a record of all certifying staff and support staff, which shall contain:

(1) The details of any aircraft maintenance licence held under MAR-66; and

(2) All relevant training completed; and

(3) The scope of their MAR-145 certification authorisation where relevant; and

(4) Particulars of staff with limited or one-off MAR-145 certification authorisations.

The organisation shall retain the record for at least three years after the staff referred to in this paragraph have ceased employment with the organisation or as soon as the authorisation has been withdrawn. In addition, upon request, the maintenance organisation shall furnish the staff referred to in this paragraph with a copy of their personal record on leaving the organisation.

The staff referred to in this paragraph shall be given access on request to their personal records as detailed above.

(k) The MAR-145 approved maintenance organisation shall provide certifying staff with a copy of their MAR-145 certification authorisation in either a documented or electronic format.

(l) Certifying staff shall produce their MAR-145 certification authorisation to any authorised person within 24 hours.

(m) The minimum age for certifying staff and support staff is 21 years.

(n) The holder of a category A aircraft maintenance licence may only exercise certification privileges on a specific aircraft type following the satisfactory completion of the relevant category A aircraft task training carried out by an organisation appropriately approved in accordance with the MAR-145 or the MAR-147. This training shall include practical hands on training and theoretical training as appropriate for each task authorised. Satisfactory completion of training shall be demonstrated by an examination or by workplace assessment carried out by the MAR-145 approved maintenance organisation.

(o) The holder of a category B2 aircraft maintenance licence may only exercise the certification privileges described in point MAR-66.20(a)(3)(ii) following the satisfactory completion of

(i) the relevant category A aircraft task training and

(ii) 6 months of documented practical experience covering the scope of the authorisation that will be issued.

The task training shall include practical hands on training and theoretical training as appropriate for each task authorised. Satisfactory completion of training shall be demonstrated by an examination or by workplace assessment. Task training and examination/assessment shall be carried out by the maintenance organisation issuing the certifying staff authorisation. The practical experience shall be also obtained within such maintenance organisation.

MAR 145.40 Equipment, Tools and Material

(See AMC 145.40)

(a) The MAR-145 approved maintenance organisation shall have available and use the necessary equipment, tools and material to perform the approved scope of work.

(1) Where the manufacturer specifies a particular tool or equipment, the MAR-145 approved maintenance organisation shall use that tool or equipment, unless the use of alternative tooling or equipment is agreed by the AACM via procedures specified in the maintenance organisation exposition.

(2) Equipment and tools must be permanently available, except in the case of any tool or equipment that is so infrequently used that its permanent availability is not necessary. Such cases shall be detailed in an exposition procedure.

(3) A MAR-145 approved maintenance organisation approved for base maintenance shall have sufficient aircraft access equipment and inspection platforms/docking such that the aircraft can be properly inspected.

(b) The MAR-145 approved maintenance organisation shall ensure that all tools, equipment and particularly test equipment, as appropriate, are controlled and calibrated to standards acceptable to the AACM at a frequency to ensure serviceability and accuracy. Records of such calibrations and traceability to the standard used shall be kept by the MAR-145 approved maintenance organisation.

MAR 145.42 Acceptance of components

(See AMC 145.42)

(a) All components shall be classified and appropriately segregated into the following categories:

(1) Components which are in a satisfactory condition, released on an AACM Form 1 or other acceptable authorised release documents prescribed in Aeronautical Circular No. AC/AW/002.

(2) Unserviceable components which shall be maintained in accordance with MAR-145 requirements.

(3) Unsalvageable components which are classified in accordance with point MAR 145.42(d).

(4) Standard parts used on an aircraft, engine, propeller or other aircraft component when specified in the manufacturer's illustrated parts catalogue and/or the maintenance data.

(5) Material both raw and consumable used in the course of maintenance when the MAR-145 approved maintenance organisation is satisfied that the material meets the required specification and has appropriate traceability. All material must be accompanied by documentation clearly relating to the particular material and containing a conformity to specification statement plus both the manufacturing and supplier source.

(b) Prior to installation of a component, the MAR-145 approved maintenance organisation shall ensure that the particular aircraft component is eligible to be fitted when different modification and/or airworthiness directive standards may be applicable.

(c) The MAR-145 approved maintenance organisation may fabricate a restricted range of parts to be used in the course of undergoing work within its own facilities provided procedures are identified in the maintenance organisation exposition.

(d) Aircraft components which have reached their certified life limit or contain a non-repairable defect shall be classified as unsalvageable and shall not be permitted to re-enter the aircraft component supply system unless certified life limits have been extended or a repair solution has been approved or accepted by AACM.

MAR 145.45 Maintenance Data

(See AMC 145.45)

(a) The MAR-145 approved maintenance organisation shall hold and use applicable current maintenance data in the performance of maintenance including modifications and repairs. "Applicable" means relevant to any aircraft, aircraft component or process specified in the MAR-145 approved maintenance organisation's approval class rating schedule and in any associated capability list.

In the case of maintenance data provided by an operator or customer, the MAR-145 approved maintenance organisation shall hold such data when the work is in progress, with the exception of the need to comply with MAR 145.55(c).

(b) For the purposes of MAR-145, applicable maintenance data shall be any of the following:

(1) Any applicable requirement, procedure, operational directive or information issued by the authority responsible for the oversight of the aircraft or aircraft component;

(2) Any applicable airworthiness directive issued by the authority responsible for the oversight of the aircraft or aircraft component;

(3) Instructions for continuing airworthiness, issued by type certificate holders, supplementary type certificate holders, and any other organisation required to publish such data and in the case of aircraft or components from third countries the airworthiness data mandated by the authority responsible for the oversight of the aircraft or aircraft component.

(4) Any applicable standard, such as but not limited to, maintenance standard practises recognised by the AACM as a good standard for maintenance.

(5) Any applicable data issued in accordance with paragraph (d).

(c) The MAR-145 approved maintenance organisation shall establish procedures to ensure that if found, any inaccurate, incomplete or ambiguous procedures, practices, information or maintenance instructions contained in the maintenance data used by maintenance personnel is recorded and notified to the author of the maintenance data.

(d) The MAR-145 approved maintenance organisation may only modify maintenance instructions in accordance with a procedure specified in the maintenance organisation's exposition. With respect to those changes, the MAR-145 approved maintenance organisation shall demonstrate that they result in equivalent or improved maintenance standards and shall inform the type certificate holder of such changes. Maintenance instructions for the purposes of this paragraph means instructions on how to carry out the particular maintenance task: they exclude the engineering design of repairs and modifications.

(e) The MAR-145 approved maintenance organisation shall provide a common work card or worksheet system to be used throughout relevant parts of the organisation. In addition, the MAR-145 approved maintenance organisation shall either transcribe

accurately the maintenance data contained in paragraphs (b) and (d) onto such work cards or worksheets or make precise reference to the particular maintenance task or tasks contained in such maintenance data. Work cards and worksheets may be computer generated and held on an electronic database subject to both adequate safeguards against unauthorised alteration and a back-up electronic database which shall be updated within 24 hours of any entry made to the main electronic database. Complex maintenance task shall be transcribed onto the work card or worksheets and subdivided into clear stages to ensure a record of the accomplishment of the complete maintenance task.

Where the MAR-145 approved maintenance organisation provides a maintenance service to an aircraft operator who requires their work card or worksheet system to be used then such work card or worksheet system may be used. In this case the MAR-145 approved maintenance organisation shall establish a procedure to ensure correct completion of the aircraft operators' work cards or worksheets.

(f) The MAR-145 approved maintenance organisation shall ensure that all applicable maintenance data is readily available for use when required by maintenance personnel.

(g) The MAR-145 approved maintenance organisation shall establish a procedure to ensure that maintenance data it controls is kept up to date. In the case of operator/customer controlled and provided maintenance data, the MAR-145 approved maintenance organisation shall be able to show that either it has written confirmation from the operator/customer that all such maintenance data is up to date or it has work orders specifying the amendment status of the maintenance data to be used or it can show that it is on the operator/customer maintenance data amendment list.

MAR 145.47 Production Planning

(See ACM & GM 145.47)

(a) The MAR-145 approved maintenance organisation shall have a system appropriate to the amount and complexity of work to plan the availability of all necessary personnel, tools, equipment, material, maintenance data and facilities in order to ensure the safe completion of the maintenance work.

(b) The planning of maintenance tasks, and the organising of shifts, shall take into account human performance limitations.

(c) When it is required to hand over the continuation or completion of a maintenance tasks for reasons of a shift or personnel changeover, relevant information shall be adequately communicated between outgoing and incoming personnel.

MAR 145.48 Performance of Maintenance

(See AMC 145.48)

The organisation shall establish procedures to ensure that:

(a) after completion of maintenance a general verification is carried out to ensure that the aircraft or component is clear of all tools, equipment and any extraneous parts or material, and that all access panels removed have been refitted;

(b) an error capturing method is implemented after the performance of any critical maintenance task;

(c) the risk of multiple errors during maintenance and the risk of errors being repeated in identical maintenance tasks are minimised; and,

(d) damage is assessed and modifications and repairs are carried out using data approved by AACM.

MAR 145.50 Certification of Maintenance

(See AMC & GM 145.50)

(a) A certificate of release to service shall be issued by appropriately authorised certifying staff on behalf of the MAR-145 approved maintenance organisation when it has been verified that all maintenance ordered has been properly carried out by the MAR-145 approved maintenance organisation in accordance with the procedures specified in the MAR 145.70 maintenance organisation exposition, taking into account the availability and use of the maintenance data specified in MAR 145.45 and that there are no non-compliances which are known to endanger flight safety.

NOTE: An aircraft component which has been maintained off the aircraft requires the issue of a certificate of release to service for such maintenance and another certificate of release to service in regard to being installed properly on the aircraft when such action occurs.

(b) A certificate of release to service shall be issued before flight at the completion of any maintenance. A certificate of release to service must contain basic details of the maintenance carried out including detailed reference of the approved data used, the date such maintenance was completed and the identity including approval reference of the MAR-145 approved maintenance organisation and certifying staff issuing such a certificate.

(c) New defects or incomplete maintenance work orders identified during the above maintenance shall be brought to the attention of the aircraft operator for the specific purpose of obtaining agreement to rectify such defects or completing the missing elements of the maintenance work order. In the case where the aircraft operator declines to have such maintenance carried out under this paragraph, paragraph (e) is applicable.

(d) A certificate of release to service shall be issued at the completion of any maintenance on an aircraft component whilst off the aircraft. The authorised release certificate identified as AACM Form 1 in Appendix 2 to MAR-145 constitutes the aircraft component certificate of release to service. When a MAR-145 approved maintenance organisation maintains an aircraft component for its own use, an AACM Form 1 may not be necessary depending upon the organisation's internal release procedures defined in the maintenance organisation exposition.

(e) By derogation to paragraph (a), when a MAR-145 approved maintenance organisation is unable to complete all maintenance ordered, it may issue a certificate of release to service within the approved aircraft limitations. The MAR-145 approved maintenance organisation shall enter such fact in the aircraft certificate of release to service before issue of such certificate.

(f) By derogation to paragraph (a) and MAR 145.42, when an aircraft is grounded at a location other than the main line station or main maintenance base due to the non-availability of an aircraft component with the appropriate release certificate, it is permissible to temporarily fit an aircraft component without the appropriate release certificate for a maximum of 30 flight hours or until the aircraft first returns to the main line station or main maintenance base, whichever is the sooner, subject to the aircraft operator agreement and said aircraft component having a suitable release certificate but otherwise in compliance with all applicable maintenance and

operational requirements. Such aircraft components shall be removed by the above prescribed time limit unless an appropriate release certificate has been obtained in the meantime under paragraph (a) and MAR 145.42.

MAR 145.55 Maintenance Records

(See AMC & GM 145.55)

(a) The MAR-145 approved maintenance organisation shall record all details of maintenance work carried out. As a minimum, the MAR-145 approved maintenance organisation shall retain records necessary to prove that all requirements have been met for issuance of the certificate of release to service, including sub-contractor's release documents.

(b) The MAR-l45 approved maintenance organisation shall provide a copy of each certificate of release to service to the aircraft operator, together with a copy of any specific approved repair/modification data used for repairs/modifications carried out.

(c) The MAR-145 approved maintenance organisation shall retain a copy of all detailed maintenance records and any associated maintenance data for three years from the date the aircraft or aircraft component to which the work relates was released from the MAR-145 approved maintenance organisation.

NOTE: Where an aircraft operator contracts a MAR-145 approved maintenance organisation to keep the aircraft operator's certificates of release to service and any associated approved repair/modification data, the retention period will be that required by the ANRM, and not that specified in MAR 145.55(c).

(1) Records kept in accordance with MAR 145.55 shall be maintenance in a format that ensures readability, security and integrity of the records at all time.

(2) Computer backup discs, tapes etc. shall be stored in a different location from that containing the working discs, tapes etc., in an environment that ensures they remain in good condition.

(3) Where a MAR-145 approved maintenance organisation terminates its operation, all retained maintenance records covering the last three years shall be distributed to the last owner or customer of the respective aircraft or aircraft component or shall be stored as specified by the AACM.

MAR 145.60 Occurrence Reporting

(See AMC 145.60, GM 145.60, AC/GEN/003)

(a) The MAR-145 approved maintenance organisation shall report to the AACM and the organisation responsible for the design of the aircraft or aircraft component any condition of the aircraft or aircraft component identified by the MAR-145 approved maintenance organisation that has resulted or may result in an unsafe condition that hazards seriously the flight safety.

(b) The MAR-145 approved maintenance organisation shall establish an internal occurrence reporting system as detailed in the maintenance organisation exposition to enable the collection and evaluation of such reports, including the assessment and extraction of those occurrences to be reported under subparagraph (a). The procedure shall identify adverse trends, corrective actions taken or to be taken by the MAR-145 approved maintenance organisation to address deficiencies and include evaluation of all known relevant information relating to such occurrences and a method to circulate the information as necessary.

(c) The MAR-145 approved maintenance organisation shall make such reports in a form and manner established by the AACM and ensure that they contain all pertinent information about the condition and evaluation results known to the MAR-145 approved maintenance organisation.

(d) Where the MAR-145 approved maintenance organisation is contracted by a commercial operator to carry out maintenance, the MAR-145 approved maintenance organisation shall also report to the operator any such condition affecting the operator's aircraft or aircraft component. In the case of an aircraft, where the State of Registry is not Macao, then the Nation Aviation Authority of the State of Registry shall be informed.

(e) The MAR-145 approved maintenance organisation shall produce and submit such reports as soon as practicable but in any case within 72 hours of the MAR-145 approved maintenance organisation identifying the condition to which the report relates.

MAR 145.65 Safety and Quality Policy, Maintenance Procedures and Quality System

(See AMC & GM 145.65)

(a) The MAR-145 approved maintenance organisation shall establish a safety and quality policy for the organisation to be included in the maintenance organisation exposition under MAR 145.70.

(b) The MAR-145 approved maintenance organisation shall establish procedures agreed by the AACM taking into account human factors and human performance to ensure good maintenance practices and compliance with the applicable requirements in MAR 145.25 to MAR 145.95. The procedures under this point shall:

(1) Ensure that a clear work order or contract has been agreed between the organisation and the organisation requesting maintenance to clearly establish the maintenance to carried out so that aircraft and components may be released to service in accordance with MAR 145.50; and,

(2) Cover all aspects of carrying out maintenance, including the provision and control of specialised services and lay down the standards to which the organisation intends to work.

(c) The MAR-145 approved maintenance organisation shall establish a quality system that includes the following;

(1) Independent audits in order to monitor compliance with required aircraft/aircraft component standards and adequacy of the procedures to ensure that such procedures invoke good maintenance practices and airworthy aircraft/aircraft components. In the smallest organisations the independent audit part of the quality system may be contracted to another MAR-145 approved maintenance organisation or a person with appropriate technical knowledge and proven satisfactory audit experience acceptable to the AACM, and;

(2) A quality feedback reporting system to the person or group of persons specified in MAR 145.30(b) and ultimately to the accountable manager that ensures proper and timely corrective action is taken in response to reports resulting from the independent audits established to meet MAR 145.65(c)(1).

(d) The MAR-145 approved maintenance organisation shall establish a safety management system.

MAR 145.70 Maintenance Organisation Exposition

(See AMC & GM 145.70)

(a) "Maintenance organisation exposition" means the document or documents that contain the material specifying the scope of work deemed to constitute approval and showing how the organisation intends to comply with this MAR-145 requirements. The MAR-145 approved maintenance organisation shall provide the AACM with a maintenance organisation exposition, containing the following information:

(1) A statement signed by the accountable manager confirming that the maintenance organisation exposition and any referenced associated manuals defines the MAR-145 approved maintenance organisation's compliance with MAR-145 and will be complied with at all times. When the accountable manager is not the chief executive officer of the MAR-145 approved maintenance organisation then such chief executive officer shall countersign the statement;

(2) The organisation's safety and quality policy as specific by MAR 145.65;

(3) The title(s) and name(s) of the persons nominated under MAR 145.30(b);

(4) The duties and responsibilities of the persons nominated under MAR 145.30(b), including matters on which they may deal directly with the AACM on behalf of the MAR-145 approved maintenance organisation;

(5) An organisation chart showing associated chains of responsibility between the persons nominated under MAR 145.30(b);

(6) A list of certifying staff and support staff with their scope of approval;

(7) A general description of manpower resources;

(8) A general description of the facilities located at each address specified in the MAR-145 approved maintenance organisation's approval certificate;

(9) A specification of the MAR-145 approved maintenance organisation's scope of work relevant to the extent of approval;

(10) The notification procedure of MAR 145.85 for MAR-145 approved maintenance organisation changes;

(11) The maintenance organisation exposition amendment procedure;

(12) The procedures and quality system established by the MAR-145 approved maintenance organisation under MAR 145.25 to MAR 145.90 inclusive;

(13) A list of commercial operators, where applicable, to which the MAR-145 approved maintenance organisation provides an aircraft maintenance service;

(14) A list of subcontracted organisations, where applicable, as specified in MAR 145.75(b);

(15) A list of line stations, where applicable, as specified in MAR 145.75(d);

(16) A list of contracted organisations, where applicable.

(b) The maintenance organisation exposition shall be amended as necessary to remain an up-to-date description of the MAR-145 approved maintenance organisations, the exposition and any subsequent amendment shall be approved by the AACM.

(c) Notwithstanding paragraph (b) minor amendments to the exposition may be approved through an exposition procedure (hereinafter called indirect approval).

(d) Copies of all amendments to the maintenance organisation exposition shall be furnished promptly to all organisations or persons to whom the exposition has been issued.

MAR 145.75 Privileges of the Approved Maintenance Organisation

In accordance with the maintenance organisation exposition, the MAR-145 approved maintenance organisation shall be entitled to carry out the following tasks:

(a) Maintain any aircraft and/or aircraft component for which it is approved at the locations identified in the approval certificate and in the maintenance organisation exposition;

(b) Arrange for maintenance of any aircraft or aircraft component for which it is approved at another organisation that is working under the quality system of the MAR-145 approved maintenance organisation. This refers to work being carried out by an organisation not itself appropriately approved to carry out such maintenance under MAR-145 and is limited to the work scope permitted under MAR 145.65(b) procedures. This work scope shall not include a base maintenance check of an aircraft or a complete workshop maintenance check or overhaul of an engine or module;

(c) Maintain any aircraft or any aircraft component for which it is approved at any location subject to the need for such maintenance arising either from the unserviceability of the aircraft or from the necessity of supporting occasional line maintenance, subject to the conditions specified in the maintenance organisation exposition;

(d) Maintain any aircraft and/or any aircraft component for which it is approved at a location identified as a line maintenance location capable of supporting minor maintenance and only if the MAR-145 approved maintenance organisation's maintenance organisation exposition both permits such activity and lists such locations;

(e) Issue certificates of release to service in respect of completion of maintenance in accordance with MAR 145.50.

MAR 145.80 Limitations on the Approved Maintenance Organisation

(See AMC 145.80)

The MAR-145 approved maintenance organisation shall only maintain an aircraft or aircraft component for which it is approved when all necessary facilities, equipment, tooling, material, maintenance data and certifying staff are available.

MAR 145.85 Changes to the Approved Maintenance Organisation

(See GM 145.85)

(a) The MAR-145 approved maintenance organisation shall notify the AACM of any proposal to carry out any of the following changes before such changes take place to enable the AACM to determine continued compliance with this MAR-145 and to amend, if necessary, the approval certificate, except that in the case of proposed

changes in personnel not known to the management beforehand, these changes shall be notified at the earliest opportunity:

(1) The name of the organisation.

(2) The location of the organisation.

(3) Additional locations of the organisation.

(4) The accountable manager.

(5) Any of the persons nominated under MAR 145.30 (b).

(6) The facilities, equipment, tools, material, procedures, work scope or certifying staff that could affect the approval.

MAR 145.90 Continued Validity of Approval

(a) Unless the approval has previously been surrendered, superseded, suspended, revoked or expired by virtue of exceeding any expiry date that may be specified in the approval certificate, the MAR-145 maintenance organisation approval shall remain valid subject to:

(1) The MAR-145 approved maintenance organisation remaining in compliance with MAR-145 requirements, in accordance with the provisions related to the handling of findings as specified under MAR 145.95; and

(2) The AACM being granted access to the MAR-145 approved maintenance organisation to determine continued compliance with this MAR-145 requirements; and

(3) The payment of any charges prescribed by the AACM. Failure to pay entitles the AACM to suspend, but does not automatically render the approval invalid.

(b) Upon surrender or revocation, the approval certificate shall be returned to the AACM.

MAR 145.95 Findings

(a) A level 1 finding is any significant non-compliance with MAR-145 requirements which lowers the safety standard and hazards seriously the flight safety.

(b) A level 2 finding is any non-compliance with MAR-145 requirements which could lower the safety standard and possibly hazard the flight safety.

(c) A level 3 finding is any observed potential deficiency, by objective evidence, which could lead to a non-compliance; or ineffective implementation of any SMS process.

(d) After receipt of notification of findings, the MAR-145 approved maintenance organisation shall define a corrective action plan and demonstrate corrective action to the satisfaction of the AACM within a period agreed with the AACM.

MAR 145.97 Equivalent Safety Case

(See GM 145.97)

(a) The AACM may exempt an organisation from a requirement in MAR-145 when satisfied that a situation exists not envisaged by a MAR-145 requirement and subject to compliance with any supplementary condition(s) the AACM considers necessary to

ensure equivalent safety. Such supplementary condition(s) shall be agreed by the AACM to ensure continued recognition of the approval.

(b) The AACM may exempt an organisation from a requirement in MAR-145 on an individual case by case permission basis only subject to compliance with any supplementary condition(s) the AACM considers necessary to ensure equivalent safety.

MAR 145.100 Revocation, Suspension, Limitation or Refusal to Renew the MAR-145 Approval Certificate

The AACM may, on reasonable grounds after due enquiry, revoke, suspend, limit or refuse to renew the MAR-145 approval certificate if the AACM is not satisfied that the holder of the approval certificate continues to meet the requirements of MAR-145 subject to the conditions of paragraph (a) or (b) as appropriate.

(a) Except as specified in paragraph (b), before revoking, suspending, limiting or refusing to renew a MAR-145 approval certificate, the AACM must first give at least 28 days notice to the holder in writing of its intention so to do and the reasons for its proposal and must offer the holder an opportunity to make representations and the AACM will consider those representations.

(b) In the case where the AACM has determined that the safe operation of an aircraft could be adversely affected the AACM may in addition to paragraph (a) provisionally suspend, in part or in whole, the MAR-145 approval certificate without prior notice until the paragraph (a) procedure is complete.

Section 2. Acceptable Means of Compliance and Guidance Material (AMC & GM)

1 General

1.1 This Section contains Acceptable Means of Compliance and Guidance Material that has been agreed by the AACM for inclusion in MAR-145.

1.2 Where a particular MAR paragraph does not have an Acceptable Means of Compliance or any Guidance Material, it is considered that no supplementary material is required.

2 Presentation

2.1 The Acceptable Means of Compliance and Guidance Material are presented in full page width on loose pages, each page being identified by the date of issue or revision under which it is issued or amended.

2.2 A numbering system has been used in which the Acceptable Means of Compliance or Guidance Material uses the same number as the MAR paragraph to which it refers. The number is introduced by the letters AMC or GM to distinguish the material from the MAR itself.

2.3 The acronyms AMC and GM also indicate the nature of the material and for this purpose the two types of material are defined as follows:

Acceptable Means of Compliance (AMC) illustrate a means, or several alternative means, but not necessarily the only possible means by which a requirement can be met. It should however be noted that where a new AMC is developed, any such AMC (which may be additional to an existing AMC) will be amended into the document.

Guidance Material (GM) provides guidance on how the organisations satisfy the intend of MAR-145.

2.4 Explanatory Notes not forming part of the AMC or GM text appear in a smaller typeface.

2.5 New, amended or corrected text is indicated by a marginal line.

3 Background

3.1 AACM aircraft maintenance policy is to require any aircraft with a Certificate of Airworthiness in either the Commercial Air Transport Category (Passenger) or Commercial Air Transport Category (Cargo) and used for Commercial Air Transport purposes to be maintained by a MAR-145 maintenance organisation approved for the type of aircraft.

3.2 A MAR-145 approved maintenance organisation within the following limitations may also carry out maintenance on aircraft type in any other Certificate of Airworthiness category.

3.2.1 Approval for aircraft maintenance may be either an approval for the aircraft type covering base maintenance or line maintenance or both.

3.2.2 Where a particular aircraft type maintenance programme does not follow the above philosophy, the AACM will decide which checks need to be classified as base maintenance.

3.2.3 AACM aircraft component maintenance policy is to require aircraft components, when removed from the aircraft, to be maintained by a MAR-145 maintenance organisation approved for the type of aircraft component.

GM 145.1 General

(See MAR 145.1)

1. A MAR-145 approved maintenance organisation may also carry out maintenance on any aircraft and/or aircraft component used for any purpose other than commercial air transport within the limitations of the particular approval.

2. A MAR-145 approved maintenance organisation may be approved to maintain aircraft/aircraft components not type accepted by the AACM.

GM 145.5 Definitions

(See MAR 145.5)

1. 'Restoration' should be understood to mean the work necessary to return the aircraft component to an approved standard.

AMC 145.10(a) Scope

(See MAR 145.10(a))

1. *Line Maintenance* should be understood as any maintenance that is carried out before flight to ensure that the aircraft is fit for the intended flight.

   (a) *Line Maintenance* may include:

   - Trouble shooting.
   - Defect rectification.
   - Component replacement with use of external test equipment if required. Component replacement may include components such as engines and propellers.
   - Scheduled maintenance and/or checks including visual inspections that will detect obvious unsatisfactory conditions/discrepancies but do not require extensive in depth inspection. It may also include internal structure, systems and powerplant items which are visible through quick opening access panels/doors.
   - Minor repairs and modifications which do not require extensive disassembly and can be accomplished by simple means.

   (b) For temporary or occasional cases (ADs, SBs) the Quality Manager may accept base maintenance tasks to be performed by a line maintenance organisation provided all requirements are fulfilled as defined by the Civil Aviation Authority.

   (c) Maintenance tasks falling outside these criteria are considered to be Base Maintenance.

   (d) Aircraft maintenance in accordance with 'progressive' type programmes should be individually assessed in relation to this paragraph. In principle, the decision

to allow some 'progressive' checks to be carried out should be determined by the assessment that all tasks within the particular check can be carried out safely to the required standards at the designated line maintenance station.

GM 145.10 Scope

This Guidance Material (GM) provides guidance on how the smallest organisations satisfy the intent of MAR-145:

1. By inference, the smallest maintenance organisation would only be involved in a limited number of light aircraft, or aircraft components, used for commercial air transport. It is therefore a matter of scale; light aircraft do not demand the same level of resources, facilities or complex maintenance procedures as the large organisation.

2. It is recognized that a MAR-145 approval may be required by two quite different types of small organisations, the first being the light aircraft maintenance hangar, the second being the component maintenance workshop, e.g. small piston engines, radio equipment, etc.

3. Where only one person is employed (in fact having the certifying function and others), these organisations approved under MAR-145 may use the alternatives provided in point 3.1 limited to the following:

Class A2	Base and Line maintenance of aeroplanes of 5700 kg and below (piston engines only)
Class A3	Base and Line maintenance of single-engined helicopters of less than 3175 kg.
Class A4	Aircraft other than A1, A2 and A3.
Class B2	Piston engines with maximum output of less than 450 HP.
Class C	Components
Class D1	Non destructive Testing.

3.1. MAR 145.30(b): The minimum requirement is for one full-time person who meets the MAR-66 requirements for certifying staff and holds the position of 'accountable manager, maintenance engineer and is also certifying staff'. No other person may issue a certificate of release to service and therefore if absent, no maintenance may be release during such absence.

3.1.1 The quality monitoring function of MAR 145.65(c) may be contracted to an appropriate organisation approved under MAR-145 or to a person with appropriate technical knowledge and extensive experience of quality audits employed on a part-time basis, with the agreement of the AACM.

Note: Full-time for the purpose of MAR-145 means not less than 35 hrs per week except during vacation periods.

3.1.2 MAR 145.35. In the case of an approval based on one person using a subcontracted quality monitoring arrangement, the requirement for a record of certifying staff is satisfied by the submission to and acceptance by the AACM of the AACM Form 4. With only one person the requirement for a separate record of authorisation is unnecessary because the MAR-145 Maintenance Organisation Approval Schedule defines the authorisation. An appropriate statement, to reflect this situation, should be included in the exposition.

3.1.3 MAR 145.65(c). It is responsibility of the contracted quality monitoring organisation or person to make a minimum of 2 visits per

12 months and it is the responsibility of this organisation or person to carry out such monitoring on the basis of 1 pre-announced visit and 1 not announced visit to the organisation.

It is the responsibility of the organisation to comply with the findings of the contracted quality monitoring organisation or the person.

CAUTION: it should be understood that if the contracted organisation or the above mentioned person loses or gives up its approval, then the organisation's approval will be suspended.

4. Recommended operating procedure for a MAR-145 approved maintenance organisation based upon up to 10 persons involved in maintenance.

4.1. MAR 145.30(b): The normal minimum requirement is for the employment on a full-time basis of two persons who meet AACM's requirements for certifying staff, whereby one holds the position of 'maintenance engineer' and the other holds the position of 'quality audit engineer'.

Either person can assume the responsibilities of the accountable manager providing that they can comply in full with the applicable elements of MAR 145.30(a), but the 'maintenance engineer' should be the certifying person to retain the independence of the 'quality audit engineer' to carry out audits. Nothing prevents either engineer from undertaking maintenance tasks providing that the 'maintenance engineer' issues the certificate of release to service.

The 'quality audit engineer' should have similar qualifications and status to the 'maintenance engineer' for reasons of credibility, unless he/she has a proven track-record in aircraft quality assurance, in which case some reduction in the extent of maintenance qualifications may be permitted.

In cases where AACM agrees that it is not practical for the organisation to nominate a post holder for the quality monitoring function, this function may be contracted in accordance to sub-paragraph 3.1.1.

AMC 145.10(b) Scope

(See MAR 145.10(b))

1. For an organisation to be approved in accordance with MAR 145.10(b) as an organisation located within Macao means that the management as specified in MAR 145.30(a) and (b) should be located in Macao.

2. Where the organisation uses facilities both inside and outside of Macao such as satellite facilities, sub-contractors, line stations etc., such facilities may be included in the approval without being identified on the approval certificate subject to the maintenance organisation exposition identifying the facilities and containing procedures to control such facilities and the AACM being satisfied that they form an integral part of the MAR-145 approved maintenance organisation.

AMC 145.10(c) Scope

(See MAR 145.10(c))

For the AACM to be satisfied that there is a need for approval, may require the potential applicant to provide to the AACM evidence from an organisation based in Macao that such organisation would like to use the potential applicant's facilities to support an aircraft/aircraft

component operated or manufactured in Macao. The evidence, when required, should be in the form of a letter(s) from the Macao based organisation(s) giving reasons for the need. Evidence of need is not required in the case of a Macao based organisation for its own facilities located in either inside or outside of Macao.

AMC 145.15(a) Application

(See MAR 145.15(a))

In a form and in a manner established by the AACM means that the application should be made on the appropriate form to the AACM (also downloadable from AACM website) and completed by the accountable manager. The required number of copies of the maintenance organisation exposition approved by the accountable manager means the number required by the AACM which normally means one electronic copy and one hard copy.

AMC 145.20 Terms of Approval

The following table identifies the ATA specification 2200 Chapter for the category C component rating. If the maintenance manual (or equivalent document) does not follow the ATA Chapters, the corresponding subjects still apply to the applicable C rating.

CLASS	RATING	ATA CHAPTERS
COMPONENTS OTHER THAN COMPLETE ENGINES OR APUs	C1 Air Cond & Press	21
	C2 Auto Flight	22
	C3 Comms and Nav	23 - 34
	C4 Doors - Hatches	52
	C5 Electrical Power & Lights	24 - 33 - 85
	C6 Equipment	25 - 38 - 44 - 45 - 50
	C7 Engine - APU	49 - 71 - 72 - 73 - 74 - 75 - 76 - 77 - 78 - 79 - 80 - 81 - 82 - 83
	C8 Flight Controls	27 - 55 - 57.40 - 57.50 -57.60 - 57.70
	C9 Fuel	28 - 47
	C10 Helicopters - Rotors	62 - 64 - 66 - 67
	C11 Helicopter - Trans	63 - 65
	C12 Hydraulic Power	29
	C13 Indicating/Recording Systems	31 - 42 - 46
	C14 Landing Gear	32
	C15 Oxygen	35
	C16 Propellers	61
	C17 Pneumatic & Vacuum	36 - 37
	C18 Protection ice/rain/fire	26 - 30
	C19 Windows	56
	C20 Structural	53 - 54 - 57.10 - 57.20 - 57.30
	C21 Water Ballast	41
	C22 Propulsion Augmentation	84

GM 145.20 Terms of Approval

(See MAR 145.20)

Appendix 1 contains a table listing all classes and rating possible under MAR-145.

AMC 145.25(a) Facility Requirements

(See MAR 145.25(a))

1. Where the hangar is not owned by the MAR-145 approved maintenance organisation, it may be necessary to establish proof of tenancy. In addition, sufficiency of hangar space to carry out planned base maintenance will need to be demonstrated by the preparation of a projected aircraft hangar visit plan relative to the maintenance programme. The aircraft hangar visit plan should be updated on a regular basis.
2. Protection from the weather elements relates to the normal prevailing local weather elements that are expected throughout any twelve month period. Aircraft hangar and aircraft component workshop structures should prevent the ingress of rain, hail, ice, snow, wind and dust etc. Aircraft hangar and aircraft component workshop floors should be sealed to minimise dust generation.
3. For line maintenance of aircraft, hangars are not essential but it is recommended that access to hangar accommodation be demonstrated for usage during inclement weather for minor scheduled work and lengthy defect rectification.
4. Aircraft maintenance staff should be provided with an area where they may study maintenance instructions and complete maintenance records in a proper manner.

AMC 145.25(b) Facility Requirements

(See MAR 145.25(b))

1. It is acceptable to combine any or all of the office accommodation requirements into one office subject to the staff having sufficient room to carry out the assigned tasks.
2. In addition, as part of the office accommodation, aircraft maintenance staff should be provided with an area where they may study maintenance instructions and complete maintenance records in a proper manner.

AMC 145.25(d) Facility Requirements

(See MAR 145.25(d))

1. Storage facilities for serviceable aircraft components should be clean, well-ventilated and maintained at a constant dry temperature to minimise the effects of condensation. Manufacturer's storage recommendations should be followed for those aircraft components identified in such published recommendations.
2. Storage racks should be strong enough to hold aircraft components and provide sufficient support for complex motor powered aircraft components such that the component is not distorted during storage.
3. All aircraft components, wherever practicable, should remain packaged in protective material to minimise damage and corrosion during storage.

AMC 145.30(a) Personnel Requirements

(See MAR 145.30(a))

With regard to the accountable manager, it is normally intended to mean the chief executive officer of the MAR-145 approved maintenance organisation, who by virtue of position has overall (including in particular financial) responsibility for running the organisation. The accountable manager may be the accountable manager for more than one organisation and is not required to be necessarily knowledgeable on technical matters as the maintenance organisation exposition defines the maintenance standards. When the accountable manager is not the chief executive officer the AACM will need to be assured that such an accountable manager has direct access to chief executive officer and has a sufficiency of 'maintenance funding' allocation.

AMC 145.30(b) Personnel Requirements

(See MAR 145.30(b))

1. Dependent upon the size of the MAR-145 approved maintenance organisation, the MAR-145 functions may be subdivided under individual managers or combined in any number of ways.

2. The MAR-145 approved maintenance organisation should have, dependent upon the extent of approval, a base maintenance manager, a line maintenance manager, a workshop manager, a safety manager and a quality manager, all of whom should report to the accountable manager except in small MAR-145 approved maintenance organisations where any one manager may also be the accountable manager, as determined by the AACM, he/she may also be the line maintenance manager or the workshop manager. The length of absence to justify deputising is the period beyond which the organisation cannot function properly due to such absence.

3. The base maintenance manager is responsible for ensuring that all maintenance required to be carried out in the hangar, plus any defect rectification carried out during base maintenance, is carried out to the design and quality standards specified in MAR 145.65(b). The base maintenance manager is also responsible for any corrective action resulting from the quality compliance monitoring of MAR 145.65(c).

4. The line maintenance manager is responsible for ensuring that all maintenance required to be carried out on the line including line defect rectification is carried out to the standards specified in MAR 145.65(b) and also responsible for any corrective action resulting from the quality compliance monitoring of MAR 145.65(c).

5. The workshop manager is responsible for ensuring that all work on aircraft components is carried out to the standards specified in MAR 145.65(b) and also responsible for any corrective action resulting from the quality compliance monitoring of MAR 145.65(c).

6. The quality manager's responsibility is specified in MAR 145.30(c). The safety manager's responsibility is specified in Aeronautical Circular No. AC/GEN/005.

7. Notwithstanding the example paragraphs 2 – 6 titles, the organisation may adopt any title for the foregoing managerial positions but should identify to the AACM the titles and persons chosen to carry out these functions.

8. Where a MAR-145 approved maintenance organisation chooses to appoint managers for all or any combination of the identified MAR-145 functions because of the size of the undertaking, it is necessary that these managers report ultimately through either

the base maintenance manager or line maintenance manager or workshop manager or quality manager or safety manager, as appropriate, to the accountable manager.

9. The MAR-145 approved maintenance organisation shall specify the minimum qualification of the managers acceptable to the AACM.

NOTE: Certifying staff may report to any of the managers specified depending upon which type of control the MAR-145 approved maintenance organisation uses (for example - licensed engineers/independent inspection/dual function supervisors etc.) so long as the quality compliance monitoring staff specified in MAR 145.65(c)(1) remain independent of all. Appendix 3 gives some organisation examples.

AMC 145.30(c) Personnel Requirements

(See MAR 145.30(c))

Monitoring the quality system includes requesting remedial action as necessary by the accountable manager and the nominated persons referred to in MAR 145.30(b).

GM 145.30 (c) Personnel Requirements

(See MAR 145.30(c))

The Quality Manager prescribed in MAR 145.30(c) should complete the Macao Airworthiness Course*.

*: For organisations located outside Macao, equivalent course may be acceptable to the AACM.

AMC 145.30(d) Personnel Requirements

(See MAR 145.30(d))

1. Has sufficient staff means that the MAR-145 approved maintenance organisation employs or contracts competent staff, as detailed in the man-hour plan, of which at least half the staff that perform maintenance in each workshop, hanger or flight line on any shift should be employed to ensure organisational stability. For the purpose of meeting a specific operational necessity, a temporary increase of the proportion of contract staff may be permitted to the MAR-145 approved maintenance organisation by AACM, in accordance with an approved procedure which should describe the extent, specific duties, and responsibilities for ensuring adequate organisation stability. For the purpose of this subparagraph, employed means the person is directly employed as an individual by the MAR-145 approved maintenance organisation whereas contracted means the person is employed by another organisation and contracted by that organisation to the MAR-145 approved maintenance organisation.

2. The maintenance man-hour plan should take into account all maintenance activities carried out outside the scope of the MAR-145 approval.

   The planned absence (for training, vacations, etc.) should be considered when developing the man-hour plan.

3. The maintenance man-hour plan should relate to the anticipated maintenance work load except that when the MAR-145 approved maintenance organisation cannot predict such workload, due to the short term nature of its contracts, then such plan should be based upon the minimum maintenance workload needed for commercial viability. Maintenance work load includes all necessary work such as, but not limited to, planning, maintenance record checks, production of worksheets/cards in paper or

electronic form, accomplishment of maintenance, inspection and the completion of maintenance records.

4. In the case of aircraft base maintenance, the maintenance man-hour plan should relate to the aircraft hangar visit plan as specified in AMC 145.25(a).

5. In the case of aircraft component maintenance, the maintenance man-hour plan should relate to the aircraft component planned maintenance as specified in MAR 145.25(a)(2).

6. The quality monitoring compliance function man-hours should be sufficient to meet the requirement of MAR 145.65(c) which means taking into account relevant AMC 145.65(c). Where quality monitoring staff perform other functions, the time allocated to such functions needs to be taken into account in determining quality monitoring staff numbers.

7. The maintenance man-hour plan should be reviewed at least every 3 months and updated when necessary.

8. Significant deviation from the maintenance man-hour plan should be reported through the departmental manager to the quality manager and the accountable manager for review. Significant deviation means more than a 25% shortfall in available man-hours during a calendar month for any one of the functions specified in MAR 145.30(d).

AMC 1 145.30 (e) Personnel Requirements

(See MAR 145.30(e))

Competence should be defined as a measurable skill or standard of performance, knowledge and understanding, taking into consideration attitude and behaviour. The referenced procedure requires amongst others that planners, mechanics, specialised services staff, supervisors, certifying staff and support staff, whether employed or contracted, are assessed for competence before unsupervised work commences and competence is controlled on a continuous basis. Competence should be assessed by evaluation of:

- On-the-job performance and/or testing of knowledge by appropriately qualified personnel, and
- Records for basic, organisational, and/or product type and differences training, and
- Experience records.

Validation of the above could include a confirmation check with the MAR-145 approved maintenance organisation(s) that issued such document(s). For that purpose, experience/training may be recorded in a document such as a log book or based on the suggested template in GM 3 to MAR-145.30(e).

As a result of this assessment, an individual’s qualification should determine:

- Which level of ongoing supervision would be required or whether unsupervised work could be permitted.
- Whether there is a need for additional training.

A record of such qualification and competence assessment should be kept.

This should include copies of all documents that attest to qualification, such as the licence and/or any authorisation held, as applicable.

For a proper competence assessment of its personnel, the MAR-145 approved maintenance organisation should consider that:

1. In accordance with the job function, adequate initial and recurrent training should be provided and recorded to ensure continued competence so that it is maintained throughout the duration of employment/contract.

2. All staff should be able to demonstrate knowledge of and compliance with the maintenance organisation procedures, as applicable to their duties.

3. All staff should be able to demonstrate an understanding of human factors and human performance issues in relation with their job function and be trained as per AMC 2 145.30 (e).

4. To assist in the assessment of competence and to establish the training needs analysis, job descriptions are recommended for each job function in the organisation. Job descriptions should contain sufficient criteria to enable the required competence assessment.

5. Criteria should allow the assessment to establish that, among others (titles might be different in each organisation):

   - Managers are able to properly manage the work output, processes, resources and priorities described in their assigned duties and responsibilities in a safe compliant manner in accordance with regulations and organisation procedures.
   - Planners are able to interpret maintenance requirements into maintenance tasks, and have an understanding that they have no authority to deviate from the maintenance data.
   - Supervisors are able to ensure that all required maintenance tasks are carried out and, where not completed or where it is evident that a particular maintenance task cannot be carried out to the maintenance data, then such problems will be reported to the MAR-145.30(c) person for appropriate action. In addition, for those supervisors, who also carry out maintenance tasks, that they understand such tasks should not be undertaken when incompatible with their management responsibilities.
   - Mechanics are able to carry out maintenance tasks to any standard specified in the maintenance data and will notify supervisors of defects or mistakes requiring rectification to re-establish required maintenance standards.
   - Specialised services staff are able to carry out specialised maintenance tasks to the standard specified in the maintenance data. They should be able to communicate with supervisors and report accurately when necessary.
   - Support staff are able to determine that relevant tasks or inspections have been carried out to the required standard.
   - Certifying staff are able to determine when the aircraft or aircraft component is ready to release to service and when it should not be released to service.
   - Quality audit staff are able to monitor compliance with MAR-145 identifying non-compliance in an effective and timely manner so that the organisation may remain in compliance with MAR-145.

Competence assessment should be based upon the procedure specified in GM 2 to MAR145.30(e).

AMC 2 145.30 (e) Personnel Requirements

(See MAR 145.30(e))

In respect to the understanding of the application of human factors and human performance issues, all maintenance organisation personnel should have received an initial and continuation human factors training. This should concern to a minimum:

- Post-holders, managers, supervisors;
- Certifying staff, support staff and mechanics;
- Technical support personnel such as planners, engineers, technical record staff;
- Quality control/assurance staff;
- Specialised services staff;
- Human factors staff/human factors trainers;
- Store department staff, purchasing department staff;
- Ground equipment operators.

1. Initial human factors training should cover all the topics of the training syllabus specified in GM 145.30(e) either as a dedicated course or else integrated within other training. The syllabus may be adjusted to reflect the particular nature of the organisation. The syllabus may also be adjusted to meet the particular nature of work for each function within the organisation. For example:

   - Small organisations not working in shifts may cover in less depth subjects related to teamwork and communication;
   - Planners may cover in more depth the scheduling and planning objective of the syllabus and in less depth the objective of developing skills for shift working.

   All personnel, including personnel being recruited from any other organisation should receive initial human factors training compliant with the organisation's training standards prior to commencing actual job function, unless their competence assessment justifies that there is no need for such training. Newly directly employed personnel working under direct supervision may receive training within 6 months after joining the maintenance organisation.

2. The purpose of human factors continuation training is primarily to ensure that staff remain current in terms of human factors and also to collect feedback on human factors issues. Consideration should be given to the possibility that such training has the involvement of the quality department. There should be a procedure to ensure that feedback is formally passed from the trainers to the quality department to initiate action where necessary.

   Human factors continuation training should be of an appropriate duration in each two year period in relation to relevant quality audit findings and other internal/external sources of information on human errors in maintenance available to the organisation.

3. Human factors training may be conducted by the maintenance organisation itself, or independent trainers, or any training organisations acceptable to AACM.

4. The human factors training procedures should be specified in the maintenance organisation exposition.

AMC 3 145.30(e) Personnel Requirements

(See MAR 145.30(e))

Additional training in fuel tank safety as well as associated inspection standards and maintenance procedures should be provided for maintenance organisations' technical personnel as applicable, especially technical personnel involved in the compliance of Critical Design Configuration Control Limitation (CDCCL) tasks.

Guidance is provided for training to maintenance organisation personnel in Appendix IV to AMC of EASA Part 145.

AMC 4 145.30(e) Personnel Requirements

(See MAR 145.30(e))

Competence assessment should include the verification for the need of additional Electrical Wiring Interconnect Systems (EWIS) training when relevant.

Guidance is provided for EWIS training programme to maintenance organisation personnel in EASA AMC 20-22.

GM 1 145.30(e) Personnel Requirements

(See AMC 145.30(e))

Training syllabus for initial human factors training

The training syllabus below identifies the topics and subtopics to be addressed during the human factors training.

The MAR-145 approved maintenance organisation may combine, divide, change the order of any subject of the syllabus to suit its own needs, so long as all subjects are covered to a level of detail appropriate to the organisation and its personnel.

Some of the topics may be covered in separate training (health and safety, management, supervisory skills, etc.) in which case duplication of training is not necessary.

Where possible practical illustrations and examples should be used, especially accident and incident reports.

Topics should be related to existing Macao aviation legislation and requirements, where relevant. Topics should be related to existing guidance/advisory material, where relevant (e.g. ICAO Human Factors Digests and Training Manual).

Topics should be related to maintenance engineering where possible; too much unrelated theory should be avoided.

1 **General / Introduction to Human Factors**

- 1.1 Need to address human factors
- 1.2 Statistics
- 1.3 Incidents

2 **Safety Culture / Organisational Factors**

3 **Human Error**

- 3.1 Error models and theories

3.2 Types of errors in maintenance tasks

3.3 Violations

3.4 Implications of errors

3.5 Avoiding and managing errors

3.6 Human reliability

4 **Human Performance & Limitations**

4.1 Vision

4.2 Hearing

4.3 Information processing

4.4 Attention and perception

4.5 Situational awareness

4.6 Memory

4.7 Claustrophobia and physical access

4.8 Motivation

4.9 Fitness/health

4.10 Stress

4.11 Workload management

4.12 Fatigue

4.13 Alcohol, medication, drugs

4.14 Physical work

4.15 Repetitive tasks / complacency

5 **Environment**

5.1 Peer pressure

5.2 Stressors

5.3 Time pressure and deadlines

5.4 Workload

5.5 Shift work

5.6 Noise and fumes

5.7 Illumination

5.8 Climate and temperature

5.9 Motion and vibration

5.10 Complex systems

5.11 Hazards in the workplace

5.12 Lack of manpower

5.13 Distractions and interruptions

6 **Procedures, Information, Tools and Practices**

6.1 Visual inspection

6.2 Work logging and recording

6.3 Procedure – practice / mismatch / norms

6.4 Technical documentation – access and quality

6.5 Critical maintenance tasks and error-capturing methods (independent inspection, re-inspection, etc)

7 **Communication**

7.1 Shift / Task handover

7.2 Dissemination of information

7.3 Cultural differences

8 **Teamwork**

8.1 Responsibility

8.2 Management, supervision and leadership

8.3 Decision making

9 **Professionalism and Integrity**

9.1 Keeping up to date; currency

9.2 Error provoking behaviour

9.3 Assertiveness

10 **Organisation's HF Program**

10.1 Reporting errors

10.2 Disciplinary policy

10.3 Error investigation

10.4 Action to address problems

10.5 Feedback

GM 2 145.30 (e) – Competence Assessment Procedure

The MAR-145 approved maintenance organisation should develop a procedure describing the process of competence assessment of personnel. The procedure should specify:

- Persons responsible for this process,
- When the assessment should take place,
- Credits from previous assessments,
- Validation of qualification records,
- Means and methods for the initial assessment
- Means and methods for the continuous control of competence including feedback on personnel performance,
- Competences to be observed during the assessment in relation with each job function,
- Actions to be taken when assessment is not satisfactory,
- Recording of assessment results.

For example, according to the job functions and the scope, size and complexity of the organisation, the assessment may consider the following (the table is not exhaustive):

	Managers	Planners	Supervisor	Certifying staff and support staff	Mechanics	Specialized Service staff	Quality audit staff
Knowledge of applicable officially recognised standards						X	X
Knowledge of auditing techniques: planning, conducting and reporting							X
Knowledge of human factors, human performance and limitations	X	X	X	X	X	X	X
Knowledge of logistics processes	X	X	X				
Knowledge of organisation capabilities, privileges and limitations	X	X	X	X	X	X	X
Knowledge of Part-M, Part-145 and any other relevant regulations	X	X	X	X			X
Knowledge of relevant parts of the maintenance organisation exposition and procedures	X	X	X	X	X	X	X
Knowledge of occurrence reporting system and understanding of the importance of reporting occurrences, incorrect maintenance data and existing or potential defects		X	X	X	X	X	
Knowledge of safety risks linked to the working environment	X	X	X	X	X	X	X
Knowledge on CDCCL when relevant	X	X	X	X	X	X	X
Knowledge on EWIS when relevant	X	X	X	X	X	X	X
Understanding of professional integrity, behavior and attitude towards safety	X	X	X	X	X	X	X
Understanding of conditions for ensuring continuing airworthiness of aircraft and components				X			X
Understanding of his/her own human performance and limitations	X	X	X	X	X	X	X
Understanding of personnel authorisations and limitations	X	X	X	X	X	X	X
Understanding critical maintenance task		X	X	X	X		X
Ability to compile and control completed work cards		X	X	X			
Ability to consider human performance and limitations	X	X	X	X			X
Ability to determine required qualifications for task performance		X	X	X			

	Managers	Planners	Supervisor	Certifying staff and support staff	Mechanics	Specialized Service staff	Quality audit staff
Ability to identify and rectify existing and potential unsafe conditions			X	X	X	X	X
Ability to manage third parties involved in maintenance activity		X	X				
Ability to confirm proper accomplishment of maintenance tasks			X	X	X	X	
Ability to identify and properly plan performance of critical maintenance task		X	X	X			
Ability to prioritise tasks and report discrepancies		X	X	X	X		
Ability to process the work requested by the operator		X	X	X			
Ability to promote the safety and quality policy	X		X				
Ability to properly process removed, uninstalled and rejected parts			X	X	X	X	
Ability to properly record and sign for work accomplished			X	X	X	X	
Ability to recognise the acceptability of parts to be installed prior to fitment				X	X		
Ability to split complex maintenance tasks into clear stages		X					
Ability to understand work orders, work cards and refer to and use applicable maintenance data		X	X	X	X	X	X
Ability to use information systems	X	X	X	X	X	X	X
Ability to use, control and be familiar with required tooling and/or equipment			X	X	X	X	
Adequate communication and literacy skills	X	X	X	X	X	X	X
Analytical and proven auditing skills (for example, objectivity, fairness, open-mindedness, determination, …)							X
Maintenance error investigation skills							X
Resources management and production planning skills	X	X	X				
Teamwork, decision-making and leadership skills	X		X				

GM 3 145.30 (e) – Template for Recording Experience/Training

The following template may be used to record the professional experience gained in an organisation and the training received and be considered during the competence assessment of the individual in another organisation.

Aviation Maintenance personnel experience credential					
Name		Given name			
Address					
Telephone		E-mail			
□ Independent worker					
Trade Group:	□ airframe □ engine □ electric □ avionics □ other (specify)				
Employer's details (when applicable)					
Name					
Address					
Telephone					
Maintenance organisation details					
Name					
Address					
Telephone					
Approval Number					
Period of employment		From:		To:	
Domain of employment					
□ Planning		□ Engineering		□ Technical records	
□ Store department		□ Purchasing			
Mechanics/Technician					
□ Line Maintenance		□ Base Maintenance		□ Component Maintenance	
□ Servicing		□ Removal/installation		□ Testing/inspection	
□ Scheduled Maintenance		□ Inspection		□ Repair	
□ Trouble-shooting		□ Trouble-shooting		□ Overhaul	
		□ Repair		□ Re-treatment	
				□ Reassembly	
	A/C type		A/C type	Component Type	
Certifying Staff and support staff					
□ Cat. A	□ Cat. B1	□ Cat. B2	□ Cat. C	□ Component	□ Other(e.g. NDT)
A/C type	A/C type	A/C type	A/C type	Component Type	Specify
Certification privilege:	□ Yes / □ No				
□ Specialized services		Speciality (NDT, composites, weilding, etc.):			
□ Skilled personnel		Speciality (sheet metal, structures, wireman, upholstery, etc.):			
□ Groud equipment operation					
□ Quality control		□ Quality assurance		□ Training	
			Total number of check boxes ticked:		

Details of employment:

Training received from the contracting organisation	
Date:	Nature of training

Certified by:	
Name:	Date:
Position:	Signature:
Contact details:	
Advisory note:	*A copy of the present credential will be kept for at least 3 years from its issuance by the maintenance organisation.*

AMC 145.30(f) Personnel Requirements

(See MAR 145.30(f))

1. Continued airworthiness non-destructive testing (NDT) means such testing specified by the type certificate holder/aircraft or engine or propeller manufacturer in accordance with the maintenance data as specified in MAR 145.45 for in service aircraft/aircraft components for the purpose of determining the continued fitness of the product to operate safely.

2. Appropriately qualified means to Level 1, 2 or 3 as defined by European Standard EN 4179 dependent upon the non-destructive testing function to be carried out. The AACM may also accept other standards if equivalent safety level can be demonstrated.

3. Notwithstanding the fact that Level 3 personnel may be qualified via EN 4179 to establish and authorise methods, techniques, etc., this does not permit such personnel to deviate from methods and techniques published by the type certificate holder/manufacturer in the form of continued airworthiness data, such as in non-destructive test manuals or service bulletins, unless the manual or service bulletin expressly permits such deviation.

4. Notwithstanding the general references in EN 4179 to a National Aerospace NDT Board, all examinations should be conducted by personnel or organisations under the general control of a NDT board outside Macao being recognised by the AACM.

5. Particular non-destructive test means any one or more of the following; Dye penetrant, magnetic particle, eddy current, ultrasonic and radiographic methods including X ray and gamma ray.

6. It should be noted that new methods are and will be developed, such as, but not limited to thermography and shearography, which are not specifically addressed by existing standards. Until such time as an agreed standard is established such methods should be carried out in accordance with the particular equipment manufacturers recommendations including any training and examination process to ensure competence of the personnel with the process.

7. Any MAR-145 approved maintenance organisation that carries out NDT should establish NDT specialist qualification procedures detailed in the exposition and accepted by the AACM.

8. Boroscoping and other techniques such as delamination coin tapping are non-destructive inspections rather than NDT. Notwithstanding such differentiation, the MAR-145 approved maintenance organisation should establish a maintenance organisation exposition procedure accepted by the AACM to ensure that personnel who carry out and interpret such inspections are properly trained and assessed for their competence with the process. Non-destructive inspections, not being considered as NDT by MAR-145 are not listed in Appendix 1 Paragraph 7 under class rating D1.

9. The referenced standards, methods, training and procedures should be specified in the Maintenance Organisation Exposition (MOE).

AMC 145.30(g) Personnel Requirements

(See MAR 145.30(g))

1. For the purposes of MAR-66.20(a)(1) and MAR-66.20(a)(3)(ii) personnel, minor scheduled line maintenance means any minor scheduled inspection/check up to and including a weekly check specified in the aircraft maintenance programme. For aircraft maintenance programmes that do not specify a weekly check, the AACM will determine the most significant check that is considered equivalent to a weekly check.

2. Typical tasks permitted after appropriate task training to be carried out by MAR-66.20(a)(1) and the MAR-66.20(a)(3)(ii) personnel for the purpose of these personnel issuing an aircraft Certificate of Release to Service as specified in MAR 145.50 as part of minor scheduled line maintenance or simple defect rectification are contained in the following list:

   (a) Replacement of wheel assemblies.

   (b) Replacement of wheel brake units.

   (c) Replacement of emergency equipment.

   (d) Replacement of ovens, boilers and beverage makers.

   (e) Replacement of internal and external lights, filaments and flash tubes.

   (f) Replacement of windscreen wiper blades.

   (g) Replacement of passenger and cabin crew seats, seat belts and harnesses.

   (h) Closing of cowlings and refitment of quick access inspection panels.

   (i) Replacement of toilet system components but excluding gate valves.

   (j) Simple repairs and replacement of internal compartment doors and placards but excluding doors forming part of a pressure structure.

   (k) Simple repairs and replacement of overhead storage compartment doors and cabin furnishing items.

   (l) Replacement of static wicks.

(m) Replacement of aircraft main and Auxiliary Power Unit (APU) aircraft batteries.

(n) Replacement of in-flight entertainment system components other than public address.

(o) Routine lubrication and replenishment of all system fluids and gases.

(p) The de-activation only of sub-systems and aircraft components as permitted by the operator's minimum equipment list where such de-activation is agreed by the AACM as a simple task.

(q) Inspection for and removal of de-icing/anti-icing fluid residues, including removal/closure of panels, cowls or covers or the use of special tools.

(r) Any other task agreed by the Civil Aviation Authority as a simple task for a particular aircraft type. This may include defect deferment when all the following conditions are met:

- There is no need for troubleshooting; and
- The task is in the Minimum Equipment List (MEL); and
- The maintenance action required by the MEL is agreed by the Civil Aviation Authority to be simple.

In the particular case of helicopters, and in addition to the items above, the following:

(s) Removal and installation of Helicopter Emergency Medical Service (HEMS) simple internal medical equipment.

(t) Removal and installation of external cargo provisions (i.e., external hook, mirrors) other than the hoist.

(u) Removal and installation of quick release external cameras and search lights.

(v) Removal and installation of emergency float bags, not including the bottles.

(w) Removal and installation of external doors fitted with quick release attachments.

(x) Removal and installation of snow pads/skid wear shoes/slump protection pads.

No task which requires troubleshooting should be part of the authorised maintenance actions. Release to service after rectification of deferred defects should be permitted as long as the task is listed above.

3. The requirement of having appropriate aircraft rated certifying staff qualified as category B1, B2, B3, as appropriate, in the case of aircraft line maintenance does not imply that the organisation must have B1, B2 and B3 personnel at every line station. The MOE should have a procedure on how to deal with defects requiring B1, B2 or B3 certifying staff.

4. AACM may accept that in the case of aircraft line maintenance an organisation has only B1, B2, B3 or certifying staff, as appropriate, provided that AACM is satisfied that the scope of work, as defined in the Maintenance Organisation Exposition, does not need the availability of all B1, B2 and B3 certifying staff. Special attention should be taken to clearly limit the scope of scheduled and non-scheduled line maintenance (defect rectification) to only those tasks that can be certified by the available certifying staff category.

AMC 145.30(h) Personnel Requirements

In accordance with MAR-145.30(h) and MAR-145.35, the qualification requirements (basic licence, aircraft ratings, recent experience and continuation training) are identical for certifying staff and for support staff. The only difference is that support staff cannot hold certification privileges when performing this role since during base maintenance the release to service will be issued by category C certifying staff.

Nevertheless, the organisation may use as support staff (for base maintenance) persons who already hold certification privileges for line maintenance.

AMC 145.30(j)(4) Personnel Requirements

(See MAR 145.30(j)(4))

For the issue of a limited certification authorisation the commander should hold either a valid air transport pilot licence (ATPL) or commercial pilot licence (CPL) granted or rendered valid by the AACM, on the aircraft type. In addition the limited certification authorisation is subject to the maintenance organisation exposition containing procedures to address the personnel requirements of MAR 145.30(e) and associated AMC and guidance material. Such procedures should include as a minimum:

(a) Completion of adequate maintenance airworthiness regulation training.

(b) Completion of adequate task training for the specific task on the aircraft. The task training should be of sufficient duration to ensure that the individual has a thorough understanding of the task to be completed and will involve training in the use of associated maintenance data.

(c) Completion of the procedural training as specified in MAR-145.

The above procedures should be specified in the MAR-145 maintenance organisation exposition and be accepted by the AACM.

2. Typical tasks that may be certified and/or carried out by the commander holding an ATPL or CPL are minor maintenance or simple checks included in the following list:

(a) Replacement of internal lights, filaments and flash tubes.

(b) Closing of cowlings and refitment of quick access inspection panels.

(c) Role changes e.g. stretcher fit, dual controls, Forward-Looking Infra Red (FLIR), doors, photographic equipment etc.

(d) Inspection for and removal of de-icing/anti-icing fluid residues, including removal/closure of panels, cowls or covers that are easily accessible but not requiring the use of special tools.

(e) Any check/replacement involving simple techniques consistent with this AMC and as agreed by the Civil Aviation Authority.

3. The authorisation should have a finite life of twelve months subject to satisfactory re-current training on the applicable aircraft type.

GM 145.30 (j)(4) Personnel Requirements (Flight Crew)

(See AMC 145.30(j)(4))

1. For the holder of an ATPL or CPL granted or rendered valid by the AACM the theoretical knowledge and examination shall include but not limited the following subjects:

   - Air law
   - Airframe/systems/powerplant
   - Instruments/electronics
   - Mass and balance
   - Performance
   - Flight planning and monitoring
   - Human performance and limitations
   - Meteorology
   - General navigation
   - Radio Navigation
   - Operational Procedures
   - Principles of Flight
   - VFR Communications
   - IFR Communications

2. For the holder of an ATPL or CPL granted or rendered valid by the AACM, gives details on the theoretical and practical knowledge and skill requirements from which Technical Training Course (TTC) details the following subjects:

   Familiarisation with basic maintenance procedures, to give additional technical background knowledge, especially with respect to the implication of systems malfunctions, and to train the applicant in maintenance related to the Minimum Equipment List (MEL).

   The theoretical knowledge instruction consists of 100 hours and includes the following elements:

   - Airframe and systems
   - Electrics
   - Powerplant and emergency equipment
   - Flight instruments and automatic flight control systems

   Practical skills training provided by an organisation approved under Part-145 is given which includes 35 hours practical experience in the following subjects:

   - Fuselage and flight controls,
   - Engines,
   - Instruments,
   - Landing gear and brakes,
   - Cabin/cockpit/emergency equipment,
   - De-icing/anti-icing related maintenance activities,

- Ground handling and servicing,
- Certificate of completion.

Following successful completion of the technical training, the training organisation carrying out the theoretical knowledge instruction and/or the practical skill training should provide the applicant with a certificate of satisfactory completion of the course, or part thereof.

AMC 145.30(j)(5) Personnel Requirements

(See MAR 145.30(j)(5))

1. For the purposes of this paragraph "unforeseen" means that the aircraft grounding could not reasonably have been predicted by the operator because the defect was unexpected due to being part of a hitherto reliable system.
2. A one-off authorisation should only be considered for issue by the quality department of the contracted MAR-145 approved maintenance organisation after it has made a reasoned judgement that such a requirement is appropriate under the circumstances and at the same time maintaining the required airworthiness standards. The organisation's quality department will need to assess each situation individually prior to the issuance of a one-off authorisation.
3. A one-off authorisation should not be issued where the level of certification required could exceed the knowledge and experience level of the person it is issued to. In all cases, due consideration should be given to the complexity of the work involved and the availability of required tooling and/or test equipment needed to complete the work.

AMC 145.30(j)(5)(i) Personnel Requirements

(See MAR 145.30(j)(5)(i))

In those situations where the requirement for a one-off authorisation to issue a Certificate of Release to Service (CRS) for a task on an aircraft type for which certifying staff does not hold a type-rated authorisation has been identified, the following procedure is recommended:

1. Flight crew should communicate full details of the defect to the operator’s supporting MAR-145 approved maintenance organisation with full details of the defect. If necessary, the supporting maintenance organisation will then request the use of a one-off authorisation from the quality department.
2. When issuing a one-off authorisation, the quality department of the MAR-145 approved maintenance organisation should verify that:
   a. Full technical details relating to the work required to be carried out have been established and passed on to the certifying staff.
   b. The organisation has an approved procedure in place for coordinating and controlling the total maintenance activity undertaken at the location under the authority of the one-off authorisation.
   c. The person to whom a one-off authorisation is issued has been provided with all necessary information and guidance relating to maintenance data and any special technical instructions associated with the specific task undertaken. A detailed step by step worksheet has been defined by the organisation, communicated to the one-off authorisation holder.

d. The person holds authorisations of equivalent level and scope on other aircraft type of similar technology, construction and systems.

3. The one-off authorisation holder should sign off the detailed step by step worksheet when completing the work steps. The completed tasks should be verified by visual examination and/or normal system operation upon return to an appropriately approved MAR-145 maintenance facility.

AMC 145.30(j)(5)(ii) Personnel Requirements

(See MAR 145.30(j)(5)(ii))

This paragraph addresses staff not employed by the MAR-145 approved maintenance organisation who meet the requirements of MAR 145.30 (j)(5). In addition to the items listed in AMC 145.30 (j)(5)(i), paragraph 1, 2a, b and c and 3 the quality department of the organisation may issue such one-off authorisation providing full qualification details relating to the proposed certifying personnel are verified by the quality department and made available at the location.

AMC 145.35(a) Certifying Staff and Support Staff

(See MAR 145.35(a))

1. Holding the MAR-66 licence with the relevant type/group rating, or a national qualification in the case of aircraft components, does not mean by itself that the holder is qualified to be authorised as certifying staff and/or support staff. The organisation is responsible to assess the competence of the holder for the scope of maintenance to be authorised.

2. The sentence "the MAR-145 approved maintenance organisation shall ensure that certifying staff and support staff have an adequate understanding of the relevant aircraft and/or aircraft components to be maintained together with the associated organisation procedures" means that the person has received training and has been successfully assessed on:

   - The type of aircraft or component;
   - The differences on:
     - The particular model/variant;
     - The particular configuration.

   The organisation should specifically ensure that the individual competencies have been established with regard to:

   - Relevant knowledge, skills and experience in the product type and configuration to be maintained, taking into account the differences between the generic aircraft type rating training that the person received and the specific configuration of the aircraft to be maintained.
   - Appropriate attitude towards safety and observance of procedures.
   - Knowledge of the associated organisation and operator procedures (i.e. handling and identification of components, MEL use, Technical Log use, independent checks, etc.).

3. Some special maintenance tasks may require additional specific training and experience, including but not limited to:

   - In-depth troubleshooting;

- Very specific adjustment or test procedures;
- Rigging;
- Engine run-up, starting and operating the engines, checking engine performance characteristics, normal and emergency engine operation, associated safety precautions and procedures;
- Extensive structural/system inspection and repair;
- Other specialised maintenance required by the maintenance programme.

For engine run-up training, simulators and/or real aircraft should be used.

4. The satisfactory assessment of the competence should be conducted in accordance with a procedure approved by AACM (item 3.4 of the MOE, as described in AMC 145.70(a)).

5. The organisation should hold copies of all documents that attest the competence and recent experience for the period described in 145.35(j).

Additional information is provided in AMC 66.20(b)3.

AMC 145.35(b) Certifying staff and Support Staff

(See MAR 145.35(b))

The MAR-145 approved maintenance organisation issues the MAR-145 certification authorisation when satisfied that compliance has been established with the appropriate requirements of MAR-145 and MAR-66. In granting the certification authorisation the MAR-145 approved maintenance organisation needs to be satisfied that the person holds a valid MAR-66 aircraft maintenance licence and may need to confirm such fact with the AACM.

AMC 145.35(c) Certifying staff and Support Staff

For the interpretation of "6 months of actual relevant aircraft maintenance experience in any consecutive 2-year period", the provisions of AMC 66.20(b)2 are applicable.

AMC 145.35(d) Certifying staff and Support Staff

(See MAR 145.35(d))

1. Continuation training is a two way process to ensure that certifying staff remain current in terms of procedures, human factors and technical knowledge and that the MAR-145 approved maintenance organisation receives feedback on the adequacy of its procedures and maintenance instructions. Due to the interactive nature of this training, consideration should be given to the possibility that such training has the involvement of the quality department to ensure that feedback is actioned. Alternatively, there should be a procedure to ensure that feedback is formally passed from the training department to the quality department to initiate action.

2. Continuation training should cover changes in relevant requirements such as MAR-145, changes in organisation procedures and the modification standard of the products being maintained plus human factors issues identified from any internal or external analysis of incidents. It should also address instances where staff failed to follow procedures and the reasons why particular procedures are not always followed. In many cases the continuation training will reinforce the need to follow procedures and ensure that incomplete or incorrect procedures are identified to the company in order

that they can be corrected. This does not preclude the possible need to carry out a quality audit of such procedures.

3. Continuation training should be of sufficient duration in each 2 year period to meet the intent of MAR 145.35(d) and may be split into a number of separate elements. MAR 145.35(d) requires such training to keep certifying staff updated in terms of relevant technology, procedures and human factors issues which means it is one part of ensuring quality. Therefore sufficient duration should be related to relevant quality audit findings and other internal/external sources of information available to the MAR-145 approved maintenance organisation on human errors in maintenance. This means that in the case of a MAR-145 approved maintenance organisation that maintains aircraft with few relevant quality audit findings, continuation training could be limited to days rather than weeks, whereas a similar organisation with a number of relevant quality audit findings, such training may take several weeks. For a MAR-145 approved maintenance organisation that maintains aircraft components, the duration of continuation training would follow the same philosophy but should be scaled down to reflect the more limited nature of the activity. For example certifying staff who release hydraulic pumps may only require a few hours of continuation training whereas those who release turbine engine may only require a few days of such training. The content of continuation training should be related to relevant quality audit findings and it is recommended that such training is reviewed at least once in every 24 month period.

4. The method of training is intended to be a flexible process and could, for example, include a MAR-147 continuation training courses, aeronautical college courses, internal short duration courses, seminars, etc. The elements, general content and length of such training should be specified in the maintenance organisation exposition unless such details may be specified under the MAR-147 approval; and cross referenced in the MAR-145 maintenance organisation exposition.

AMC 145.35(e) Certifying staff and Support Staff

(See MAR 145.35(e))

The programme for continuation training should list all certifying staff and support staff and when training will take place, the elements of such training and an indication that it was carried out reasonably on time as planned. Such information should subsequently be transferred to the certifying staff record as required by MAR 145.35(j).

AMC 145.35(f) Certifying staff and Support Staff

(See MAR 145.35(f))

As stated in MAR-145.35 (f), except where any of the unforeseen cases of MAR-145.30(j)(5) applies, all prospective certifying staff and support staff should be assessed for competence related to their intended duties in accordance with AMCs 1, 2, 3 and 4 to 145.30 (e), as applicable.

AMC 145.35(j) Certifying staff and Support Staff

(See MAR 145.35(j))

1. The following minimum information as applicable should be kept on record in respect of each certifying staff and support staff:

   (a) Name

   (b) Date of Birth

   (c) Basic Training

   (d) Type Training

   (e) Continuation Training

   (f) Experience

   (g) Qualifications relevant to the authorisation

   (h) Scope of the authorisation

   (i) Date of first issue of the authorisation

   (j) If appropriate - expiry date of the authorisation

   (k) Identification Number of the authorisation

2. The record may be kept in any format but should be controlled by the MAR-145 approved maintenance organisation's quality department. This does not mean that the quality department should run the record system.

3. Persons authorised to access the system should be maintained at a minimum to ensure that records cannot be altered in an unauthorised manner or that such confidential records become accessible to unauthorised persons.

4. The AACM is an authorised person when investigating the records system for initial and continued approval or when the AACM has cause to doubt the competence of a particular person.

AMC 145.35(n) Certifying staff and Support Staff

1. It is the responsibility of the MAR-145 organisation issuing the category A certifying staff authorisation to ensure that the task training received by this person covers all the tasks to be authorised. This is particularly important in those cases where the task training has been provided by a MAR-147 organisation or by a MAR-145 organisation different from the one issuing the authorisation.

2. "*Appropriately approved in accordance with MAR-147"* means an organisation holding an approval to provide category A task training for the corresponding aircraft type.

3. "*Appropriately approved in accordance with MAR-145*" means an organisation holding a maintenance organisation approval for the corresponding aircraft type.

AMC 145.35(o) Certifying staff and Support Staff

1. The privilege for a B2 licence holder to release minor scheduled line maintenance and simple defect rectification in accordance with MAR-66.20(a)(3)(ii) can only be granted by the MAR-145 approved organisation where the licence holder is employed/contracted after meeting all the requirements specified in MAR-145.35(o). This privilege cannot be transferred to another MAR-145 approved organisation.

2. When a B2 licence holder already holds a certifying staff authorisation containing minor scheduled line maintenance and simple defect rectification for a particular aircraft type, new tasks relevant to category A can be added to that type without requiring another 6 months of experience. However, task training (theoretical plus practical hands-on) and examination/assessment for these additional tasks is still required.

3. When the certifying staff authorisation intends to cover several aircraft types, the experience may be combined within a single 6-month period.

4. For the addition of new types to the certifying staff authorisation, another 6 months should be required unless the aircraft is considered similar per AMC 66.20(b)2 to the one already held.

5. The term "6 months of experience" may include full-time employment or part-time employment. The important aspect is that the person has been involved during a period of 6 months (not necessarily every day) in those tasks which are going to be part of the authorisation

AMC 145.40(a) Equipment, Tools and Material

(See MAR 145.40(a))

1. Once the applicant for MAR-145 approval has determined the intended scope of approval for consideration by the AACM, it will be necessary to show that all tools and equipment as specified in the maintenance data can be made available when needed. All such tools and equipment that require to be controlled in terms of servicing or calibration by virtue of being necessary to measure specified dimensions and torque figures etc, should be clearly identified and listed in a control register including any personal tools and equipment that the MAR-145 approved maintenance organisation agrees can be used.

2. The necessary material to perform the scope of work means readily available raw material and aircraft components in accordance with the manufacturer's recommendation unless the organisation has an established spares provisioning procedure.

AMC 145.40(b) Equipment, Tools and Material

(See MAR 145.40(b))

1. The control of these tools and equipment requires that the MAR-145 approved maintenance organisation has a procedure to inspect/service and, where appropriate, calibrate such items on a regular basis and indicate to users that the item is within any inspection or service or calibration time-limit. A clear system of labelling all tooling, equipment and test equipment is therefore necessary giving information on when the next inspection or service or calibration is due and if the item is unserviceable for any other reason where it may not be obvious. A register should be maintained for all precision tooling and equipment together with a record of calibrations and standards used.

2. Inspection, service or calibration on a regular basis should be in accordance with the equipment manufacturers' instructions except where the MAR145 approved maintenance organisation can show by results that a different time period is appropriate in a particular case.

3. In this context, 'standards acceptable to the AACM' means those standards established or published by an official body whether having legal personality or not, which are widely recognised by the air transport sector as constituting good practice.

AMC 145.42(b) Acceptance of Components

(See MAR 145.42(b))

The AACM Form 1 identifies the status of an aircraft component. Block 12 'Remarks' on the AACM Form 1 in some cases contains vital airworthiness related information which may need appropriate and necessary actions. The receiving organisation should be satisfied that the component in question is in satisfactory condition and has been appropriately released to service. In addition, the organisation should ensure that the component meets the approved data/standard, such as the required design and modification standard. This may be accomplished by reference to the manufacturer's parts catalogue or other approved data (i.e. Service Bulletin). Care should also be taken in ensuring compliance with applicable airworthiness directives, the status of any life-limited parts fitted to the aircraft component as well as Critical Design Configuration Control Limitations (CDCCL).

AMC 145.42(c) Acceptance of Components

(See MAR 145.42(c))

1. The agreement by the AACM for the fabrication of parts by the MAR-145 approved maintenance organisation should be formalized through the approval of a detailed procedure in the Maintenance Organisation Exposition. This AMC contains principles and conditions to be taken into account for the preparation of an acceptable procedure.

2. Fabrication, inspection assembly and test should be clearly within the technical and procedural capability of the MAR-145 approved maintenance organisation;

3. All necessary data to fabricate the part should be approved either by the AACM or the type certificate (TC) holder or appropriately approved design organisation approval holder, or supplemental type certificate (STC) holder;

4. Items fabricated by a MAR-145 approved maintenance organisation may only be used by that organisation in the course of overhaul, maintenance, modifications, or repair of aircraft or components undergoing work within its own facility. The permission to fabricate does not constitute approval for manufacture, or to supply externally and the parts do not qualify for certification on AACM Form 1. This prohibition also applies to the bulk transfer of surplus inventory, in that locally fabricated parts are physically segregated and excluded from any delivery certification.

5. Fabrication of parts, modification kits etc for onward supply and/or sale may not be conducted by a MAR-145 approved maintenance organisation.

6. The data specified in paragraph 3 may include repair procedures involving the fabrication of parts. Where the data on such parts is sufficient to facilitate fabrication, the parts may be fabricated by a MAR-145 approved maintenance organisation. Care should be taken to ensure that the data include details of part numbering, dimensions, materials, processes, and any special manufacturing techniques, special raw material specification or/and incoming inspection requirement and that the MAR-145 approved maintenance organisation has the necessary capability. That capability should be defined by way of maintenance organisation exposition content. Where special processes or inspection procedures are defined in the approved data which are

not available at the MAR-145 approved maintenance organisation the organisation cannot fabricated the part unless the TC/STC- holder gives an approval alternative.

7. Examples of fabrication under the scope of a MAR-145 approval can include but are not limited to the following:

   (a) Fabrication of bushes, sleeves and shims.

   (b) Fabrication of secondary structural elements and skin panels.

   (c) Fabrication of control cables.

   (d) Fabrication of flexible and rigid pipes.

   (e) Fabrication of electrical cable looms and assemblies.

   (f) Formed or machined sheet metal panels for repairs.

   All the above fabricated parts, should be in accordance with data provided in overhaul or repair manuals, modification schemes and service bulletins, drawings or otherwise approved by the AACM.

   Note: It is not acceptable to fabricate any item to pattern unless an engineering drawing of the item is produced which includes any necessary fabrication processes and which is acceptable to the AACM.

8. Where a TC-holder or an approved production organisation is prepared to make available complete data which is not referred to in aircraft manuals or service bulletins but provides manufacturing drawings for items specified in parts lists, the fabrication of these items is not considered to be within the scope of an approval unless agreed otherwise by the AACM in accordance with a procedure specified in the maintenance organisation exposition.

9. Inspection and Identification.

   Any locally fabricated part should be subjected to an inspection stage before, separately, and preferably independently from, any inspection of its installation. The inspection should establish full compliance with the relevant manufacturing data, and the part should be unambiguously identified as fit for use by stating conformity to the approved data. Adequate records should be maintained of all such fabrication processes including, heat treatment and the final inspections. All parts, except those having not enough space, should carry a part number which clearly relates it to the manufacturing/inspection data. Additional to the part number the MAR-145 approved maintenance organisation's identity should be marked on the part for traceability purposes.

AMC 145.42(d) Acceptance of Components

(See MAR 145.42(d))

1. The following types of aircraft components should typically be classified as unsalvageable:

   (a) Aircraft components with non-repairable defects, whether visible or not to the naked eye;

   (b) Aircraft components that do not meet design specifications, and cannot be brought into conformity with such specifications;

   (c) Aircraft components subjected to unacceptable modification or rework that is irreversible;

(d) Certified life-limited parts that have reached or exceeded their certified life limits, or have missing or incomplete records;

(e) Aircraft components that cannot be returned to airworthy condition due to exposure to extreme forces, heat or adverse environment;

(f) Aircraft components for which conformity with an applicable airworthiness directive cannot be accomplished;

(g) Aircraft components for which maintenance records and/or traceability to the manufacturer cannot be retrieved.

2. It is common practice for possessors of aircraft components to dispose of unsalvageable components 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. Misrepresentation of the status of aircraft components and the practice of making such items appear serviceable have resulted in the use of unsalvageable nonconforming Components. Therefore MAR-145 approved maintenance organisations disposing of unsalvageable aircraft components should consider the possibility of such components later being misrepresented and sold as serviceable aircraft components. Caution should be exercised to ensure that unsalvageable aircraft components are disposed of in a manner that does not allow them to be returned to service.

AMC 145.45(b) Maintenance Data

(See MAR 145.45(b))

1. Except as specified in paragraph 5, each MAR-145 approved maintenance organisation should hold and use the following minimum maintenance data relevant to the organisation's approval class rating. All maintenance related Macao Aviation Requirements and associated AMC and GM, all applicable Macao Aeronautical Circulars, all applicable airworthiness directives plus any airworthiness directive supplied by a contracted non-Macao operator or customer as well as Critical Design Configuration Control Limitations.

2. In addition to paragraph 1, a MAR-145 approved maintenance organisation with an approval class rating in category A – Aircraft, should hold and use the following maintenance data where published: the appropriate sections of the operator's aircraft maintenance programme, aircraft maintenance manual, repair manual, supplementary structural inspection document, corrosion control document, service bulletins, service letters, service instructions, modification leaflets, Non Destructive Testing (NDT) manual, parts catalogue, type certificate data sheet and any other specific document issued by the type certificate or supplementary type certificate holder as maintenance data.

3. In addition to paragraph 1, a MAR-145 approved maintenance organisation with an approval class rating in category B – Engines/APUs, should hold and use the following maintenance data where published. The appropriate sections of the engine/APU maintenance and repair manual, service bulletins, service letters, modification leaflets, NDT manual, parts catalogue, type certificate data sheet and any other specific document issued by the type certificate holder as maintenance data.

4. In addition to paragraph 1, a MAR-145 approved maintenance organisation with an approval class rating in category C – Components other than complete engines/APUs, should hold and use the following maintenance data where published. The appropriate sections of the vendor maintenance and repair manual, service bulletins and service

letters plus any document issued by the type certificate holder as maintenance data on whose product the component may be fitted when applicable.

5. Appropriate sections of the paragraphs 2 to 4 additional maintenance data means in relation to the maintenance work scope at each particular maintenance facility. For example, a base maintenance facility should have almost complete set(s) of the maintenance data whereas a line maintenance facility may need only the maintenance manual and the parts catalogue.

6. A MAR-145 approved maintenance organisation only approved in class rating category D – Specialised services, should hold and use all applicable specialised service(s) process specification.

AMC 145.45(c) Maintenance Data

(See MAR 145.45(c))

1. The referenced procedure should ensure that when maintenance personnel discover inaccurate, incomplete or ambiguous information in the maintenance data they should record the details. The procedure should then ensure that the MAR-145 approved maintenance organisation notifies the problem to the author of the maintenance data in a timely manner. A record of such communications to the author of the maintenance data should be retained by the MAR-145 approved organisation until such time as the type certificate holder has clarified the issue by e.g. amending the maintenance data.

2. The referenced procedure should be specified in the Maintenance Organisation Exposition.

AMC 145.45(d) Maintenance Data

(See MAR 145.45(d))

The referenced procedure should address the need for a practical demonstration by the mechanic to the quality personnel of the proposed modified maintenance instruction. When satisfy the quality personnel should approve the modified maintenance instruction and ensure that the type certificate or supplementary type certificate holder is informed of the modified maintenance instruction. The procedure should include a paper/electronic traceability of the complete process from start to finish and ensure that the relevant maintenance instruction clearly identifies the modification. Modified maintenance instructions should only be used in the following circumstances:

(a) Where the type certificate/supplementary type certificate holders original intent can be carried out in a more practical or more efficient manner.

(b) Where the type certificate/supplementary type certificate holders original intent cannot be achieved by following the maintenance instructions. For example, where a component cannot be replaced following the original maintenance instructions.

(c) For the use of alternative tools/equipment.

AMC 145.45(e) Maintenance Data

(See MAR 145.45(e))

1. The MAR-145 approved maintenance organisation should:

   - Transcribe accurately the maintenance data onto such work cards or worksheets, or
   - Make precise reference to the particular maintenance task(s) contained in such maintenance data, which already identifies the task as a CDCCL where applicable.

2. Relevant parts of the organisation means with regard to aircraft base maintenance, aircraft line maintenance, engine workshops, mechanical workshops and avionic workshops. Therefore, for example engine workshops should have a common system throughout such engine workshops that may be different to that in aircraft base maintenance.

3. The workcards should differentiate and specify, when relevant, disassembly, accomplishment of task, reassembly and testing. In the case of a lengthy maintenance task involving a succession of personnel to complete such task, it may be necessary to use supplementary workcards or worksheets to indicate what was actually accomplished by each individual person.

AMC 145.45(f) Maintenance Data

(See MAR 145.45 (f))

1. Data being made available to personnel maintaining aircraft means that the data should be available in close proximity to the aircraft being maintained for supervisors, mechanics and certifying staff to study.

2. Where computer systems are used, the number of computer terminals should be sufficient in relation to the size of the work programme to enable easy access, unless the computer system can produce paper copies. Where microfilm or microfiche readers/printers are used, a similar requirement is applicable.

AMC 145.45(g) Maintenance Data

(See MAR 145.45 (g))

1. To keep data up to date a procedure should be set up to monitor the amendment status of all data and maintain a check that all amendments are being received by being a subscriber to any document amendment scheme. Special attention should be given to TC related data such as certification life-limited parts, airworthiness limitations and Airworthiness Limitation Items (ALI), etc.

AMC 145.47(a) Production Planning

(See MAR 145.47(a))

1. Depending on the amount and complexity of work generally performed by the MAR-145 approved maintenance organisation, the planning system may range from a very simple procedure to a complex organisational set-up including a dedicated planning function in support of the production function.

2. For the purpose of MAR-145, the production planning function includes two complementary elements:

   - Scheduling the maintenance work ahead, to ensure that it will not adversely interfere with other work as regards the availability of all necessary personnel, tools, equipment, material, maintenance data and facilities.
   - During maintenance work, organising maintenance teams and shifts and provide all necessary support to ensure the completion of maintenance without undue time pressure.

3. When establishing the production planning procedure, consideration should be given to the following:

   - Logistics,
   - Inventory control,
   - Square meters of accommodation,
   - Man-hours estimation,
   - Man-hours availability,
   - Preparation of work,
   - Hangar availability,
   - Environmental conditions (access, lighting standards and cleanliness),
   - Co-ordination with internal and external suppliers, etc.
   - Scheduling of safety-critical tasks during periods when staff are likely to be most alert.

AMC 145.47(b) Production Planning

(See MAR 145.47(b))

Limitations of human performance, in the context of planning safety related tasks, refers to the upper and lower limits, and variations, of certain aspects of human performance (Circadian rhythm / 24 hours body cycle) which personnel should be aware of when planning work and shifts.

AMC 145.47(c) Production Planning

(See MAR 145.47(c))

The primary objective of the changeover / handover information is to ensure effective communication at the point of handing over the continuation or completion of maintenance actions. Effective task and shift handover depends on three basic elements:

- The outgoing person’s ability to understand and communicate the important elements of the job or task being passed over to the incoming person.
- The incoming person’s ability to understand and assimilate the information being provided by the outgoing person.
- A formalised process for exchanging information between outgoing and incoming persons and a planned shift overlap and a place for such exchanges to take place.

GM 145.48 Performance of Maintenance

AUTHORISED PERSON

An ‘authorised person’ is a person formally authorised by the maintenance organisation to perform or supervise a maintenance task. An ‘authorised person’ is not necessarily ‘certifying staff’.

SIGN-OFF

A ‘sign-off’ is a statement issued by the ‘authorised person’ which indicates that the task or group of tasks has been correctly performed. A ‘sign-off’ relates to one step in the maintenance process and is, therefore, different to a certificate of release to service.

AMC1 145.48(b) Performance of Maintenance

The procedure should identify the error-capturing methods, the critical maintenance tasks, the training and qualification of staff applying error-capturing methods, and how the organisation ensures that its staff is familiar with critical maintenance tasks and error-capturing methods.

AMC2 145.48(b) Performance of Maintenance

CRITICAL MAINTENANCE TASKS

(a) The procedure should ensure that the following maintenance tasks are reviewed to assess their impact on flight safety:

  (1) Tasks that may affect the control of the aircraft flight path and attitude, such as installation, rigging and adjustments of flight controls;

  (2) Aircraft stability control systems (autopilot, fuel transfer);

  (3) Tasks that may affect the propulsive force of the aircraft, including installation of aircraft engines, propellers and rotors; and

  (4) Overhaul, calibration or rigging of engines, propellers, transmissions and gearboxes.

(b) The procedure should describe which data sources are used to identify critical maintenance tasks. Several data sources may be used, such as:

  (1) Information from the design approval holder;

  (2) Accident reports;

  (3) Investigation and follow-up of incidents;

  (4) Occurrence reporting;

  (5) Flight data analysis;

  (6) Results of audits;

  (7) Normal operations monitoring schemes; and

  (8) Feedback from training.

AMC3 145.48(b) Performance of Maintenance

ERROR-CAPTURING METHODS

(a) Error-capturing methods are those actions defined by the organisation to detect maintenance errors made when performing maintenance.

(b) The organisation should ensure that the error-capturing methods are adequate for the work and the disturbance of the system. A combination of several actions (visual inspection, operational check, functional test, rigging check) may be necessary in some cases.

AMC4 145.48(b) Performance of Maintenance

INDEPENDENT INSPECTION

Independent inspection is one possible error-capturing method.

(a) What is an independent inspection

An independent inspection is an inspection performed by an 'independent qualified person' of a task carried out by an 'authorised person', taking into account that:

(1) The 'authorised person' is the person who performs the task or supervises the task and they assume the full responsibility for the completion of the task in accordance with the applicable maintenance data;

(2) The 'independent qualified person' is the person who performs the independent inspection and attests the satisfactory completion of the task and that no deficiencies have been found. The 'independent qualified person' does not issue a certificate of release to service, therefore they are not required to hold certification privileges;

(3) The 'authorised person' issues the certificate of release to service or signs off the completion of the task after the independent inspection has been carried out satisfactorily;

(4) The work card system used by the organisation should record the identification of both persons and the details of the independent inspection as necessary before the certificate of release to service or sign-off for the completion of the task is issued.

(b) Qualifications of persons performing independent inspections

The organisation should have procedures to demonstrate that the 'independent qualified person' has been trained and has gained experience in the specific inspection to be performed. The organisation could consider making use of, for example:

(1) Staff holding a certifying staff or support staff or sign-off authorisation or equivalent necessary to release or sign off the critical maintenance task;

(2) Staff holding a certifying staff or support staff or sign-off authorisation or equivalent necessary to release or sign off similar task in a product of similar category and having received specific practical training in the task to be inspected; or

(3) A commander holding a limited certification authorisation in accordance with MAR 145.30(j)(4) and having received adequate practical training and having enough experience in the specific task to be inspected and on how to perform independent inspection.

(c) How to perform an independent inspection

An independent inspection should ensure correct assembly, locking and sense of operation. When inspecting control systems that have undergone maintenance, the independent qualified person should consider the following points independently:

(1) All those parts of the system that have actually been disconnected or disturbed should be inspected for correct assembly and locking;

(2) The system as a whole should be inspected for full and free movement over the complete range;

(3) Cables should be tensioned correctly with adequate clearance at secondary stops;

(4) The operation of the control system as a whole should be observed to ensure that the controls are operating in the correct sense;

(5) If different control systems are interconnected so that they affect each other, all the interactions should be checked through the full range of the applicable controls; and

(6) Software that is part of the critical maintenance task should be checked, for example: version, compatibility with aircraft configuration.

(d) What to do in unforeseen cases when only one person is available

REINSPECTION:

(1) Reinspection is an error-capturing method subject to the same conditions as an independent inspection is, except that the 'authorised person' performing the maintenance task is also acting as 'independent qualified person' and performs the inspection.

(2) Reinspection, as an error-capturing method, should only be performed in unforeseen circumstances when only one person is available to carry out the task and perform the independent inspection. The circumstances cannot be considered unforeseen if the person or organisation has not assigned a suitable 'independent qualified person' to that particular line station or shift.

(3) The certificate of release to service is issued after the task has been performed by the 'authorised person' and the reinspection has been carried out satisfactorily. The work card system used by the organisation should record the identification and the details of the reinspection before the certificate of release to service for the task is issued.

AMC 145.48(c) Performance of Maintenance

The procedures should be aimed at:

(a) Minimising multiple errors and preventing omissions. Therefore, the procedures should specify:

(1) That every maintenance task is signed off only after completion;

(2) How the grouping of tasks for the purpose of sign-off allows critical steps to be clearly identified; and

(3) That work performed by personnel under supervision (i.e. temporary staff, trainees) is checked and signed off by an authorised person;

(b) Minimising the possibility of an error being repeated in identical tasks and, therefore, compromising more than one system or function. Thus, the procedures should ensure

that no person is required to perform a maintenance task involving removal/installation or assembly/disassembly of several components of the same type fitted to more than one system, a failure of which could have an impact on safety, on the same aircraft or component during a particular maintenance check. However, in unforeseen circumstances when only one person is available, the organisation may make use of reinspection as described in point (d) of AMC4 145.48(b).

GM 145.48(c) Performance of Maintenance

To minimise the risk of multiple errors or errors being repeated, the organisation may implement:

- Procedures to plan the performance by different persons of the same task in different systems;
- Duplicate inspection or re-inspection procedures.

GM 145.48(d) Performance of Maintenance

The organisation should ensure that when performing maintenance the CDCCL are not compromised. The organisation should pay particular attention to possible adverse effects of any change to the wiring of the aircraft, even of a change not specifically associated with the fuel tank system. For example, it should be common practice to identify segregation of fuel gauging system wiring as a CDCCL. The organisation can prevent adverse effects associated with changes to the wiring by standardising maintenance practices through training, and not through periodic inspections. Training should be provided to avoid indiscriminate routing and splicing of wire and to provide comprehensive knowledge of critical design features of fuel tank systems that would be controlled by a CDCCL.

AMC 145.50(a) Certification of Maintenance

(See MAR 145.50(a))

'Endanger flight safety' means any instances where safe operation could not be assured or which could lead to an unsafe condition. It typically includes, but is not limited to, significant cracking, deformation, corrosion or failure of primary structure, any evidence of burning, electrical arcing, significant hydraulic fluid or fuel leakage and any emergency system or total system failure. An airworthiness directive overdue for compliance is also considered a hazard to flight safety.

AMC 145.50(b) Certification of Maintenance

(See MAR 145.50(b))

1. The certificate of release to service should contain the following statement:

   'Certifies that the work specified except as otherwise specified was carried out in accordance with MAR-145 and in respect to that work the aircraft/aircraft component is considered ready for release to service'.

   Reference should also be made to the MAR-145 approval number.

2. It is acceptable to use an alternate abbreviated certificate of release to service consisting of the following statement 'MAR-145 release to service' instead of the full

certification statement specified in paragraph 1. When the alternate abbreviated certificate of release to service is used, the introductory section of the technical log should include an example of the full certification statement from paragraph 1.

3. The certificate of release to service should relate to the task specified in (S)TC holder's or operator's instructions or the aircraft maintenance programme which itself may cross-refer to maintenance data.

4. The date such maintenance was carried out should include when the maintenance took place relative to any life or overhaul limitation in terms of date/flying hours/cycles/landings etc., as appropriate.

5. When extensive maintenance has been carried out, it is acceptable for the certificate of release to service to summarise the maintenance as long as there is a unique cross-reference to the work package containing full details of maintenance carried out. Dimensional information should be retained in the work-pack record.

6. The person issuing the certificate of release to service should use his normal signature except in the case where a computer release to service system is used. In this latter case the AACM will need to be satisfied that only the particular person can electronically issue the release to service. One such method of compliance is the use of a magnetic or optical personal card in conjunction with a personal identity number (PIN) known only to the individual which is keyed into the computer. A certification stamp is optional.

AMC 1 145.50(d) Certification of Maintenance

(See MAR 145.50(d))

1. The purpose of the certificate is to release assemblies/items/components/parts (hereafter referred to as 'item(s)') after maintenance and to release maintenance work carried out on such items under the MAR-145 approval and to allow items removed from one aircraft/aircraft component to be fitted to another aircraft/aircraft component.

2. The certificate is to be used for export/import purposes, as well as for domestic purposes, and serves as an official certificate for items from the manufacturer/maintenance organisation to users.

3. It can only be issued by organisations approved by the AACM within scope of the approval.

4. The certificate may be used as a rotable tag by utilising the available space on the reverse side of the certificate for any additional information and dispatching the item with two copies of the certificate so that one copy may be eventually returned with the item to the MAR-145 approved maintenance organisation. The alternative solution is to use existing rotable tags and also supply a copy of the certificate.

5. A certificate should not be issued for any item when it is known that the item is unserviceable except in the case of an item undergoing a series of maintenance processes at several MAR-145 approved maintenance organisations and the item needs a certificate for the previous maintenance process carried out for the next MAR-145 approved maintenance organisation to accept the item for subsequent maintenance processes. In such a case, a clear statement of limitation should be endorsed in Block 12.

AMC 2 145.50(d) Certification of maintenance

(See MAR 145.50(d))

1. A component which has been maintained off the aircraft needs the issuance of a certificate of release to service for such maintenance and another certificate of release to service in regard to being installed properly on the aircraft when such action occurs.

   When a MAR-145 approved maintenance organisation maintains a component for use by the same organisation, an AACM Form 1 may not be necessary depending upon the organisation's internal release procedures defined in the maintenance organisation exposition.

2. In the case of the issue of AACM Form 1 for components in storage before MAR-145 became effective and not released on an AACM Form 1 or equivalent in accordance with MAR 145.42(a) or removed serviceable from a serviceable aircraft or an aircraft which has been withdrawn from service the following applies:

   2.1. An AACM Form 1 may be issued for an aircraft component which has been:

   - Maintained before MAR-145 became effective.
   - Used on an aircraft and removed in a serviceable condition. Examples include leased and loaned aircraft components.
   - Removed from aircraft which have been withdrawn from service, or from aircraft which have been involved in abnormal occurrences such as accidents, incidents, heavy landings or lightning strikes.
   - Maintained by an unapproved organisation.

   2.2. An appropriately rated MAR-145 approved maintenance organisation may issue an AACM Form 1 as detailed in this AMC sub-paragraph 2.5 to 2.8, as appropriate, in accordance with procedures detailed in the maintenance organisation exposition as approved by the AACM. The appropriately rated organisation is responsible for ensuring that all reasonable measures have been taken to ensure that only approved and serviceable aircraft components are issued an AACM Form 1 under this paragraph.

   2.3. For the purposes of this AMC 2 only, appropriately rated means an organisation with an approval class rating for the type of component or for the product in which it may be installed.

   2.4. An AACM Form 1 issued in accordance with this paragraph 2 should be issued by signing in block 14b and stating 'Inspected' in block 11. In addition, block 12 should specify:

      2.4.1. When the last maintenance was carried out and by whom.

      2.4.2. If the component is unused, when the component was manufactured and by whom with a cross-reference to any original documentation which should be in included with the Form.

      2.4.3. A list of all airworthiness directives, repairs and modifications known to have been incorporated. If no airworthiness directives or repairs or modifications are known to be incorporated, then this should be so stated.

      2.4.4. Detail of life used for service life-limited parts being any combination of fatigue, overhaul or storage life.

      2.4.5. For any aircraft component having its own maintenance history record, reference to the particular maintenance history record as

long as the record contains the details that would otherwise be required in Block 12. The maintenance history and acceptance test report or statement, if applicable, should be attached to the AACM Form 1.

2.5. Used aircraft components removed from a serviceable aircraft

2.5.1. Serviceable aircraft components removed from a Macao registered aircraft may be issued with an AACM Form 1 by an appropriately rated MAR-145 approved maintenance organisation subject to compliance with this sub-paragraph.

(a) The MAR-145 approved maintenance organisation should ensure that the aircraft component was removed from the aircraft by an appropriately qualified person.

(b) The aircraft component may only be deemed serviceable if the last flight operation with the aircraft component fitted revealed no faults on that component/related system.

(c) The aircraft component should be inspected for satisfactory condition including in particular damage, corrosion or leakage and compliance with any additional maintenance data.

(d) The aircraft record should be researched for any unusual events that could affect the serviceability of the aircraft component such as involvement in accidents, incidents, heavy landings or lightning strikes. Under no circumstances may an AACM Form 1 be issued in accordance with this paragraph 2.5 if it is suspected that the aircraft component has been subjected to extremes of stress, temperatures or immersion which could affect its operation.

(e) A maintenance history record should be available for all used serialised aircraft components.

(f) Compliance with known modifications and repairs should be established.

(g) The flight hours/cycles/landings as applicable of any service life-limited parts including time since overhaul should be established.

(h) Compliance with known applicable airworthiness directives should be established.

(i) Subject to satisfactory compliance of an aircraft component, an AACM Form 1 may be issued and should contain the information as specified in sub-paragraph 2.4 including the aircraft from which the aircraft component was removed.

2.5.2. Serviceable aircraft components removed from a non Macao registered aircraft may only be issued with an AACM Form 1 if the aircraft components are leased or loaned from the MAR-145 approved maintenance organisation who retains control of the airworthiness status of the aircraft components. An AACM Form 1 may be issued and should contain the information as specified in sub-paragraph 2.4 including the aircraft from which the aircraft component was removed.

2.6. Used aircraft components removed from an aircraft withdrawn from service.

Serviceable aircraft components removed from a Macao registered aircraft withdrawn from service may be issued with an AACM Form 1 by a MAR-145 approved maintenance organisation subject to compliance with this sub-paragraph.

(a) Aircraft withdrawn from service are sometimes dismantled for spares. This is considered to be a maintenance activity and should be accomplished under the control of a MAR-145 approved maintenance organisation, employing procedures approved by the AACM.

(b) To be eligible for installation, aircraft components removed from such aircraft may be issued with an AACM Form 1 by an appropriately rated MAR-145 approved maintenance organisation following a satisfactory assessment.

(c) As a minimum, the assessment will need to satisfy the standards set out in sub-paragraph 2.5 as appropriate. This should, where known, include the possible need for the alignment of scheduled maintenance that may be necessary to comply with the maintenance programme applicable to the aircraft on which the aircraft component is to be installed.

(d) Irrespective of whether the aircraft holds a certificate of airworthiness or not, the MAR-145 approved maintenance organisation responsible for certifying any removed component should ensure that the manner in which the components were removed and stored are compatible with the standards required by MAR-145.

(e) A structured plan should be formulated to control the aircraft disassembly process. The disassembly is to be carried out by an appropriately rated MAR-145 approved maintenance organisation under the supervision of certifying staff who will ensure that the aircraft components are removed and documented in a structured manner in accordance with the appropriate maintenance data and disassembly plan.

(f) All recorded aircraft defects should be reviewed and the possible effects these may have on both normal and standby functions of removed aircraft components are to be considered.

(g) Dedicated control documentation is to be used as detailed by the disassembly plan, to facilitate the recording of all maintenance actions and aircraft component removals performed during the disassembly process. Components found to be unserviceable are to be identified as such and quarantined pending a decision on the actions to be taken. Records of the maintenance accomplished to establish serviceability are to form part of the component maintenance history.

(h) Suitable MAR-145 facilities for the removal and storage of removed components are to be used which include suitable environmental conditions, lighting, access equipment, aircraft tooling and storage facilities for the work to be undertaken. While it may be acceptable for aircraft components to be removed, given local environmental conditions, without the benefit of an enclosed facility, subsequent disassembly (if required) and storage of the aircraft components should be in accordance with the manufacturer’s recommendations.

2.7. Used aircraft components maintained by organisations not approved in accordance with MAR-145. For used components maintained by a maintenance organisation not approved under MAR-145, due care should be taken before acceptance of such components. In such cases an appropriately rated MAR-145 approved maintenance organisation should establish satisfactory conditions by:

(a) Dismantling the aircraft component for sufficient inspection in accordance with the appropriate maintenance data;

(b) Replacing all service life-limit components when no satisfactory evidence of life used is available and/or the aircraft components are in an unsatisfactory condition;

(c) Reassembling and testing as necessary the aircraft component;

(d) Completing all certification requirements as specified in MAR 145.50.

2.8. Used aircraft components removed from an aircraft involved in an accident or incident. Such aircraft components should only be issued with an AACM Form 1 when processed in accordance with sub-paragraph 2.6 and a specific work order including all additional necessary tests and inspections deemed necessary by the accident or incident. Such a work order may require input from the TC holder or original manufacturer as appropriate. This work order should be referenced in Block 12.

GM 145.50(d) AACM Form 1 Block 12 'Remarks'

(See MAR 145.50(d))

Examples of data to be entered in this block as appropriate:

- Maintenance documentation used, including the revision status, for all work performed and not limited to the entry made in block 11.
- A statement such as 'in accordance with the CMM' is not acceptable.
- NDT methods with appropriate documentation used when relevant.
- Compliance with airworthiness directives or service bulletins.
- Repairs carried out.
- Modifications carried out.
- Replacement parts installed.
- Life-limited parts status.
- Shelf life limitations.
- Deviations from the customer work order.
- Release statements to satisfy a foreign Civil Aviation Authority maintenance requirement.
- Information needed to support shipment with shortages or re-assembly after delivery.
- Reference to aid traceability, such as batch numbers.

AMC 145.50(e) Certification of Maintenance

(See MAR 145.50(e))

1. Being unable to establish full compliance with MAR 145.50(a) means that the maintenance required by the aircraft operator could not be completed due either to running out of available aircraft maintenance downtime for the scheduled check or by virtue of the condition of the aircraft requiring additional maintenance downtime.

2. The aircraft operator is responsible for ensuring that all required maintenance has been carried out before flight and therefore MAR 145.50(e) requires such operator to be informed in the case where full compliance with MAR 145.50(a) cannot be achieved within the operator's limitations. If the operator agrees to the deferment of full compliance, then the certificate of release to service may be issued subject to details of the deferment, including the operator's authority, being endorsed on the certificate.

   NOTE: Whether or not the aircraft operator does have the authority to defer maintenance is an issue between the aircraft operator and the AACM. In case of doubt concerning such a decision of the operator, the MAR-145 approved maintenance organisation should inform AACM on such doubt, before issuing the certificate of release to service.

3. The procedure should draw attention to the fact that MAR 145.50(a) does not normally permit the issue of a certificate of release to service in the case of non-compliance and should state what action the mechanic, supervisor and certifying staff should take to bring the matter to the attention of the relevant department or person responsible for technical co-ordination with the aircraft operator so that the issue may be discussed and resolved with the aircraft operator. In addition, the appropriate person(s) as specified in MAR 145.30(b) should be kept informed in writing of such possible non-compliance situations and this should be included in the procedure.

AMC 145.50(f) Certification of Maintenance

(See MAR 145.50(f))

1. Suitable release certificate means a certificate which clearly states that the aircraft component is serviceable; that clearly specifies the organisation releasing said aircraft component together with details of the authority under whose approval the organisation works including the approval or authorisation reference.

2. Compliance with all other MAR-145 and operator requirements means making an appropriate entry in the aircraft technical log, checking for compliance with type design standards, modifications, repairs, airworthiness directives, life limitations and condition of the aircraft component plus information on where, when and why the aircraft was grounded.

GM 145.55(a) Maintenance Records

(See MAR 145.55(a))

1. Properly executed and retained records provide owners, operators and maintenance personnel with information essential in controlling unscheduled and scheduled maintenance, and troubleshooting to eliminate the need for re-inspection and rework to establish airworthiness.

   The prime objective is to have secure and easily retrievable records with comprehensive and legible contents. The aircraft record should contain basic details of all serialised aircraft components and all other significant aircraft components

installed, to ensure traceability to such installed aircraft component documentation and associated maintenance data as specified in MAR 145.45.

2. Some gas turbine engines are assembled from modules and a true total time in service for a total engine is not kept. When owners and operators wish to take advantage of the modular design, then total time in service and maintenance records for each module is to be maintained. The maintenance records as specified are to be kept with the module and should show compliance with any mandatory requirements pertaining to that module.

3. Reconstruction of lost or destroyed records can be done by reference to other records which reflect the time in service, research of records maintained by repair facilities and reference to records maintained by individual mechanics etc. When these things have been done and the record is still incomplete, the owner/operator may make a statement in the new record describing the loss and establishing the time in service based on the research and the best estimate of time in service. The reconstructed records should be submitted to the AACM for acceptance.

   NOTE: Additional maintenance may be required.

4. The maintenance record can be either a paper or computer system or any combination of both.

5. Paper systems should use robust material which can withstand normal handling and filing. The record should remain legible throughout the required retention period.

6. Computer systems may be used to control maintenance and/or record details of maintenance work carried out. Computer systems used for maintenance should have at least one backup system which should be updated at least within 24 hours of any maintenance. Each terminal is required to contain programme safeguards against the ability of unauthorised personnel to alter the database.

AMC 145.55(c) Maintenance Records

(See MAR 145.55(c))

Associated maintenance data is specific information such as repair and modification data. This does not necessarily require the retention of all Aircraft Maintenance Manual, Component Maintenance Manual, Illustrated Parts Catalog (IPC) etc. issued by the TC holder or STC holder. Maintenance records should refer to the revision status of the data used.

AMC 145.60(a) Occurrence Reporting

(See MAR 145.60(a), AC/GEN/003)

AACM Aeronautical Circular No. AC/GEN/003 regarding Mandatory Occurrence Reporting scheme provides further guidance on occurrence reporting.

GM 145.60(a) Occurrence Reporting

(See MAR 145.60(a), AC/GEN/003)

The organisation responsible for the design is normally the Type Certificate Holder of the aircraft, engine or propeller and/or if known the Supplemental Type Certificate (STC) Holder.

AMC 145.60(b) Occurrence Reporting

(See MAR 145.60(b), AC/GEN/003)

1. The aim of occurrence reporting is to identify the factors contributing to incidents, and to make the system resistant to similar errors.

2. An occurrence reporting system should enable and encourage free and frank reporting of any (potentially) safety related occurrence. This will be facilitated by the establishment of a just culture. An organisation should ensure that personnel are not inappropriately punished for reporting or co-operating with occurrence investigations.

3. The internal reporting process should be closed-loop, ensuring that actions are taken internally to address safety hazards.

4. Feedback to reportees, both on an individual and more general basis, is important to ensure their continued support for the scheme.

GM 145.60(c) Occurrence Reporting

(See MAR 145.60(c), AC/GEN/003)

Each report should contain at least the following information:

- Organisation name and approval reference.
- Information necessary to identify the subject aircraft and / or component.
- Date and time relative to any life or overhaul limitation in terms of flying hours/cycles/landings etc. as appropriate.
- Details of the condition as required by MAR 145.60(b).
- Any other relevant information found during the evaluation or rectification of the condition.

AMC 145.65(a) Safety and Quality Policy, Maintenance Procedures and Quality System

(See MAR 145.65(a))

The safety and quality policy should as a minimum include a statement committing the MAR-145 approved maintenance organisation to:

- Recognise safety as a prime consideration at all times
- Apply Human factors principles
- Encourage personnel to report maintenance related errors/incidents
- Recognise that compliance with procedures, quality standards, safety standards and regulations is the duty of all personnel
- Recognise the need for all personnel to cooperate with the Quality Auditors.

AMC 145.65(b) Safety and Quality Policy, Maintenance Procedures and Quality System

(See MAR 145.65(b))

1. Maintenance procedures should be held current such that they reflect best practice within the MAR-145 approved maintenance organisation. It is the responsibility of all organisation's employees to report any differences via their organisation's internal occurrence reporting mechanisms.

2. All procedures, and changes to those procedures, should be verified and validated before use where practicable.

3. All technical procedures should be designed and presented in accordance with good human factors principles.

AMC 145.65(b)(2) Safety and Quality Policy, Maintenance Procedures and Quality System

(See MAR 145.65(b)(2))

Specialised services include any specialised activity, such as, but not limited to Non-Destructive Testing requiring particular skills and/or qualification. MAR 145.30(f) covers the qualification of personnel but, in addition, there is a need to establish maintenance procedures that cover the control of any specialised process.

AMC 145.65(c)(1) Safety and Quality Policy, Maintenance Procedures and Quality System

(See MAR 145.65(c)(1))

1. The primary objectives of the quality system are to enable the MAR-145 approved maintenance organisation to ensure that it can deliver a safe product and that organisation remains in compliance with the requirements.

2. An essential element of the quality system is the independent audit.

3. The independent audit is an objective process of routine sample checks of all aspects of the MAR-145 approved maintenance organisation's ability to carry out all maintenance to the required standards and includes some product sampling as this is the end result of the maintenance process. It represents an objective overview of the complete maintenance related activities and is intended to complement the MAR 145.50(a) requirement for certifying staff to be satisfied that all required maintenance has been properly carried out before issue of the certificate of release to service. Independent audits should include a percentage of random audits carried out on a sample basis when maintenance is being carried out. This means some audits during the night for those organisations that work at night.

4. Except as specified in paragraphs 7 and 9, the independent audit should ensure that all aspects of MAR-145 compliance are checked every 12 months and may be carried out as a complete single exercise or subdivided over the 12 month period in accordance with a scheduled plan. The independent audit does not require each procedure to be checked against each product line when it can be shown that the particular procedure is common to more than one product line and the procedure has been checked every 12 months without resultant findings. Where findings have been identified, the particular procedure should be rechecked against other product lines

until the findings have been rectified after which the independent audit procedure may revert back to 12 monthly for the particular procedure.

5. Except as specified otherwise in paragraph 7, the independent audit should sample check one product on each product line every 12 months as a demonstration of the effectiveness of maintenance procedures compliance. It is recommended that procedures and product audits be combined by selecting a specific product example, such as an aircraft or engine or instrument and sample checking all the procedures and requirements associated with the specific product example to ensure that the end result should be an airworthy product.

   For the purpose of the independent audit a product line includes any product under an Appendix 1 approval class rating as specified in the MAR-145 approval schedule issued to the particular organisation.

   It therefore follows for example that a MAR-145 approved maintenance organisation with a capability to maintain aircraft, repair engines, brakes and autopilots would need to carry out 4 complete audit sample checks each year except as specified otherwise in subparagraphs 5, 7 or 9, GM 145.65(c)(1) contains some examples of audit subjects and plans.

6. The sample check of a product means to witness any relevant testing and visually inspect the product and associated documentation. The sample check should not involve repeat disassembly or testing unless the sample check identifies findings requiring such action.

7. Except as specified otherwise in paragraph 9, where the smallest MAR-145 approved maintenance organisation, that is an organisation with a maximum of 10 personnel actively engaged in maintenance, chooses to contract the independent audit element of the quality system in accordance with MAR 145.65(c)(1) it is conditional on the audit being carried out twice in every 12 month period.

8. Except as specified otherwise in paragraph 9, where the MAR-145 approved maintenance organisation has line stations listed as per MAR 145.75(d) the quality system should describe how these are integrated into the system and include a plan to audit each listed line station at a frequency consistent with the extent of flight activity at the particular line station. Except as specified otherwise in paragraph 9 the maximum period between audits of a particular line station should not exceed 24 months.

9. Except as specified otherwise in paragraph 5, the AACM may agree to increase any of the audit time periods specified in this AMC 145.65(c)(1) by up to 100% provided that there are no safety related findings and subject to being satisfied that the MAR-145 approved maintenance organisation has a good record of rectifying findings in a timely manner.

10. A report should be raised each time an audit is carried out describing what was checked and the resulting findings against applicable requirements, procedures and products.

11. The independence of the audit should be established by always ensuring that audits are carried out by personnel not responsible for the function, procedure or products being checked. It therefore follows that a large MAR-145 approved maintenance organisation, being an organisation with more than about 500 maintenance staff should have a dedicated quality audit group whose sole function is to conduct audits, raise finding reports and follow up to check that findings are being rectified. For the medium sized MAR-145 approved maintenance organisation, being an organisation with less than about 500 maintenance staff, it is acceptable to use competent personnel from one section/department not responsible for the production function,

procedure or product to audit the section/department that is responsible subject to the overall planning and implementation being under the control of the quality manager. MAR-145 approved maintenance organisations with a maximum of 10 maintenance staff actively engaged in carrying out maintenance may contract the independent audit element of the quality system to another MAR-145 approved maintenance organisation or a competent person acceptable to the AACM.

GM 145.65(c)(1) Safety and Quality Policy, Maintenance Procedures and Quality System

(See MAR 145.65(c)(1))

1. The purpose of this GM is to give guidance on just one acceptable working audit plan to meet part of the needs of MAR 145.65(c)(1). There is any number of other acceptable working audit plans.

2. The proposed plan lists the subject matter that should be covered by the audit and attempts to indicate applicability in the various types of workshops and aircraft facilities. The list should therefore be tailored for the particular situation and more than one list may be necessary. Each list should be shown against a timetable to indicate when the particular item is scheduled for audit and when the audit was completed.

Paragraph	Comment	Hangar	Engine Workshop	Mechanic Workshop	Avionic Workshop
145.25		Yes	Yes	Yes	Yes
145.30		Yes	Yes	Yes	Yes
145.35		Yes	Yes	Yes	Yes
145.40		Yes	Yes	Yes	Yes
145.42		Yes	Yes	Yes	Yes
145.45		Yes	Yes	Yes	Yes
145.47		Yes	Yes	Yes	Yes
145.48		Yes	Yes	If appl	If appl
145.50		Yes	Yes	Yes	Yes
145.55		Yes	Yes	Yes	Yes
145.60		Yes	Yes	Yes	Yes
145.65		Yes	Yes	Yes	Yes
2.1	MOE	Yes	Yes	Yes	Yes
2.2	MOE	Yes	Yes	Yes	Yes
2.3	MOE	Yes	Yes	Yes	Yes
2.4	MOE	Yes	Yes	Yes	Yes
2.5	MOE	Yes	Yes	Yes	Yes
2.6	MOE	Yes	Yes	Yes	Yes
2.7	MOE	Yes	Yes	Yes	Yes
2.8	MOE	Yes	Yes	Yes	Yes
2.9	MOE	Yes	Yes	Yes	Yes
2.10	MOE	Yes	No	No	No
2.11	MOE	Yes	Yes	Yes	Yes
2.12	MOE	Yes	Yes	Yes	Yes
2.13	MOE	Yes	Yes	Yes	Yes
2.14	MOE	Yes	Yes	Yes	Yes
2.15	MOE	Yes	No	No	No
2.16	MOE	Yes	Yes	Yes	Yes
2.17	MOE	If appl	If appl	If appl	If appl
2.18	MOE	Yes	Yes	Yes	Yes
2.19	MOE	Yes	Yes	Yes	Yes
2.20	MOE	Yes	Yes	Yes	Yes
2.21	MOE	If appl	If appl	If appl	If appl
2.22	MOE	Yes	Yes	No	No
2.23	MOE	Yes	Yes	If appl	If Appl
2.24	MOE	Yes	Yes	Yes	Yes

2.25	MOE	Yes	Yes	Yes	Yes
2.26	MOE	Yes	Yes	Yes	Yes
2.27	MOE	Yes	Yes	Yes	Yes
2.28	MOE	Yes	Yes	Yes	Yes
L2.1	MOE	If appl	No	No	No
L2.2	MOE	If appl	No	No	No
L2.3	MOE	If appl	No	No	No
L2.4	MOE	If appl	No	No	No
L2.5	MOE	If appl	No	No	No
L2.6	MOE	If appl	No	No	No
L2.7	MOE	If appl	No	No	No
3.9	MOE	If appl	If appl	If appl	If appl
3.10	MOE	If appl	If appl	If appl	If appl
3.11	MOE	If appl	If appl	If appl	No
3.12	MOE	Yes	Yes	No	No
3.13	MOE	Yes	Yes	Yes	Yes
3.14	MOE	Yes	Yes	Yes	Yes
145.70		Yes	Yes	Yes	Yes
145.75		Yes	Yes	Yes	Yes
145.80		Yes	Yes	Yes	Yes
145.85		Yes	Yes	Yes	Yes
145.95		If appl	If appl	If appl	If appl

Note 1: 'if appl' means if applicable or relevant.

Note 2: In the line station case all line stations should be audited at the frequency agreed with the AACM within the limits of AMC 145.65 (c)(1).

Note 3: The reference system used for this example working audit plan relates either to the MAR-145 paragraphs or the AMC 145.70(a) Maintenance Organisation Exposition (MOE) items. Where an MOE item has been omitted it is due to the existence of a clear MAR-145 paragraph covering the same issue. MAR-145 paragraphs have priority due to being the primary requirement.

AMC 145.65(c)(2) Safety and Quality Policy, Maintenance Procedures and Quality System

(See MAR 145.65(c)(2))

1. An essential element of the quality system is the quality feedback system.

2. The quality feedback system may not be contracted to outside persons. The principal function of the quality feedback system is to ensure that all findings resulting from the independent quality audits of the organisation are properly investigated and corrected in a timely manner and to enable the accountable manager to be kept informed of any safety issues and the extent of compliance with MAR-145.

3. The independent quality audit reports referenced in AMC 145.65(c)(1) paragraph 10 should be sent to the relevant department(s) for rectification action giving target rectification dates. Rectification dates should be discussed with such department(s) before the quality department or nominated quality auditor confirms such dates in the report. The relevant department(s) are required by MAR 145.65(c)(2) to rectify findings and inform the quality department or nominated quality auditor of such rectification.

4. The accountable manager should hold regular meetings with staff to check progress on rectification except that in the large organisations such meetings may be delegated on a day to day basis to the quality manager subject to the accountable manager meeting at least twice per year with the senior staff involved to review the overall performance and receiving at least a half yearly summary report on findings of non-compliance.

5. All records pertaining to the independent quality audit and the quality feedback system should be retained for at least 2 years after the date of clearance of the finding to which they refer or for such periods as to support changes to the AMC 145.65(c)(1) paragraph 9 audit time periods, whichever is the longer.

AMC 145.70(a) Maintenance Organisation Exposition

(See MAR 145.70(a))

The following information should be included in the maintenance organisation exposition:

The information specified in MAR 145.70(a) subparagraphs (6) and (12) to (16) inclusive, whilst a part of the maintenance organisation exposition, may be kept as separate documents or on separate electronic data files subject to the management part of said maintenance organisation exposition containing a clear cross-reference to such documents or electronic data files.

The maintenance organisation exposition should contain the information, as applicable, specified in this AMC. The information may be presented in any subject order so long as all applicable subjects are covered. Where a MAR-145 approved maintenance organisation uses a different format, for example, to allow the maintenance organisation exposition to serve more than one approval, then the maintenance organisation exposition should contain a cross reference Annex using this list as an index with an explanation as to where in the subject matter can be found in the maintenance organisation exposition.

The maintenance organisation exposition should contain information, as applicable, on how the maintenance organisation complies with Critical Design Configuration Control Limitations' (CDCCL) instructions.

Small MAR-145 approved maintenance organisations may combine the various items to form a simple exposition more relevant to their needs.

The operator may use electronic data processing (EDP) for publication of the maintenance organisation exposition. The maintenance organisation exposition should be made available to the AACM in a form acceptable to the AACM. Attention should be paid to the compatibility of EDP publication systems with the necessary dissemination of the maintenance organisation exposition, both internally and externally.

PART 0 OPERATOR'S GENERAL ORGANISATION

This section reserved for those MAR-145 approved maintenance organisations who are also Macao AOC operators.

PART 1 MANAGEMENT

1.1 Corporate commitment by the accountable manager;

1.2 Safety and Quality Policy;

1.3 Management personnel;

1.4 Duties and responsibilities of the management personnel;

1.5 Management Organisation Chart;

1.6 List of certifying staff, support staff

1.7 Manpower resources;

1.8 General description of the facilities at each address intended to be approved;

1.9 Organisations intended scope of work;

1.10 Notification procedure to the AACM regarding changes to the organisation's activities/approval/location/personnel;

1.11 Exposition amendment procedures including, if applicable, delegated procedures.

PART 2 MAINTENANCE PROCEDURES

2.1 Supplier evaluation and subcontract control procedure;

2.2 Acceptance/inspection of aircraft components and material from outside contractors;

2.3 Storage, tagging and release of aircraft components and material to aircraft maintenance;

2.4 Acceptance of tools and equipment;

2.5 Calibration of tools and equipment;

2.6 Use of tooling and equipment by staff (including alternate tools);

2.7 Cleanliness standards of maintenance facilities;

2.8 Maintenance instructions and relationship to aircraft/aircraft component manufacturers' instructions including updating and availability to staff;

2.9 Repair procedure;

2.10 Aircraft maintenance programme compliance;

2.11 Airworthiness Directives procedure;

2.12 Optional modification procedure;

2.13 Maintenance documentation in use and completion of same;

2.14 Technical record control;

2.15 Rectification of defects arising during base maintenance;

2.16 Release to service procedure;

2.17 Records for the operator;

2.18 Reporting of defects to the AACM/Operator/Manufacturer;

2.19 Return of defective aircraft components to store;

2.20 Defective components to outside contractors;

2.21 Control of computer maintenance record systems;

2.22 Control of man-hour planning versus scheduled maintenance work;

2.23 Critical maintenance tasks and error-capturing methods;

2.24 Reference to specific maintenance procedures such as;

Engine running procedures

Aircraft pressure run procedures

Aircraft towing procedures

Aircraft taxiing procedures

2.25 Procedures to detect and rectify maintenance errors;

2.26 Shift/task handover procedures;

2.27 Procedures for notification of maintenance data inaccuracies and ambiguities to the type certificate holder;

2.28 Production planning procedures.

PART L2 ADDITIONAL LINE MAINTENANCE PROCEDURES

L2.1 Line maintenance control of aircraft components, tools, equipment etc;

L2.2 Line maintenance procedures related to servicing/fuelling/de-icing including inspection for/removal of de-icing/anti-icing fluid residues etc;

L2.3 Line maintenance control of defects and repetitive defects;

L2.4 Line procedure for completion of technical log;

L2.5 Line procedure for pooled parts and loan parts;

L2.6 Line procedure for return of defective parts removed from aircraft;

L2.7 Line procedure control for critical maintenance tasks and error-capturing methods.

PART 3 QUALITY SYSTEM PROCEDURES

3.1 Quality audit of organisation procedures;

3.2 Quality audit of aircraft;

3.3 Quality audit remedial action procedure;

3.4 Certifying staff and support staff qualification and training procedures;

3.5 Certifying staff and support staff records;

3.6 Quality audit personnel;

3.7 Qualifying inspectors;

3.8 Qualifying mechanics;

3.9 Aircraft or aircraft component maintenance tasks exemption process control;

3.10 Concession control for deviation from organisations' procedures;

3.11 Qualification procedure for specialised activities such as NDT, welding, etc;

3.12 Control of manufacturers' and other maintenance working teams;

3.13 Human Factors training procedure;

3.14 Competence assessment of personnel;

3.15 Training procedures for on-the-job training as per Section 6 of Appendix 3 to MAR-66 (limited to the case where the Civil Aviation Authority for the MAR-145 approval and for the MAR-66 licence is the same).

PART 4

4.1 Contracting operators;

4.2 Operator procedures and paperwork;

4.3 Operator record completion.

PART 5

5.1 Sample of documents;

5.2 List of Sub-contractors as per MAR 145.75 (b);

5.3 List of Line maintenance locations as per MAR 145.75 (d);

5.4 List of contracted MAR-145 organisations as per MAR 145.70 (a) (16).

PART 6 OPERATOR'S MAINTENANCE PROCEDURES

This section is reserved for those MAR-145 approved maintenance organisations who are also operators.

The details of such procedures can be found in Aeronautical Circular, AC/AW/022 and the Nineteenth Schedule of Air Navigation Regulation of Macao (ANRM) Operator's Maintenance Responsibility.

PART 7 JOINT MAINTENANCE MANAGEMENT SUPPLEMENTARY PROCEDURES FOR A MAR-145 APPROVED MAINTENANCE ORGANISATION

This section is reserved for those MAR-145 approved maintenance organisations who are also recognised organisations under the Cooperation Arrangement on Mutual Acceptance of Approval of Aircraft Maintenance Organisations between General Administration of Civil Aviation of China, Civil Aviation Department, Hong Kong, China and Civil Aviation Authority – Macao, China.

GM 145.70(a) Maintenance Organisation Exposition

(See MAR 145.70(a))

1. The purpose of the Maintenance Organisation Exposition (MOE) is to set forth the procedures, means and methods of the Organisation.

2. Compliance with its contents will assure compliance with the MAR-145 requirements, which is a pre-requisite to obtaining and retaining a MAR-145 approval certificate.

3. MAR 145.70 (a)(1) to (a)(11) constitutes the 'management' part of the MOE and therefore could be produced as one document and made available to the MAR 145.30(b) person(s) who should be reasonably familiar with its contents. MAR 145.70(a)(6) list of Certifying Staff and categories B1 and B2 support staff may be produced as a separate document.

4. MAR 145.70 (a)(12) constitutes the working procedures of the MAR-145 approved maintenance organisation and therefore as stated in the requirement may be produced as any number of separate procedures manuals. It should be remembered that these documents should be cross-referenced from the management MOE.

5. Personnel are expected to be familiar with those parts of the manuals that are relevant to the maintenance work they carry out.

6. The MAR-145 approved maintenance organisation should specify in the MOE who should amend the manual particularly in the case where there are several parts.

7. The Quality Manager should be responsible for monitoring the amendment of the MOE, unless otherwise agreed by the AACM, including associated procedures manuals and submission of the proposed amendments to the AACM. However the AACM may agree via a procedure stated in the amendment section of the MOE that

some defined class of amendments may be incorporated without prior AACM approval.

8. The MOE should cover four main parts:

   a. The management MOE covering the parts specified earlier.

   b. The maintenance procedures covering all aspects of how aircraft components may be accepted from outside sources and how aircraft will be maintained to the required standard.

   c. The quality system procedures including the methods of qualifying mechanics, inspection, certifying staff and quality audit personnel.

   d. Contracted operator procedures and paperwork.

9. The accountable manager's exposition statement as specified under MAR 145.70(a)(1) should embrace the intent of the following paragraph and in fact this statement may be used without amendment. Any modification to the statement should not alter the intent.

   'This exposition and any associated referenced manuals define the organisation and procedures upon which the Civil Aviation Authority-Macao, China (AACM) MAR-145 Approval is based as required by MAR 145.70. These procedures are approved by the undersigned and should be complied with, as applicable, when work/orders are being progressed under the terms of the MAR-145 approval.

   It is accepted that these procedures do not override the necessity of complying with any new or amended regulation and/or requirements published or adopted by the AACM from time to time where these new or amended regulation and/or requirements are in conflict with these procedures.

   It is understood that the AACM will approve this organisation whilst the AACM is satisfied that the procedures are being followed and work standards maintained. It is further understood that the AACM reserves the right to suspend, limit or revoke the MAR-145 approval of the organisation if the AACM has evidence that procedures are not followed or standards not upheld.

   Signed ……

   Dated ……

   Accountable Manager and ……(quote position)……

   For and on behalf of ..…….(quote organisation's name)……'

NOTE: Whenever the accountable manager changes, it is important to ensure that the new accountable manager signs the paragraph 9 statement at the earliest opportunity.

Failure to carry out this action could invalidate the MAR-145 Approval.

10. When an organisation is approved against any other MAR containing a requirement for an exposition, a supplement covering the differences will suffice to meet the requirements except that the supplement must have an index showing where those parts missing from the supplement are covered.

AMC 145.75(b) Privileges of the MAR-145 Approved Maintenance Organisation

(See MAR 145.75(b))

1. Working under the quality system of a MAR-145 approved maintenance organisation (sub-contracting) refers to the case of one organisation, not itself appropriately approved to MAR-145 that carries out aircraft line maintenance or minor engine maintenance or maintenance of other aircraft components or a specialised service as a sub-contractor for a MAR-145 approved maintenance organisation. To be appropriately approved to sub-contract the MAR-145 approved maintenance organisation should have a procedure for the control of such sub-contractors as described below. Any MAR-145 approved maintenance organisation that carries out maintenance for another MAR-145 approved maintenance organisation within its own approval scope is not considered to be subcontracting for the purpose of this paragraph.

NOTE: For those MAR-145 approved maintenance organisations that are also certificated by the FAA under FAR Part 145 it should be noted that FAR Part 145 is more restrictive in respect of maintenance activities that can be contracted or sub-contracted to another maintenance organisation. It is therefore recommended that any listing of contracted or sub-contracted maintenance organisations should identify which meet the MAR-145 criteria and which meet the FAR Part 145 criteria.

2. Maintenance of engines or engine modules other than a complete workshop maintenance check or overhaul is intended to mean any maintenance that can be carried out without disassembly of the core engine or, in the case of modular engines, without disassembly of any core module.

3 FUNDAMENTALS OF SUB-CONTRACTING UNDER MAR-145

3.1 The fundamental reasons for allowing a MAR-145 approved maintenance organisation to sub-contract certain maintenance tasks are:

a. To permit the acceptance of specialised maintenance services, such as, but not limited to, plating, heat treatment, plasma spray, fabrication of specified parts for minor repairs/modifications, etc., without the need for direct approval by AACM in such cases.

b. To permit the acceptance of aircraft maintenance up to but not including a base maintenance check as specified in MAR 145.75(b) by organisations not appropriately approved under MAR-145 when it is unrealistic to expect direct approval by AACM. The AACM will determine when it is unrealistic but in general it is considered unrealistic if only one or two organisations intend to use the sub-contract organisation.

c. To permit the acceptance of component maintenance.

d. To permit the acceptance of engine maintenance up to but not including a workshop maintenance check or overhaul of an engine or engine module as specified in MAR 145.75(b) by organisations not appropriately approved under MAR-145 when it is unrealistic to expect direct approval by AACM. The determination of unrealistic is as per sub-paragraph (b).

3.2 When maintenance is carried out under the sub-contract control system it means that for the duration of such maintenance, the MAR-145 approval has been temporarily extended to include the sub-contractor. It therefore follows that those parts of the sub-contractor's facilities, personnel and procedures involved with the maintenance organisation's products undergoing maintenance should meet MAR-145 requirements for the duration of that

maintenance and it remains the responsibility of the MAR-145 approved maintenance organisation to ensure such requirements are satisfied.

3.3 For the criteria specified in sub-paragraph 3.1 the MAR-145 approved maintenance organisation is not required to have complete facilities for maintenance that it needs to sub-contract but it should have its own expertise to determine that the sub-contractor meets the necessary standards. However a maintenance organisation cannot be approved under MAR-145 unless it has the in-house facilities, procedures and expertise to carry out the majority of maintenance for which it wishes to be approved in terms of the number of class ratings.

3.4 The MAR-145 approved maintenance organisation may find it necessary to include several specialist sub-contractors to enable it to be approved to completely certify the release to service of a particular product. Examples could be specialist welding, electro-plating, painting etc. To authorise the use of such sub-contractors, the AACM will need to be satisfied that the MAR-145 approved maintenance organisation has the necessary expertise and procedures to control such sub-contractors.

3.5 A MAR-145 approved maintenance organisation working outside the scope of its approval schedule is deemed to be not approved. Such an organisation may in this circumstance operate only under the sub-contract control of another MAR-145 approved maintenance organisation.

3.6 Authorisation to sub-contract is indicated by the AACM accepting the maintenance organisation exposition containing a specific procedure on the control of sub-contractors.

4 PRINCIPAL MAR-145 PROCEDURES FOR THE CONTROL OF SUB-CONTRACTORS NOT APPROVED UNDER MAR-145

4.1 A pre audit procedure should be established whereby the MAR-145 approved maintenance organisations' sub-contract control section, which may also be the MAR 145.65(b) quality system independent audit section, should audit a prospective sub-contractor to determine whether those services of the sub-contractor that it wishes to use meet the intent of MAR-145.

4.2 The MAR-145 approved maintenance organisation needs to assess to what extent it will use the sub-contractor's facilities. As a general rule the MAR-145 approved maintenance organisation should require its own paperwork, approved data and material/spare parts to be used, but it could permit the use of tools, equipment and personnel from the sub-contractor as long as such tools, equipment and personnel meet the requirement of MAR-145. In the case of sub-contractors who provide specialised services it may for practical reasons be necessary to use their specialised services personnel, approved data and material subject to acceptance by the MAR-145 approved maintenance organisation. Specialised service personnel should meet any published MAR qualification standard except that where no MAR qualification standard is published, existing national requirements should be followed.

4.3 Unless the sub-contracted maintenance work can be fully inspected on receipt by the MAR-145 approved maintenance organisation it will be necessary for such MAR-145 approved maintenance organisation to supervise the inspection and release from the sub-contractor. Such activities should be fully described in the organisation procedure. The MAR-145 approved maintenance organisation will need to consider whether to use its own staff or authorise the sub-contractor's staff.

4.4 The certificate of release to service may be issued either at the sub-contractor or at the organisation facility by staff issued a certification authorisation in accordance with MAR 145.30 as appropriate, by the MAR-145 approved maintenance organisation. Such staff would normally come from the MAR-145 approved maintenance organisation but may otherwise be a person from the sub-contractor who meets the MAR-145 approved maintenance organisation certifying staff standard which itself is approved by the AACM via the maintenance organisation exposition. The certificate of release to service and the AACM Form 1 will always be issued under the MAR-145 approved maintenance approval reference.

4.5 The sub-contract control procedure will need to record audits of the sub-contractor, to have a corrective action follow up plan and to know when sub-contractors are being used. The procedure should include a clear revocation process for sub-contractors who do not meet the MAR-145 approved maintenance organisation's requirements.

4.6 The quality audit staff of the MAR-145 approved maintenance organisation will need to audit the sub-contract control section and sample audit sub-contractors unless this task is already carried out by the quality audit staff as stated in sub-paragraph 4.1.

4.7 The contract between the MAR-145 approved maintenance organisation and the sub-contractor should contain a provision for the AACM staff to have right of access to the sub-contractor.

AMC 145.80 Limitations on the MAR-145 Approved Maintenance Organisation

(See MAR 145.80)

This paragraph is intended to cover the situation where the larger MAR-145 approved maintenance organisation may temporarily not hold all the necessary tools, equipment etc., for an aircraft type or variant specified in the organisation's approval. This paragraph means that the AACM need not amend the approval to delete the aircraft type or variants on the basis that it is a temporary situation and there is a commitment from the organisation to re-acquire tools, equipment etc. before maintenance on the type may recommence.

AMC 145.85 Changes to the MAR-145 Approved Maintenance Organisation

(See MAR 145.85)

The primary purpose of this paragraph is to enable the MAR-145 approved maintenance organisation to remain approved if agreed by the AACM during negotiations about any of the specified changes. Without this paragraph the approval would automatically be suspended in all cases.

GM 145.97(a) Equivalent Safety Case

(See MAR 145.97)

Once a MAR 145.97(a) equivalent safety case has been accepted by the AACM, it is intended that such equivalent safety cases be published by the AACM as amended MARs or AMCs.

Appendix 1. Organisations Approval Class and Rating System

1. Except as stated otherwise for the smallest MAR-145 approved maintenance organisation in paragraph 12, Table 1 provides the standard system for the approval of maintenance organisation under MAR-145. An organisation may be granted an approval ranging from a single class and rating with limitations to all classes and ratings with limitations.

2. In addition to Table 1 the MAR-145 approved maintenance organisation is required by MAR 145.20 to indicate scope of work in the maintenance organisation exposition. See also paragraph 11.

3. Within the approval class(es) and rating(s) granted by the AACM, the scope of work specified in the maintenance organisation exposition defines the exact limits of approval. It is therefore essential that the approval class(es) and rating(s) and the organisations scope of work are matching.

4. A category A class rating means that the MAR-145 approved maintenance organisation (AMO) may carry out maintenance on the aircraft and any component (including engines and/or APUs), in accordance with aircraft maintenance data or, if agreed by the AACM, in accordance with component maintenance data, only whilst such components are fitted to the aircraft. Nevertheless, such A-rated MAR-145 AMO may temporarily remove a component for maintenance, in order to improve access to that component, except when such removal generates the need for additional maintenance not eligible for the provisions of this paragraph. This will be subject to a control procedure in the maintenance organisation exposition to be approved by the AACM. The limitation section will specify the scope of such maintenance thereby indicating the extent of approval.

5. A category B class rating means that the MAR-145 approved maintenance organisation may carry out maintenance on the uninstalled engine and/or APU and engine and/or APU components, in accordance with engine and/or APU maintenance data or, if agreed by the competent authority, in accordance with component maintenance data, only whilst such components are fitted to the engine and/or APU except. Nevertheless, such B-rated MAR-145 AMO may temporarily remove a component for maintenance, in order to improve access to that component, except when such removal generates the need for additional maintenance not eligible for the provisions of this paragraph. The limitation section will specify the scope of such maintenance thereby indicating the extent of approval. A MAR-145 approved maintenance organisation with a category B class rating may also carry out maintenance on an installed engine during ‘base’ and ‘line’ maintenance subject to a control procedure in the maintenance organisation exposition to be approved by the AACM. The maintenance organisation exposition scope of work should reflect such activity where permitted by the AACM.

6. A category C class rating means that the MAR-145 approved maintenance organisation may carry out maintenance on uninstalled components (excluding engines and APUs) intended for fitment to the aircraft or engine/APU. The limitation section will specify the scope of such maintenance thereby indicating the extent of approval. A MAR-145 approved maintenance organisation with a category C class rating may also carry out maintenance on an installed component during base and line maintenance or at an engine/APU maintenance facility subject to a control procedure in the maintenance organisation exposition to be approved by the AACM. The maintenance organisation exposition scope of work shall reflect such activity where permitted by the AACM.

7. A category D class rating is a self contained class rating not necessarily related to a specific aircraft, engine or other component. The D1 - Non Destructive Test (NDT) rating is only necessary for a MAR-145 approved maintenance organisation that carries out NDT as a particular task for another organisation. A MAR-145 approved maintenance organisation with a class rating in A or B or C category may carry out NDT on products it is maintaining subject to the maintenance organisation exposition containing NDT procedures, without the need for a D1 class rating.

8. Category A class ratings are subdivided into 'Base' or 'Line' maintenance. A MAR 145 approved maintenance organisation may be approved for either 'Base' or 'Line' maintenance or both. It should be noted that a 'Line' facility located at a main base facility requires a 'Line' maintenance approval.

9. The 'limitation' section is intended to give the AACM flexibility to customise the approval to a particular organisation. Ratings shall be mentioned on the approval only when appropriately limited. Table 1 specifies the types of limitation possible. Whilst maintenance is listed last in each class rating it is acceptable to stress the maintenance task rather than the aircraft or engine type or manufacturer, if this is more appropriate to the organisation (an example could be avionic systems installations and maintenance.) Such mention in the limitation section indicates that the maintenance organisation is approved to carry out maintenance up to and including this particular type/task.

10. When reference is made to series, type and group in the limitation section of class A and B, series means a specific type series such as Airbus 300 or 310 or 319 or Boeing 737-300 series or RB211-524 series etc; type means a specific type or model such as Airbus 310-240 type or RB 211-524 B4 type etc; any number of series or types may be quoted; group means for example Cessna single piston engined aircraft or Lycoming non-supercharged piston engines etc.

11. When a lengthy capability list is used which could be subject to frequent amendment, then such amendment should be in accordance with a procedure acceptable to the AACM and included in the maintenance organisation exposition as referred in MAR145.70 (c).

12. A MAR-145 approved maintenance organisation which employs only one person to both plan and carry out all maintenance can only hold a limited scope of approval rating. The maximum permissible limits are:

CLASS AIRCRAFT	RATING A2 AEROPLANES 5700 KG AND BELOW	PISTON ENGINE 5 700 KG AND BELOW
CLASS AIRCRAFT	RATING A3 HELICOPTERS	SINGLE PISTON ENGINE 3175 KG AND BELOW
CLASS AIRCRAFT	RATING A4 AIRCRAFT OTHER THAN A1, A2 AND A3	NO LIMITATION
CLASS ENGINES	RATING B2 PISTON	LESS THAN 450 HP
CLASS COMPONENTS RATING OTHER THAN COMPLETE ENGINE OR APUs	C1 TO C22	AS PER CAPABILITY LIST
CLASS SPECIALISED SERVICES	D1 NDT	NDT METHOD(S) TO BE SPECIFIED

It should be noted that such an organisation may be further limited by the AACM in the scope of approval dependent upon the capability of the particular organisation.

TABLE 1

CLASS	RATING	LIMITATION	BASE	LINE
AIRCRAFT	A1 Aeroplanes above 5700kg	[Rating reserved to Maintenance Organisations approved in accordance with MAR-145] [Shall state aeroplane manufacturer or group or series or type and/or the maintenance tasks] *Example: Airbus A320 Series*	[YES/NO]	[YES/NO]
	A2 Aeroplanes 5700 kg and below	[Shall state aeroplane manufacturer or group or series or type and/or the maintenance tasks] *Example: DHC-6 Twin Otter Series*	[YES/NO]	[YES/NO]
	A3 Helicopters	[Shall state helicopter manufacturer or group or series or type and/or the maintenance tasks] *Example: AgustaWestland S.p.A AW139*	[YES/NO]	[YES/NO]
	A4 Aircraft other than A1, A2 and A3	[Shall state aircraft series or type and/or the maintenance tasks]	[YES/NO]	[YES/NO]
ENGINES	B1 Turbine	[Shall state engine series or type and/or the maintenance tasks] *Example: PT6A Series*		
	B2 Piston	[Shall state engine manufacturer or group or series or type and/or the maintenance tasks]		
	B3 APU	[Shall state engine manufacturer or group or series or type and/or the maintenance tasks]		
COMPONENTS OTHER THAN COMPLETE ENGINES OR APUs	C1 Air Cond & Press	[Shall state aircraft type or aircraft manufacturer or component manufacturer or the particular component and/or cross refer to a capability list in the exposition and/or the maintenance tasks.] *Example: PT6A Fuel Control*		
	C2 Auto flight			
	C3 Comms and Nav			
	C4 Doors - Hatches			
	C5 Electrical Power & Lights			
	C6 Equipment			
	C7 Engine - APU			
	C8 Flight Controls			
	C9 Fuel			
	C10 Helicopter - Rotors			
	C11 Helicopter - Trans			
	C12 Hydraulic Power			
	C13 Indicating - recording system			
	C14 Landing Gear			
	C15 Oxygen			
	C16 Propellers			
	C17 Pneumatic & Vacuum			
	C18 Protection ice/rain/fire			
	C19 Windows			
	C20 Structural			
	C21 Water ballast			
	C22 Propulsion Augmentation			
SPECIALISED SERVICES	D1 Non Destructive Testing	[Shall state particular NDT method(s)]		

Appendix 2. The Authorised Release Certificate/AACM Form 1

This appendix and the following instructions relate only to the use of the AACM Form 1 for maintenance purposes.

1. PURPOSE AND SCOPE

(i) The primary purpose of the Certificate is to declare the airworthiness of maintenance work undertaken on products, parts and appliances (hereafter referred to as 'item(s)').

(ii) Correlation must be established between the Certificate and the item(s). The originator must retain a Certificate in a form that allows verification of the original data.

(iii) The Certificate is acceptable to many airworthiness authorities, but may be dependent on the existence of bilateral agreements and/or the policy of the airworthiness authority. The 'approved design data' mentioned in this Certificate then means approved by the airworthiness authority of the importing country.

(iv) The certificate is not a delivery or shipping note.

(v) Aircraft are not to be released using the certificate.

(vi) The Certificate does not constitute approval to install the item on a particular aircraft, engine, or propeller but helps the end user determine its airworthiness approval status.

(vii) A mixture of production released and maintenance release items is not permitted on the same certificate.

2. GENERAL FORMAT

(i) The Certificate must comply with the format attached including block numbers and the location of each block. The size of each block may however be varied to suit the individual application, but not to the extent that would make the Certificate unrecognisable.

(ii) The Certificate must be in 'landscape' format but the overall size may be significantly increased or decreased as long as the Certificate remains recognisable and legible. If in doubt consult the AACM.

(iii) The User/Installer responsibility statement can be placed on either side of the form.

(iv) All printing should be clear and legible to permit easy reading.

(v) The Certificate may either be pre-printed or computer generated but in either case the printing of lines and characters must be clear and legible and in accordance with the defined format.

(vi) The Certificate should be in English, and if appropriate, in one or more other languages.

(vii) The details to be entered on the Certificate may be either machine/computer printed or handwriting using block letters and must permit easy reading.

(viii) Limit the use of abbreviations to a minimum, to aid clarity.

(ix) The space remaining on the reverse side of the Certificate may be used by the originator for any additional information but must not include any certification statement. Any use of the reverse side of the Certificate must be referenced in the appropriate block on the front side of the Certificate.

3. COPIES

(i) There is no restriction in the number of copies of the Certificate sent to the customer or retained by the originator.

4. ERROR(S) ON A CERTIFICATE

(i) If an end-user finds an error(s) on a Certificate, he must identify it/them in writing to the originator. The originator may issue a new Certificate only if the error(s) can be verified and corrected.

(ii) The new Certificate must have a new tracking number, signature and date.

(iii) The request for a new Certificate may be honoured without re-verification of the item(s) condition. The new Certificate is not a statement of current condition and should refer to the previous Certificate in block 12 by the following statement; "This Certificate corrects the error(s) in block(s) [enter block(s) corrected] of the Certificate [enter original tracking number] dated [enter original issuance date] and does not cover conformity/ condition/ release to service". Both Certificates should be retained according to the retention period associated with the first.

5. COMPLETION OF THE RELEASE CERTIFICATE BY THE ORIGINATOR

Block 1 Approving Authority/Country

Pre-printed
"Civil Aviation Authority"
"MACAO, CHINA"

Block 2 AACM Form 1 header

Pre-printed
"AUTHORISED RELEASE CERTIFICATE"
"AACM FORM 1"

Block 3 Form Tracking Number

Enter the unique number established by the numbering system/procedure of the organisation identified in block 4; this may include alpha/numeric characters.

Block 4 Approved Organisation Name and Address

Enter the full name and address of the MAR-145 approved maintenance organisation releasing the work covered by this Certificate. Logos, etc., are permitted if the logo can be contained within the block.

Block 5 Work Order/ Contract/ Invoice

To facilitate customer traceability of the item(s), enter the work order number, contract number, invoice number, or similar reference number.

Block 6 Item

Enter line item numbers when there is more than one line item. This block permits easy cross-referencing to the Remarks block 12.

Block 7 Description

Enter the name or description of the item. Preference should be given to the term used in the instructions for continued airworthiness or maintenance data (e.g. Illustrated Parts Catalogue, Aircraft Maintenance Manual, Service Bulletin, Component Maintenance Manual).

Block 8 Part Number

Enter the part number as it appears on the item or tag/packaging. In case of an engine or propeller the type designation may be used.

Block 9 Quantity

State the quantity of items.

Block 10 Serial Number

If the item is required by regulations to be identified with a serial number, enter it here. Additionally, any other serial number not required by regulation may also be entered. If there is no serial number identified on the item, enter "N/A".

Block 11 Status/Work

The following describes the permissible entries for block 11. Enter only one of these terms – where more than one may be applicable, use the one that most accurately describes the majority of the work performed and/or the status of the article.

(i) *Overhauled*. Means a process that ensures the item is in complete conformity with all the applicable service tolerances specified in the type certificate holder's, or equipment manufacturer's instructions for continued airworthiness, or in the data which is approved or accepted by the Authority. The item will be at least disassembled, cleaned, inspected, repaired as necessary, reassembled and tested in accordance with the above specified data.

(ii) *Repaired*. Rectification of defect(s) using an applicable standard[1].

(iii) *Inspected/Tested*. Examination, measurement, etc. in accordance with an applicable standard1 (e.g. visual inspection, functional testing, bench testing etc.).

(iv) *Modified*. Alteration of an item to conform to an applicable standard[1].

Block 12 Remarks

Describe the work identified in Block 11, either directly or by reference to supporting documentation, necessary for the user or installer to determine the airworthiness of item(s) in relation to the work being certified. If necessary, a separate sheet may be used and referenced from the main AACM Form 1. Each statement must clearly identify which item(s) in Block 6 it relates to.

Examples of information to be entered in block 12 are:

(i) Maintenance data used, including the revision status and reference.

(ii) Compliance with airworthiness directives or service bulletins.

(iii) Repairs carried out.

(iv) Modifications carried out.

(v) Replacement parts installed.

[1] Applicable standard means a manufacturing/design/maintenance/quality standard, method, technique or practice approved by or acceptable to the AACM. The applicable standard shall be described in block 12

(vi) Life limited parts status.

(vii) Deviations from the customer work order.

(viii) Release statements to satisfy a foreign Civil Aviation Authority maintenance requirement.

(ix) Information needed to support shipment with shortages or re-assembly after delivery.

If printing the data from an electronic AACM Form 1, any appropriate data not fit for other blocks should be entered in this block.

Block 13a-13e

General Requirements for blocks 13a-13e: Not used for maintenance release. Shade, darken, or otherwise mark to preclude inadvertent or unauthorised use.

Block 14a

Mark the appropriate box(es) indicating which regulations apply to the completed work. If the box "other regulations specified in block 12" is marked, then the regulations of the other airworthiness authority(ies) must be identified in block 12. At least one box must be marked, or both boxes may be marked, as appropriate.

For all maintenance carried out by MAR-145 approved maintenance organisations, the certification statement "unless otherwise specified in block 12" is intended to address the following cases;

(a) Where the maintenance could not be completed.

(b) Where the maintenance deviated from the standard required by MAR-145.

(c) Where the maintenance was carried out in accordance with a requirement other than that specified in MAR-145. In this case block 12 shall specify the particular national regulation.

Block 14b Authorised Signature

This space shall be completed with the signature of the authorised person. Only persons specifically authorised under the rules and policies of the AACM are permitted to sign this block. To aid recognition, a unique number identifying the authorised person may be added.

Block 14c Certificate/Approval Number

Enter the Certificate/Approval number/reference. This number or reference is issued by the AACM.

Block 14d Name

Enter the name of the person signing block 14b in a legible form.

Block 14e Date

Enter the date on which block 14b is signed, the date must be in the format dd = 2 digit day, mmm = first 3 letters of the month, yyyy = 4 digit year

User/Installer Responsibilities

Place the following statement on the Certificate to notify end users that they are not relieved of their responsibilities concerning installation and use of any item accompanied by the form:

"This certificate does not automatically constitute authority to install the item(s).

Where the user/installer performs work in accordance with regulations of an airworthiness authority different than the airworthiness authority specified in block 1, it is essential that the user/installer ensures that his/her airworthiness authority accepts items from the airworthiness authority specified in block 1.

Statements in blocks 13a and 14a do not constitute installation certification. In all cases aircraft maintenance records must contain an installation certification issued in accordance with the national regulations by the user/installer before the aircraft may be flown."

6. EFFECTIVITY

AW/CERT/001 should be used for the release of all items from 01 June 2020 but may be used if available prior to 01 June 2020. Issue 4 of AACM Form One may be used for the period up to 31 May 2020.

1. Approving Authority/Country Civil Aviation Authority MACAO, CHINA	2.	**AUTHORISED RELEASE CERTIFICATE** AACM FORM 1			3. Form Tracking Number
4. Approved Organisation Name and Address					5. Work Order/ Contract/ Invoice
6. Item	7. Description	8. Part No.	9. Quantity	10. Serial No.	11. Status/Work
12. Remarks					
13a. **Certifies that the items identified above were manufactured in conformity to:** ☐ Approved design data and are in a condition for safe operation ☐ Non-approved design data specified in block 12			14a. ☐ **MAR 145.50 Release to Service** ☐ **Other regulation specified in block 12** Certifies that unless otherwise specified in block 12, the work identified in block 11 and described in block 12, was accomplished in accordance with MAR-145 and in respect to that work the items are considered ready for release to service.		
13b. Authorised Signature		13c. Approval/Authorisation No.	14b Authorised Signature		14c. Certificate/Approval Ref. No.
13d. Name		13e. Date (dd mmm yyyy)	14d. Name		14e. Date (dd mmm yyyy)

User/Installer Responsibilities

This certificate does not automatically constitute authority to install the item(s).
Where the user/installer performs work in accordance with regulations of an airworthiness authority different than the airworthiness authority specified in block 1, it is essential that the user/installer ensures that his/her airworthiness authority accepts items from the airworthiness authority specified in block 1.
Statements in blocks 13a and 14a do not constitute installation certification. In all cases aircraft maintenance records must contain an installation certification issued in accordance with the national regulations by the user/installer before the aircraft may be flown."

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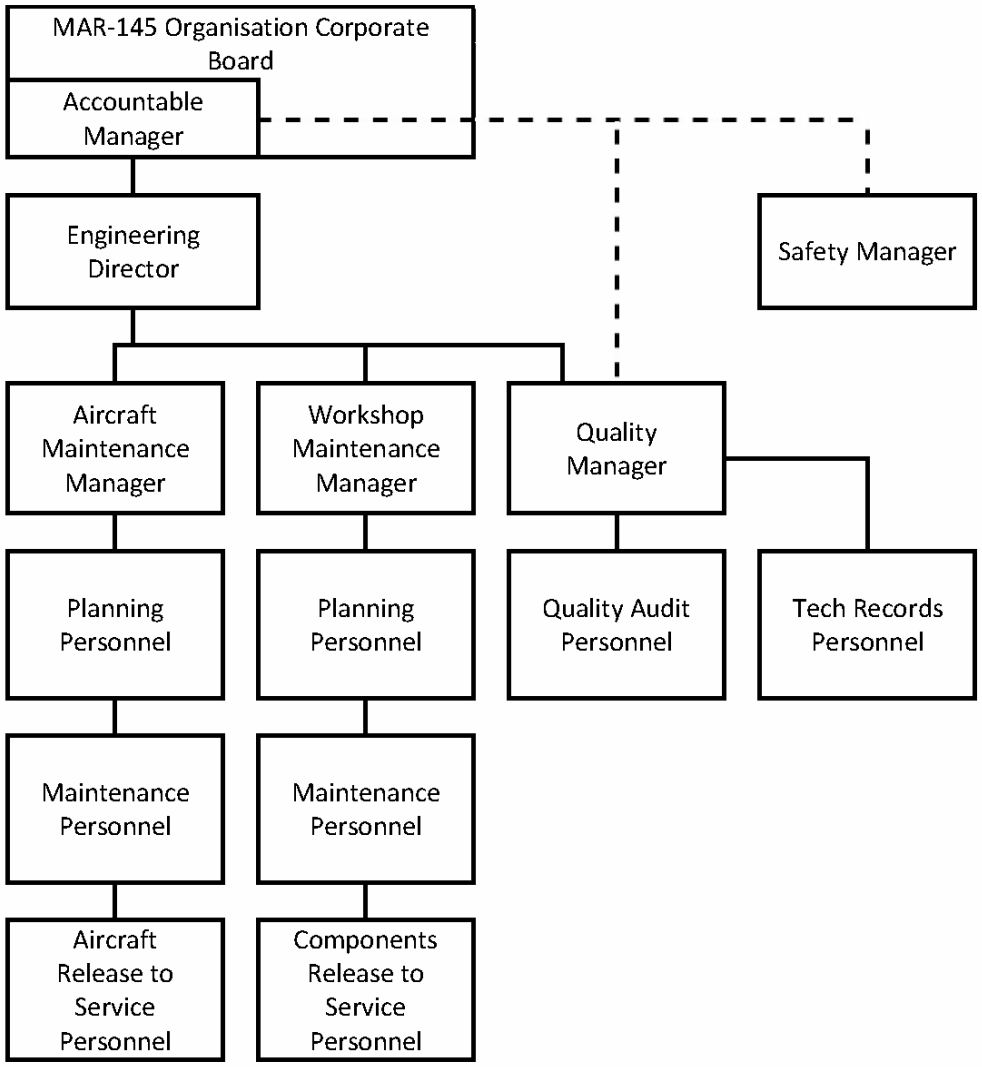
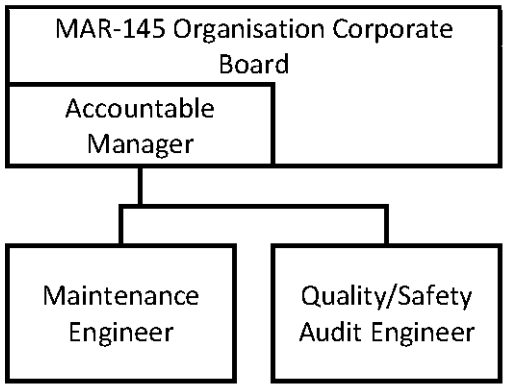
Appendix 3. Some Outline Examples of Organisational Structures Possible under MAR-145

A. TYPICAL LARGE ORGANISATION



1. The Engineering Director may be the accountable manager if it is a Corporate Board position and meets the other requirements for accountable manager. Typically such a position is entitled Vice President (Engineering)
2. Quality Audit personnel must remain independent of the Maintenance Manager. Release to Service personnel may report instead to the quality Manager position.
3. Technical records personnel may report instead to the Aircraft (Workshop) Manager.
4. The Safety Manager shall have a direct access to the accountable manger

B. TYPICAL SMALL ORGANISATION



Appendix 4. Conditions for the use of staff not qualified in accordance with the MAR-66 referred to in points in MAR 145.30 (j)(1) and (2)

1) Certifying staff in compliance with all the following conditions are deemed to meet the intent of point MAR 145.30 (j)(1) and (2):

(a) The person shall hold a licence or a certifying staff authorisation issued under the national regulations in full compliance with ICAO Annex 1.

(b) The scope of work of the person shall not exceed the scope of work defined by the national licence or the certifying staff authorisation, whatever is the most restrictive.

(c) The person shall demonstrate he/she received training on human factors and aviation legislation referred to in modules 9 and 10 of Appendix 1 to MAR-66.

(d) The person shall demonstrate five years maintenance experience for line maintenance certifying staff and eight years for base maintenance certifying staff. However, those persons whose authorised tasks do not exceed those of a MAR-66 category A certifying staff, need to demonstrate three years maintenance experience only.

(e) Line maintenance certifying staff and base maintenance support staff shall demonstrate he/she received type training and passed examinations at category B1, B2 or B3 level, as applicable, referred to in Appendix 3 to MAR-66 for each aircraft type in the scope of work referred to in point (b). Those persons whose scope of work does not exceed those of a category A certifying staff may however receive task training in lieu of complete type training.

(f) Base maintenance certifying staff shall demonstrate he/she received type training and passed examination at the category C level referred to in Appendix 3 to MAR-66 for each aircraft type in the scope of work referred to in point (b), except that for the first aircraft type, training and examination shall be at the category B1, B2 or B3 level of Appendix 3.

2) Protected rights

(a) The personnel having privileges before the entry into force of the relevant requirements of MAR-66 may continue to exercise them without the need to comply with points 1(c) to 1(f).

(b) However after that date any certifying staff willing to extend the scope of their authorisation to include additional privileges shall comply with point 1.

(c) Notwithstanding subparagraph 2(b) above, in the case of additional type training, compliance with points 1(c) and 1(d) is not required.'