



**Australian Government**

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**Civil Aviation Safety Authority**

Acceptable Means of Compliance (AMC)

and

Guidance Material (GM)

**CASR Part 145**

Approved Maintenance Organisation Requirements

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*An Acceptable Means of Compliance (AMC) explains how one or more requirements of the Civil Aviation Safety Regulations 1998 (CASRs) for the issue of a certificate, licence, approval or other authorisation, can be met by an individual or organisation applying to Civil Aviation Safety Authority (CASA) for the authorisation.*

*Applicants are not required to comply with an AMC but if they do, CASA will issue the authorisation to which the AMC relates.*

*Individuals and operators may, on their own initiative, propose other ways of meeting the requirements of the CASR; however, any such proposal will be subject to separate assessment by CASA to determine whether the authorisation can be issued.*

*Guidance Material (GM) provides explanations and amplification of a CASR policy intention, rather than a means of complying with it. GM should be read in conjunction with the applicable CASRs and AMCs. GM is identified by grey shaded text.*

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## AMENDMENTS

April 2016	<ul style="list-style-type: none"> <li>• Provision for surface finishing added at AMC 145.A.30 (f) .</li> </ul>
Nov 2011	<ul style="list-style-type: none"> <li>• Removal of 30 (f) GM advice that if read literally would have prevented specialist maintainers from providing maintenance certifications.</li> </ul>
Dec 2011	<ul style="list-style-type: none"> <li>• Conversion and amendment of 30 (a) AMC into GM for Accountable Manager Requirements.</li> <li>• Amended text for 30 (a) GM - Accountable Manager Requirements</li> <li>• Conversion and amendment of 30 (b) AMC into GM for Responsible Manager requirements.</li> <li>• Amended text for 30 (b) GM - Responsible Manager Requirements</li> <li>• 30 (b) AMC – amendment of subheading “Acceptable Corporate Management Structures” to now read: “Acceptable AMO Management Structures”</li> <li>• Amended numbering and heading of 30 (c) AMC – Examples of Acceptable Organisation Management Structures to now read: MOS 145.A.30 (b) Examples of Acceptable AMO Management Structures</li> <li>• Amended numbering of GM’s for 30 (c) GM to now read GM 145.A.30 (c) 1 – Quality Manager Requirements; and GM 145.A.30 (c) 2 – Safety Manager Requirements</li> <li>• Conversion and amendment of 30 (c) AMC into GM for Quality Manager Requirements.</li> <li>• Amended text for 30 (c) GM - Quality Manager Requirements</li> <li>• Conversion and amendment of 30 (c) AMC into GM for Safety Manager Requirements.</li> <li>• Amended text for 30 (c) GM - Safety Manager Requirements</li> <li>• Provided additional AMC for 30 (f) AMC –Specialist Maintenance Certifying Employee</li> <li>• Provided additional AMC for 30 (g) - Line Maintenance Certifying Employee</li> <li>• Inserted “be” after “will” in paragraph two for 30 (g) GM – Line Maintenance</li> <li>• Removal of 30 (i) AMC as it is a duplicate of 30 (h) AMC</li> <li>• 30 (h) AMC – amended to now read MOS AMC 145.A.30 (h) and (i)</li> <li>• Inserted a “,” after Equipment and capitalised Tools and Material in the heading for 145.A.40</li> <li>• 65 (b) 1,6 AMC – after “periods” omit “and” and insert “or”</li> <li>• Re-formatted heading numbering throughout entire document</li> </ul>

<p>July 2013</p>	<ul style="list-style-type: none"> <li>• Provided an AMC for 145.A.30 (e) allowing non-complex organisations to use the CASA Human Factors training resource kit ‘<i>Safety Behaviours: Human Factors for Engineers</i>’ to meet the syllabus and course content requirements of their initial Human Factors training.</li> </ul>
<p>April 2014</p>	<ul style="list-style-type: none"> <li>• Provided GM for paragraph 145.A.35 (e) — competency assurance for the initial authorisation of an AMO certifying employee following the transition of a CAR (1988) 30 Certificate of Approval holder to Part 145 AMO. Includes guidance on training requirements for initial approval of any new employee as a certifying employee.</li> </ul>
<p>September 2015</p>	<ul style="list-style-type: none"> <li>• For section 145.A.10 of the MOS, additional explanation of the intent of Appendix I of the MOS in relation to the ability to provide maintenance services that are specialist maintenance under a maintenance category A, B, or C approval rating.</li> <li>• For paragraph 145.A.30 (c) the addition of AMC to provide clarity with respect to the ability of the QM authorisation function to be delegated to another person within the QMS of the AMO.</li> <li>• For paragraph 145.A.30 (f) — clarification that aircraft metal or composite structural inspections may fall within the competency of a licence holder.</li> <li>• For paragraph 145.A.30 (f) — clarification that colour contrast dye penetrant inspection techniques fall within the competency of category B1 AMEL training and assessment.</li> <li>• For paragraph 145.A.30 (k) — additional guidance in relation to intent relating to AMO authorisation of ICAO Annex 1 licence holders outside Australian territory.</li> <li>• For paragraph 145.A.45 (d) — additional AMC for acceptable procedures to approve tooling and equipment alternative to that specified by maintenance data.</li> <li>• For paragraph 145.A.45 (e) — additional AMC and GM for maintenance records requirements in relation to complex maintenance.</li> </ul>
<p>February 2016</p>	<ul style="list-style-type: none"> <li>• For section 145.A.37 of the MOS, advice that AC 145-04 <i>Control and delivery of training by a Part 145 AMO</i>, contains an AMC for the purpose of permitted training in an AMO.</li> </ul>

## **MOS 145.A.05 — Applicability of this MOS**

### **MOS AMC 145.A.05 — Content of the Exposition**

The Approved Maintenance Organisation (AMO) Exposition describes how the organisation complies with the requirements of CASR Part 42, 145 and the Part 145 MOS.

An AMC for the provision of an Exposition is one which is a single paper or electronic document that includes all procedures. Such an Exposition will include all requirements of section 145.A.70 of the Part 145 MOS, which includes procedures such as those which show how the AMO will comply with requirements for:

- organisational structure and management requirements;
- facilities;
- tooling and equipment use, supply, storage, testing calibration;
- compliance to Subpart 42.E of Part 42 of the CASR, including procedures for:
  - how the AMO will receive, inspect and accept aeronautical products for use or fitment to aircraft or other aeronautical products;
  - how the AMO will comply with requirements relating to fitting of aeronautical products; and
  - how the AMO will deal with unserviceable, unsalvageable and suspected unapproved parts;
- training, assessment, qualification and authorisation of employees;
- production planning;
- the carrying out of maintenance in accordance with instructions for continuing airworthiness;
- certification of maintenance and release to service;
- quality and Safety policies and procedures; and
- compliance to requirements of subparagraph 145.A.65 (c) 5 for all records associated with the requirements of the Part 145 MOS including compliance to Division 42.D.7 of Part 42 of the CASR for the making, dissemination and retention of maintenance records and all requirements for the making, dissemination and retention of any record that is part of the continuing airworthiness record for an aircraft in accordance with Part 42 of the CASR.

An acceptable Exposition may be paper based, electronic or a combination of medium showing compliance to the requirements of CASR Parts 42 and 145 and the Part 145 MOS. Refer to AMC 145.A.70 for acceptable content of the management part of the Exposition and which provisions of the Part 145 MOS may be in separate paper or electronic documents.

### **MOS GM 145.A.05 — The Exposition — Context & Purpose**

The Part 145 MOS Instrument 2011 is a legal instrument empowered by regulation 145.015 of the CASR to specify matters affecting the maintenance or airworthiness of aircraft. It specifies the outcomes required for organisations for approval as a Part 145 AMO. Maintenance performance rules that apply to the carrying out of maintenance by that organisation are specified in CASR Part 42.

The means by which an organisation demonstrates to CASA and its employee's compliance with the requirements of MOS Part 145 is, its Exposition. Where the Part 145 MOS requires an AMO to demonstrate how it will comply with performance rules of CASR Part 42, it will reference that CASR regulation. For example, refer section 145.A.42 of the Part 145 MOS — Acceptance of aeronautical products. The organisations Exposition is required under regulation 145.025 to accompany any application to CASA for approval of the organisation under CASR Part 145.



Not all of the provisions of the Part 145 MOS need to be included in the management part of the Exposition. 145.A.70 in the Part 145 AMC provides a list of provisions that may be located in separate documents or electronic files. Any document that shows how the AMO will comply with provisions or requirements specified in the Part 145 MOS is part of the Exposition, whether it is part of the management part of the Exposition or not. Such documents must be referenced from the management part and made available to CASA for assessment and ongoing oversight of the AMO compliance.

## **MOS 145.A.10 — Scope of the AMO**

### **MOS AMC 145.A.10 — Capability Statement**

Where an approval certificate lists (under the limitation section) specific aircraft or aeronautical products for the maintenance of which the AMO is approved, an acceptable capability statement will indicate the locations at which those specific aircraft or aeronautical products are to be maintained.

Where an approval certificate lists a series or class of aircraft or aeronautical products (and not specific aircraft or aeronautical products) an acceptable AMO statement of capability will list the specific aircraft or aeronautical products that it has the capability to maintain and at which locations those activities are to be performed. The list of specific aircraft or aeronautical products must not extend beyond the meaning of the broader statement of series, group or class specified on the approval certificate.

### **MOS GM 145.A.10 — Capability Statement**

An AMOs approved scope of maintenance will be defined by the approval certificate issued by CASA and the Exposition. The approval certificate may list locations, Classes, Ratings and their limitations for the maintenance services that the AMO is approved to provide. This scope of maintenance and limitations apply to the organisation as a whole.

Subparagraph 145.A.70 (a) 10 details a requirement for the organisation to specify in its Exposition the scope of maintenance it can perform at each of its normal locations. Normal locations are listed in the Exposition under subparagraph 145.A.70 (a) 15.

Note: In accordance with paragraph 145.A.75 (b) the AMO may carry out unscheduled maintenance and repairs in accordance with an Exposition procedure at locations other than those listed under the requirements referred to in the paragraph above.

Where the AMO uses facilities either inside or outside Australia such as satellite facilities, sub-contractors or line stations, such facilities may be included in the approval without being identified on the approval certificate. Such an approval may be granted if the AMOs Exposition identifies the facilities and has related control procedures and CASA is satisfied that they form an integral part of the AMO.

Where an AMO requires capability for aircraft or aeronautical products that fall outside of a rating limitation stated on the certificate, an application to CASA for significant change is required in accordance with paragraph 145.010 (2) (d) of CASR Part 145.

Where an AMO has a procedure in its Exposition for changes to the organisation that are not significant changes and which cover changes to the capability statement, such changes need not be directly approved by CASA; they are approved by the AMO under the CASA approved procedure.

The specialist maintenance fields specified in subparagraph 145.A.30 (f) 3. of the Part 145 MOS form two distinct types. Items (i), (ii) and (iv) list specialist maintenance fields whose nature is particularly defined by a method or process. Maintenance methods and processes under these fields are applied consistently regardless of what aircraft or aeronautical product type they are

performed on; and the competency required for authorisation to carry out the maintenance is primarily dependent upon the method or process qualification.

Competencies required for specialist maintenance fields specified in paragraph 145.A.30 (f) 3. items (iii) and (v) are more dependent upon aircraft, equipment or aeronautical product type. Authorisation is primarily dependent upon training and qualification on the particular aircraft, equipment or aeronautical product.

Under the provisions of Appendix I of the Part 145 MOS, an AMO may apply for approval to carry out maintenance that is specialist maintenance, under its category A, B, or C rating approval. The application must be supported by detailed exposition procedures describing the particular capability required to be approved and the personnel qualification standards, training, assessment and authorisation standards and procedures to be used. If approved for specialist maintenance under these exposition procedures and capability statement of the AMO, the specialist maintenance may be performed on, but limited to any aircraft or aeronautical product for which the AMO is approved under its category A, B, or C approval rating.

Under the provisions of Appendix I of the Part 145 MOS, an AMO may be approved to carry out maintenance that is specialist maintenance under a category D approval rating if it is maintenance under one of items (i), (ii) or (iv); (or (ix) if CASA agrees that the maintenance is a process in nature) of subparagraph 145.A.30 (f) 3 of the Part 145 MOS. If approved for the specialist maintenance under a D rating, the AMO may perform that maintenance on any aircraft or aeronautical product, limited by:

- the scope of its Approval Certificate, which will specify particular methods, processes and functions approved and any limitations applied to the approval; and
- the AMO's capability as described within the AMO's exposition.

### **MOS AMC 145.A.10 — Line Maintenance**

*Line Maintenance:* an AMC would be for an AMO to describe its line maintenance as being any maintenance that is carried out before flight to ensure that the aircraft is fit for the intended flight.

Line Maintenance may include:

- trouble shooting;
- defect rectification;
- aeronautical product replacement with use of external test equipment if required. Aeronautical product replacement may include products 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 power plant items which are visible through quick opening access panels/doors; and
- minor repairs and modifications which do not require extensive disassembly and can be accomplished by simple means.

The provision of maintenance services in accordance with progressive type programs or for temporary and occasional cases (airworthiness directives, service bulletins) under a Line Maintenance approval, an AMC is for the AMO to have a control procedure in its Exposition that:

- shows how the organisation will assess its capability to complete all tasks within the particular check safely to the required standards at the designated line maintenance station; and
- includes Quality Manager approval of the assessment.

### **MOS GM 145.A.10 — Base Maintenance**

Maintenance tasks falling outside the criteria for Line Maintenance above are considered to be *Base Maintenance*.

### **MOS AMC 145.A.10 — Small Organisations of One Person**

The minimum AMC to paragraph 145.A.30 (b) of the Part 145 MOS is for one full-time person who holds the position of ‘Accountable Manager’, ‘Responsible Manager’, maintenance engineer and also Certifying Employee. No other person may issue a Certificate of Release to Service (CRS) and therefore if absent, no maintenance may be released during such absence.

The quality and safety monitoring functions under paragraphs 145.A.65 (c) and (d) of the Part 145 MOS may be contracted to an appropriate organisation approved under CASR Part 145 or to an individual with appropriate technical knowledge and extensive experience of quality audits employed on a part-time basis, with the agreement of CASA.

Note: Full time for the purpose of CASR Part 145 means not less than 35 hours per week except during vacation periods.

For a small organisation of one individual, it is not necessary for the individual to issue an authorisation to him or herself. An AMC to the intent of paragraph 145.A.35 (i) of the Part 145 MOS will be for the AMO’s Exposition to describe the capability of the organisation, which will be limited by an individual’s qualifications. The individual’s qualifications are required to be specified under paragraph 145.A.30 (e) of the Part 145 MOS and may be referred to in the description of the AMO’s capability within the Exposition. CASA approval of the capability (or scope of maintenance) of the AMO achieves the independence of authority intended by paragraph 145.A.35 (i) of the Part 145 MOS. With only one person as above, the requirement for a separate record of authorisation under paragraph 145.A.35 (j) of the Part 145 MOS, may be satisfied by a description of the individual’s authorisations or qualifications to be included in the AMO’s Exposition.

### **MOS GM 145.A.10 — Small Organisations of One Person**

This GM provides guidance on how the smallest organisations satisfy the intent of CASR Part 145.

The small Part 145 AMO would only be involved with a small number of small aircraft, or aeronautical products used for large aircraft or aircraft operated in air transport operations. It is therefore a matter of scale; small AMO’s maintaining a small number of small aircraft do not demand the same level of resources, facilities or complex maintenance procedures as a large organisation.

A CASR Part 145 approval may be required by two quite different types of small organisations; the first being the small aircraft maintenance hangar, the second being the aeronautical product maintenance workshop maintaining such products as small piston engines, radio equipment etc.

The intent of paragraph 145.A.35 (i) of the Part 145 MOS is that in order to avoid conflicts of personal interest, the authorisation of employees to certify on behalf of the AMO should be by an individual with responsibilities and accountabilities separated from the maintenance functions of the organisation.

### **MOS AMC 145.A.10 — Small Organisations up to Ten Individuals involved in Maintenance**

For AMC to paragraph 145.A.30 (b) of the Part 145 MOS, the normal minimum requirement is for the employment on a full-time basis of two persons who meet CASA requirements for certifying employees, whereby one holds the position of ‘maintenance engineer’ and the other holds the position of ‘quality audit engineer’.

Either person could assume the responsibilities of the Accountable Manager providing that they can comply in full with the applicable elements of paragraph 145.A.30 (a) of the Part 145 MOS, but the ‘maintenance engineer’ should be the certifying person to retain the independence of the ‘quality auditor’ to carry out audits. Nothing prevents either engineer from undertaking maintenance tasks providing that the ‘maintenance engineer’ issues the CRS.

- The ‘quality auditor’ 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 acceptable.
- In cases where CASA agrees that it is not practical for the organisation to nominate a post holder for the quality management function, this function may be contracted in accordance with second paragraph of *AMC – Small Organisations of One Person*, but if the AMO is approved on this basis, then paragraph 3 of *AMC – Small Organisations of One Person* is also applicable.

## **MOS 145.A.12 — Definitions**

### **MOS GM 145.A.12 — Definitions**

Definitions of words and terms within this section are usually specific to the Part 145 MOS and the relevant AMC/GM documents. Ordinary dictionary words are not normally defined; they are assumed to take their ordinary dictionary meanings. Some terms may be used in reference to maintenance requirements and performance rules that are found in Part 42 of the CASR. Such terms may be defined in that CASR Part and the definition is not replicated in this MOS.

## **MOS 145.A.25 — Facilities Requirements**

### **MOS AMC 145.A.25 (a) — Maintenance Facility Requirements**

AMO facilities and locations may be included in the approval without being identified on the approval certificate. This would be acceptable if the Exposition identifies the locations and contains procedures for assessment and control of maintenance capability at such locations and CASA is satisfied that the locations and facilities form an integral part of the AMO.

An AMC to the requirement for segregation of specialist workshops will be segregation to the extent that sensitive equipment is not contaminated in areas where they are to be maintained. For example, workshops where composite repairs and sanding is performed should be segregated from electronic, hydro mechanical component or hydraulic component workshops. Segregation may be by physically isolating workshops with solid walls or by a combination of distance and less substantially partitioned bays with adequate environmental control. Additionally, similar segregation should be provided where sensitive tooling and equipment is used for maintenance.

Facilities including aircraft hangars, aeronautical product maintenance workshops and office accommodation may be provided that are appropriate for the tasks carried out in them to the extent that:

- employees can carry out required tasks without undue discomfort because of temperature (for example, there may be adequate heating and cooling);
- airborne contamination, including dust, is kept to a minimum and below a level in the work task area where visible aircraft or aeronautical product surface contamination can be seen;
- lighting allows each maintenance task to be carried out properly or effectively; and
- noise does not distract individuals from carrying out maintenance tasks.

Where facilities cannot ensure these criteria or for maintenance that must be performed outside any hangar, workshop or office as mentioned above such as for line maintenance, a Part 145 AMO may comply with this requirement by:

- providing personal protective equipment and clothing;
- having procedures that define the conditions under which maintenance tasks may be performed in the facility. For example:
  - under conditions that are extreme for the location, such as in cyclonic weather or blizzards or dust storms, Exposition procedures should specify what maintenance may or may not be carried out in AMO facilities and what measures will be taken to ensure the safety and security of aircraft and aeronautical products; and
  - if airborne contamination results in visible surface contamination, all systems that could be affected by the contamination are sealed until the contamination and the source of the contamination are removed.

Aircraft hangar and component workshop floors should be sealed to minimise dust generation. The degree to which floors should be sealed depends upon the approved scope of maintenance for the facility. An acceptable standard for a workshop that overhauls intricate avionic components will be more stringent than for an aircraft hangar that is approved for line maintenance and defect rectification.

As a minimum, for hangar floors to be sealed, means that they should not be dirt or gravel floors where dust and dirt may contaminate aircraft or aeronautical products. The outcome required is that where systems or components are open they should not be subjected to dust and contamination due to environmental factors.

### **MOS GM 145.A.25 (a) — Maintenance Facility Requirements**

Where the hangar is not owned by the organisation, it may be necessary to establish proof of tenancy.

Protection from the weather elements relates to the normal prevailing local weather elements that are expected throughout any 12 month period. Aircraft hangar and component workshop structures should prevent the ingress of rain, hail, ice, snow, wind and dust etc. Aircraft hangar and component workshop floors should be sealed to minimise dust generation.

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.

### **MOS AMC 145.A.25 (b) — Office Accommodation**

It is acceptable to combine any or all of the office accommodation requirements into one office; subject to employees having sufficient space to carry out assigned tasks. Office accommodation may be provided for the processing and management of check sheets and task cards and their certification management, as well as for the research and reading of maintenance tasks, maintenance instructions and other maintenance data by maintenance employees.

### **MOS GM 145.A.25 (b) — Office Accommodation**

This provision is intended to provide for adequate office accommodation for:

- maintenance planning functions; and
- research and reading of Instructions for Continuing Airworthiness (ICA) including maintenance data required by maintenance employees for scheduled maintenance and dealing with defects; and
- certification and coordination requirements of maintenance employees for:
  - normal scheduled maintenance; and
  - the rectification or deferral of defects that could normally be expected in the AMOs maintenance facilities and locations.
- reporting referred to within Parts 42 or 145 of the CASR and their MOS.

### **MOS AMC 145.A.25 (d) — Storage Facility Requirements**

Having storage facilities for serviceable aeronautical products, tools and equipment that are clean, well ventilated and maintained at a constant dry temperature to minimise the effects of condensation will be an AMC. Manufacturers storage recommendations will be followed for those aeronautical products, tools and equipment identified in such published recommendations.

Acceptable storage racks will be strong enough to hold aeronautical products and provide sufficient support for large aeronautical products such that the product is not distorted during storage.

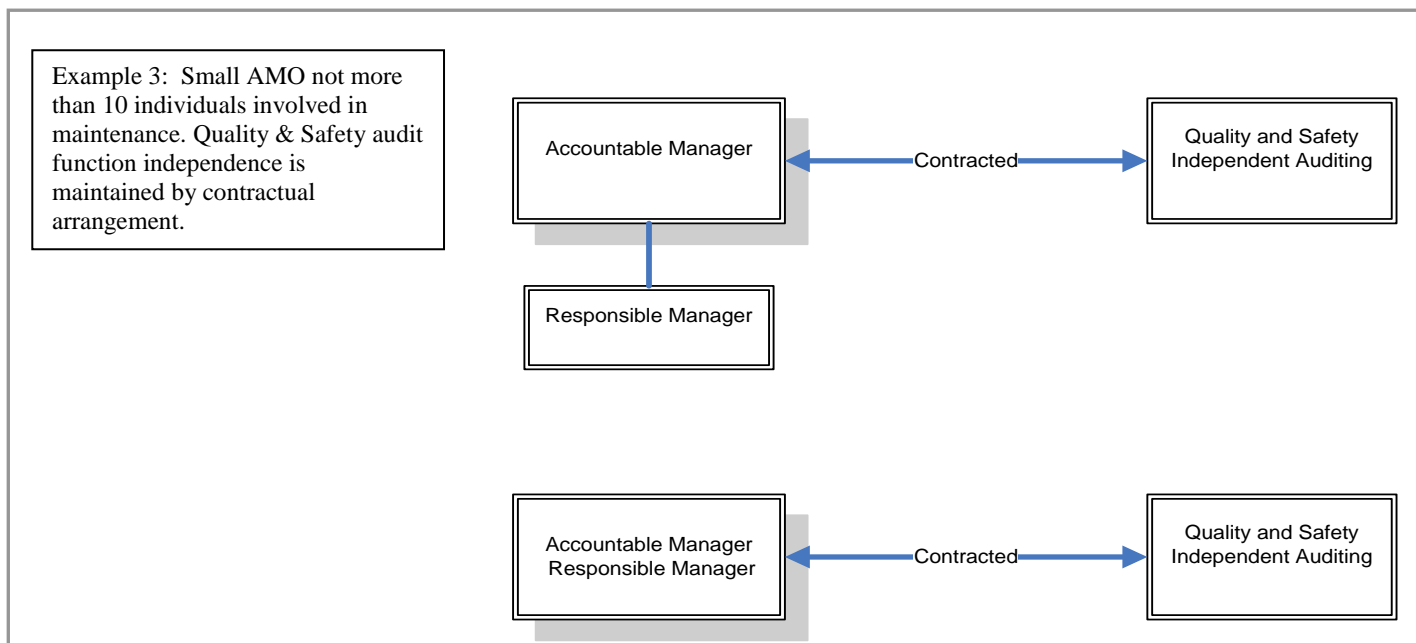
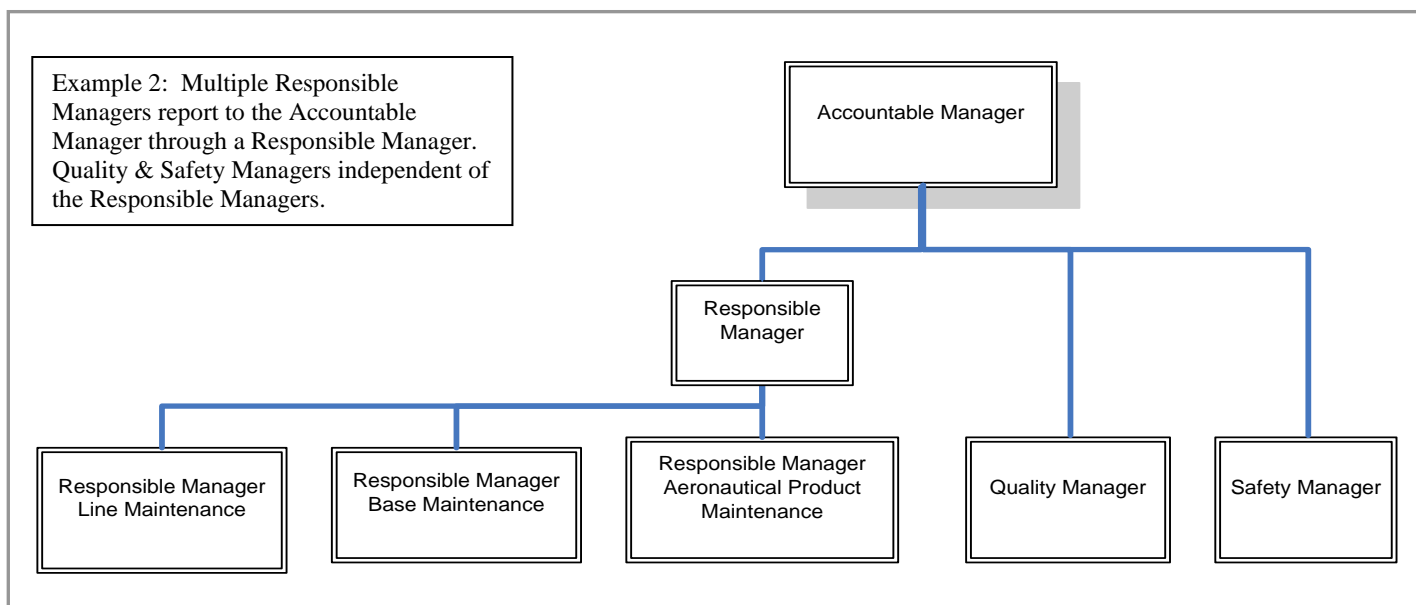
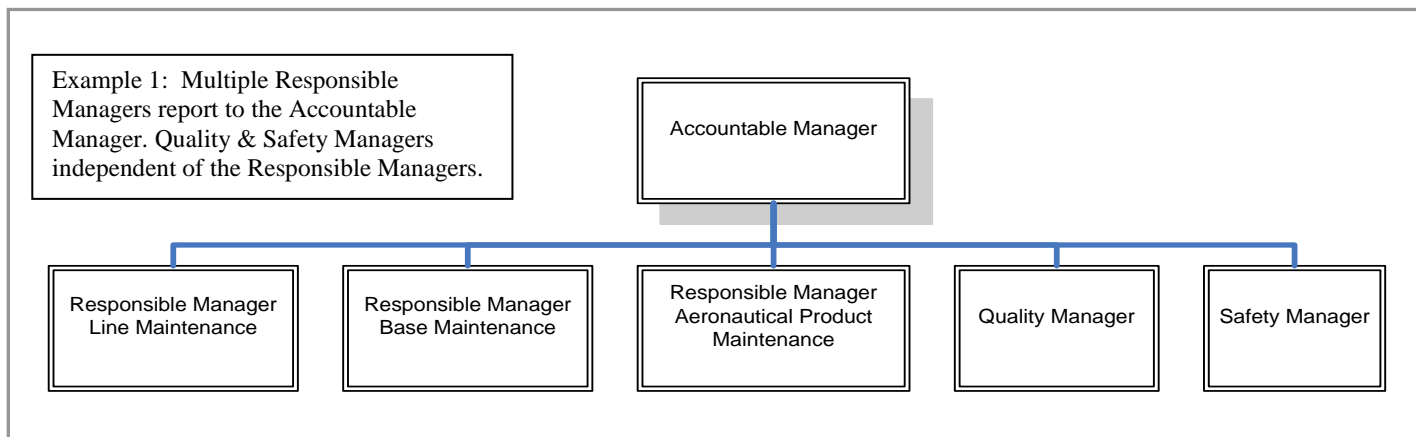
All aeronautical products, wherever practicable, will remain packaged in protective material to minimise damage and corrosion during storage.

### **MOS AMC 145.A.25 (e) — Hangar Visit Requirements**

An acceptable hangar visit plan will be one that is described in the Exposition as a document that is regularly updated and used as a reference for projected planning of hangar utilisation. The hangar visit plan by virtue of its continual changeability needs only to be included in the Exposition by reference, with the description and procedures for control and amendment to be included in the Exposition. The purpose of a hangar visit plan is to show that adequate facilities are at the disposal of the AMO for the proposed scope of maintenance.

## MOS 145.A.30 — Personnel Requirements

### MOS 145.A.30 (a) — Examples of Acceptable AMO Management Structures





### **MOS GM 145.A.30 (a) — Accountable Manager Requirements**

With regard to the Accountable Manager, it is normally intended to mean the Chief Executive Officer (CEO) of the AMO, who by virtue of the position has overall (including in particular financial) responsibility for running the organisation. An individual who held a similar position under the previous Civil Aviation Regulations 1988, or who held a position in business with responsibilities similar to that of an Accountable Manager, or who may hold a qualification such as an Advanced Diploma of Aviation Maintenance Management (Avionics or Mechanical), or selected units of competency from that qualification may be suitable for the position of Accountable Manager.

An individual may be the Accountable Manager for more than one organisation. In this case, it is the responsibility of the Accountable Manager to demonstrate how he/she will effectively manage their time for each organisation, and this should be outlined in each of the AMO's exposition documents. When the Accountable Manager is not the CEO (or equivalent), or where the finances of the organisation may be controlled by a board of Directors, CASA will need to be satisfied that such an Accountable Manager has direct access to the CEO and has sufficient 'maintenance funding' allocated to support the scope of maintenance proposed for approval.

#### ***Acceptable AMO Management Structures***

1. For a small AMO where the independent quality and safety audit functions of the AMO are contracted to another person or organisation, it will be acceptable for a Responsible Manager of the AMO to also be the individual nominated as the Quality and Safety Manager. This will be to fulfil any responsibilities other than the conduct of the independent audit, which would normally be required of the Quality and Safety Managers.
2. However where an AMO has a Quality and/or Safety department that is responsible for the AMO's independent audit functions, the Quality and Safety Manager(s) will not report through another Responsible Manager to the Accountable Manager. The line of responsibility will be directly to the Accountable Manager, to achieve independence of the maintenance responsibilities of the AMO.
3. An AMO may nominate one or more Responsible Managers for any or a combination of the functions for which the AMO is responsible. An acceptable corporate structure will be one where the number of Responsible Managers is governed by the complexity of the scope of maintenance proposed by the AMO, and the capability of those individuals to manage the areas of responsibility in the organisation.
4. It is acceptable for the Responsible Managers to report either directly to the Accountable Manager, or through other Responsible Managers, provided that the responsibility and accountability of the Responsible Managers is not diluted in the reporting line by the number of Responsible Managers.

Certifying employees may report to any of the managers specified depending upon the type of control the AMO uses (for example, licensed engineers/independent inspection/dual function supervisors etc.). However, the employees that conduct the quality compliance monitoring referred to in subparagraph 145.A.65 (c) 1 of the Part 145 MOS and employees that conduct any safety compliance audits under a safety management system under paragraph 145.A.65 (d) of the Part 145 MOS should retain reporting lines independent of the maintenance management structure referred to in paragraph 145.A.30 (b) of the Part 145 MOS.

### **MOS GM 145.A.30 (b) — Responsible Manager Requirements**

An individual who held a position in business with responsibilities similar to that of the Responsible Manager, or who may hold a qualification such as an Advanced Diploma of Aviation Maintenance Management (Avionics or Mechanical), or selected units of competency from that qualification may be suitable for the position of Responsible Manager. This position could have been held under a previous Civil Aviation Regulations 1988 approval or an approval issued by another NAA.

A person may be suitable to hold the position of Responsible Manager if the individual has an aircraft maintenance engineer qualification or a related allied trade qualification and the following experience:

- at least 5 years' experience in matters for which he or she is responsible; or
- at least 2 years' experience in matters for which he or she is responsible provided he or she has at least an additional 3 years' experience in civil aircraft maintenance.

The Responsible Manager should also have a comprehensive knowledge of:

- the regulations and standards; and
- the AMO's exposition;

relating to matters for which he or she is responsible.

The size of a Part 145 AMO and the complexity of its scope of approval will determine the number of Responsible Managers required. The need for more than one Responsible Manager will be increased if the scope of maintenance approved is expanded beyond the expertise (experience and qualifications) demonstrated for the first individual. For example, if an organisation is approved for both aircraft maintenance and aeronautical product maintenance, each function may require a separate Responsible Manager.

The AMO should have, dependent upon its size and the extent of approval, a Responsible Manager responsible for each of the areas of base maintenance, line maintenance and aeronautical product workshops, all of whom should report to the Accountable Manager.

It will be acceptable for an AMO to have an Accountable Manager who is also the Responsible Manager, if the organisation has 10 employees or less actively involved in the provision of maintenance services and only one class of maintenance approved (refer to the Part 145 MOS - Appendix 1 for Classes of maintenance).

The responsibility for compliance to the AMOs Exposition and CASR Part 145, may be divided between Responsible Managers in a number of ways.

***A Responsible Manager for base maintenance*** is responsible for ensuring that all maintenance required to be carried out as base maintenance, plus any defect rectification carried out during base maintenance, is carried out to the design and quality standards specified under paragraph 145.A.65 (b) of the Part 145 MOS and to the requirements of Part 42 of the CASR. This Responsible Manager is also responsible for any corrective action resulting from the quality compliance monitoring function under paragraph 145.A.65 (c) of the Part 145 MOS that pertains to base maintenance.

***A Responsible Manager for line maintenance*** 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 under paragraph 145.A.65 (b) of the Part 145 MOS and to the requirements of Part 42 of the CASR. This Responsible Manager is also responsible for any corrective action resulting from the quality compliance monitoring function under paragraph 145.A.65 (c) of the Part 145 MOS that pertains to line maintenance.

**A Responsible Manager for workshop maintenance** is responsible for ensuring that all maintenance carried out on aeronautical products under his or her field of responsibility is carried out to the standards specified under paragraph 145.A.65 (b) of the Part 145 MOS and to the requirements of Part 42 of the CASR. This Responsible Manager is also responsible for any corrective action resulting from the quality compliance monitoring under paragraph 145.A.65 (c) of the Part 145 MOS that pertains to workshop maintenance.

The AMO may adopt any title for the described Responsible Management positions, but should identify to CASA the titles and persons nominated in accordance with paragraph 145.A.30 (b) of the Part 145 MOS.

#### **MOS GM 145.A.30 (c) 1 — Quality Manager Requirements**

An individual who held a position in business with responsibilities similar to that of the Quality Manager may be suitable for the position of Quality Manager. This position could have been held under a previous Civil Aviation Regulations 1988 approval or an approval issued by another NAA.

A person may be suitable to hold the position of Quality Manager if the individual has the following knowledge and experience:

- comprehensive knowledge of the AMO's exposition;
- knowledge of CASR Part 145 and the Part 145 MOS;
- a formal qualification in quality management; and
- at least 2 years' experience in quality management system activities.

Monitoring the Part 145 AMO's Quality Management System includes requesting remedial and corrective action by the Accountable Manager and the nominated persons referred to in paragraph 145.A.30 (b) of the Part 145 MOS.

#### **MOS AMC 145.A.30 (c) 1 (iv) — Quality Manager Requirements**

The quality manager remains responsible on behalf of the organisation for issuing certification authorisations to certifying employees. The Quality Manager may nominate other persons to actually issue or revoke the certification authorisations in accordance with a procedure as specified in the exposition. The procedure must ensure the authorisation process remains a quality management system function to ensure the nominee is independent from the employee receiving the certification authorisation.

#### **MOS GM 145.A.30 (c) 2 — Safety Manager Requirements**

An individual who held a position in business with responsibilities similar to that of the Safety Manager may be suitable for the position of Safety Manager. This position could have been held under a previous Civil Aviation Regulations 1988 approval or an approval issued by another NAA.

A person may be suitable to hold the position of Safety Manager if the individual is familiar with most aspects of the organisation, its activities, its management and personnel, and has the following training and experience:

- familiarisation with different aircraft, types of maintenance operations;
- understanding the role of human performance in accident causation and prevention;
- operation of the SMS;
- investigation of reportable matters and hazardous events;
- crisis management and emergency response planning;
- safety promotion; and
- specialised training or familiarisation.

### ***Qualifications***

The Safety Manager's qualifications and attributes may include the following:

- broad operational knowledge and experience in the functions of an aviation organisation;
- sound knowledge of safety management principles and practices;
- sound knowledge and understanding of Human Factors (HF);
- good written and verbal communication skills;
- well-developed interpersonal skills;
- computer literacy;
- the ability to relate to all levels, both inside and outside the organisation;
- organisational ability;
- capable of working unsupervised;
- good analytical skills;
- leadership skills and an authoritative approach;
- worthy of respect among peers and management;
- instructional qualifications and experience; for example, Certificate IV in Workplace Training and Assessment;
- knowledge of document procedure design;
- sound understanding of hardware and software issues as it relates to SMS; and
- good understanding of aviation operations.

### **MOS AMC 145.A.30 (d) — Personnel Requirements**

An AMC to this provision is for an AMO to either directly employ individuals or to contract individuals on a basis of continued employment where;

- all contracted individuals are made aware that when working for the organisation, they are required to comply with the organisations procedures specified in its Exposition, which are relevant to their duties;
- for line maintenance, the contracted individuals will be limited to half of the number of employees on any shift that are required to perform the maintenance that would normally be expected under the organisations approval; and
- for base maintenance and aeronautical product maintenance, at least half of the contracted individuals will be engaged for at least the duration of the base maintenance or aeronautical product maintenance check.

An acceptable maintenance man-hour plan will take into account any maintenance carried out on aircraft/aeronautical products from outside Australia and should also take into account all work performed that is not within the scope of the AMOs maintenance approval.

An acceptable maintenance man-hour plan will relate to the anticipated maintenance work load except that when the AMO cannot predict such workload due to the short term nature of its contracts, then the maintenance manpower 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.

In the case of aircraft base maintenance, an acceptable maintenance man-hour plan will relate to the aircraft hangar visit plan as specified in paragraph 145.A.25 (e) of the Part 145 AMC.

For Quality and SMS monitoring functions, an acceptable man-hour plan will be one that is sufficient to meet the requirements of paragraphs 145.A.65(c) and (d) of the Part 145 MOS. Where quality and safety monitoring employees perform other functions, the time allocated to

those functions needs to be taken into account in determining requisite quality and safety monitoring employee numbers.

An acceptable maintenance man-hour plan will be one that is reviewed at least every 3 months and updated when necessary. Because of the changing nature of the man-hour plan, it is acceptable to be included in the Exposition by reference and with the main part of the Exposition describing the man-hour plan and the procedure for its management.

An acceptable procedure for significant deviations from the maintenance man-hour plan will be where the deviations are 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 paragraph 145.A.30 (d) of the Part 145 MOS.

### **MOS GM 145.A.30 (d) — Man-Hour Plan Requirements**

‘Has sufficient employees’ means that the AMO employs or contracts a sufficient number of individuals on a basis that provides for organisational stability and consistency of the workforce.

The AMOs policies relating to the number of employees required under various types of maintenance and the levels of supervision required between individual maintainers and Certification Authorisation holders should be shown here. CASA does not prescribe supervisory ratios however the AMO should be able to show reasonable compliance to the standards set in their Exposition through the management of personnel availability through their man-power planning procedures.

### **MOS AMC 145.A.30 (e) — Employee Qualification**

It will be an AMC to this provision for an AMO Exposition to include a procedure that identifies varying stages or levels of qualification, from accepted national qualification standards for more complex tasks, to simple on-the-job training and AMO acceptance of competency of individuals for less difficult or repetitive tasks. The procedures specify standards for employees including planners, Aircraft Maintenance Engineers, specialist maintenance employees, supervisors and certifying employees to be assessed for competence by ‘on the job’ evaluation and/or by examination relevant to their particular job function within the organisation before unsupervised work is permitted.

A record of the qualification and competency assessment would need to be kept. Adequate initial and recurrent training is provided and recorded to ensure continued competence.

The acceptable procedure for assessment will ascertain that:

- Planners are able to transcribe maintenance requirements into maintenance tasks and have an appreciation that they have no authority to deviate from the maintenance data;
- Individuals performing maintenance tasks are able to carry out maintenance tasks to standards specified in the instructions for continuing airworthiness and will notify supervisors of errors requiring rectification to re-establish required maintenance standards;
- 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 instructions for continuing airworthiness; such problems will be reported to the person detailed in paragraph 145.A.30(c) of the Part 145 MOS 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.
- Certifying employees authorised to issue CRS are able to determine when the aircraft or aeronautical product is serviceable and ready to release to service and when it should not be released to service.

- Quality and safety audit employees are able to monitor compliance with the AMOs procedures, its Exposition and CASR Part 145, identifying non-compliance and safety hazards in an effective and timely manner.
- In the case of planners, maintenance employees, supervisors and certifying employees, knowledge of the AMOs Exposition relevant to their particular role in the organisation is confirmed.

The aforementioned list is not exclusive and may include other categories of personnel.

### ***Competency Assessment***

An acceptable means of ascertaining competence of individuals who will be authorised to:

- perform maintenance on behalf of the AMO;
- issue CRS for aeronautical products on behalf of the AMO;

will include Exposition procedures for assessment that include assessment events.

### ***Assessment Events***

Assessment events are designed against performance criteria set by the AMO for the aircraft or aeronautical product type and specific tasks. The performance criteria may include task outcomes, elements of competence, consideration of contingencies and job role environment. The performance criteria would recognise the integration of knowledge and skills as fundamental to affecting the required outcome. Assessment events would allow that the gathering of current evidence infers competence.

### ***Consideration of Evidence as Part of Assessment Events***

Evidence that could be considered as part of the overall assessment includes:

- documented supervised on-the-job (OJT) experience and performance;
- formal qualifications, training, experience and OJT performance (examples of material considered include training recognised by National Airworthiness Authorities (NAA), Trade Authorities or Standards governing bodies and Institutes); or
- individual competency units and courses reported under the Australian Quality Training Framework (AQTF) by a Part 147 Training Organisation or a Recognised Training Organisation.

An acceptable means of establishing competence of individuals to perform maintenance on behalf of an AMO, will be procedures for assessment that include:

- AMO defined specified task training and documented supervised OJT experience and performance;
- AMO recognition of defined Qualifications, Training, experience and OJT performance (i.e. Qualifications and/or certificated training recognised by NAA, National Training and Trade Recognition Authorities or Standards governing bodies and Institutes);
- formal recognition of specified competency units assessed in accordance with the AQTF by a Part 147 Training Organisation or a Recognised Training Organisation (i.e. MEA405 Repair Aircraft Composite Structures and components); or
- formal recognition of a qualification issued by a Part 147 Training Organisation comprising relevant competency units defined in accordance with the AQTF (i.e. Cert IV in Aeroskills (Mechanical) comprising relevant elective competencies).

An acceptable means of establishing competence of individuals to issue CRS for aeronautical products on behalf of an AMO, will be procedures for assessment that include AMO defined specified task training and documented OJT experience and performance:

- AMO recognition of defined qualifications, training and experience (i.e. qualifications and/or certificated training recognised by NAA, National Training and Trade Recognition Authorities or Standards governing bodies and Institutes);
- formal recognition of specified competency units assessed in accordance with the AQTF by a Part 147 Training Organisation or a Recognised Training Organisation (i.e. MEA405 Repair Aircraft Composite Structures and components); or
- formal recognition of a qualification issued by a Part 147 Training Organisation comprising relevant competency units defined in accordance with the AQTF (i.e. Cert IV in Aeroskills (Mechanical) comprising relevant elective competencies).

### ***Engine Ground Running; Borescope Inspection; Flight Control Rigging***

An acceptable qualification for use as a prerequisite for training, assessment and authorisation of employees for these functions is a Part 66 Licence that covers the aircraft and engine type.

For guidance on requirements for engine ground running, refer to Advisory Circular (AC) 66-3.

### ***Human Factors Issues and Human Performance Limitations***

With respect to the understanding of the application of human factors and human performance issues, maintenance, management, and quality audit personnel may be assessed for the need to receive initial human factors training, but in any case all employees involved in any maintenance, management, quality and safety audit functions should receive human factors continuation training. This may include:

- post-holders, managers, supervisors;
- certifying employees, aircraft maintenance engineers, aeronautical product workshop maintenance employees, and specialist maintenance technicians;
- technical support personnel such as, planners, engineers, technical record staff;
- quality control/assurance and SMS employees;
- human factors staff/human factors trainers;
- supply department staff, purchasing department staff;
- ground equipment operators; and
- contract staff in the above categories.

### ***Human Factors — Initial Training AMC-1***

An AMC for the training should include development of knowledge and skills specifically aimed at the minimisation of the risks associated with HF and human performance limitations influences on human error within the AMO. This should include tools and techniques to support the AMO's error management aims of reducing both the likelihood and consequence of error within the organisation.

Acceptable initial human factors training covers all the topics of the training syllabus specified in the syllabus below, either as a dedicated course or else integrated within other training. The syllabus may be adjusted to reflect the particular nature of the AMO.

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.
- depending on the result of the competency assessments, initial training should be provided to employees within 6 months of joining the AMO, but temporary employees should be trained shortly after joining the organisation to cope with the duration of employment.

- employees recruited from another AMO and temporary employees should be assessed for the need to receive any additional Human factors training to meet the new AMO's human factors training standard.

### ***Training syllabus for initial human factors training***

The training syllabus below identifies the topics and subtopics that may be addressed as an AMC for the provision of HF training. The AMO may combine, divide, or change the order of any subject of the syllabus to suit its own needs, provided that 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 legislation, guidance and advisory material, where relevant (eg. ICAO, HF Digests and Training Manuals).

Where appropriate, training should extend to skill development for non-technical skills that have been identified as mitigations for risks stemming from human factors and the influence of human performance limitations. Further guidance from ICAO on syllabus, learning outcomes and levels is detailed in 'Human Factors Guidelines for Aircraft Maintenance Manual 2003, Appendix B to Chapter 5, Human Factors Training Needs and Objectives'.

Topics should be related to maintenance engineering where possible, too much unrelated theory should be avoided. Relevant topics for planning training may include:

- 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
- 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

## Human Factors — Initial Training AMC–2

### *Safety Behaviours: Human Factors for Engineers – a CASA Human Factors training resource kit*

An AMC to the requirement for provision of initial Human Factors training for non-complex organisations<sup>1</sup> will be to use the CASA Human Factors training resource kit ‘*Safety Behaviours: Human Factors for Engineers*’ to meet the syllabus and course content requirements of their initial Human Factors (HF) training. If a non-complex organisation elects to use the CASA HF training resource, it must also include details of the training procedures for its HF course in its exposition. Information should include:

- course content delivery method/s; for example, they may elect to require training processes such as self-paced learning and completion of the student workbook;
- criteria for selection of facilitators;
- methods for assessment of individual achievement against the course learning outcomes; and
- methods for evaluation of course effectiveness.

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<sup>1</sup> Criteria for defining a Non-complex organisation are found in this AMC/GM as GM for 145.65 (d).

### ***Human Factors — Initial Training AMC-3***

Complex organisations<sup>2</sup> may also seek to use this resource kit as the basis of their HF training program; however to ensure they fully meet the requirements of the MOS, such an organisation, in addition to the requirements listed above for non-complex organisation, would need to:

- carry out a gap analysis to ensure that the course content sufficiently covers its specific HF risks; and where it does not, add information to the course specific to its operations; and
- set out the procedures it is electing to use to deliver this CASA HF training resource and how those procedures will be appropriate for its circumstances. For complex organisations, procedures for delivery of the CASA HF training resource content may describe delivery methods such as facilitated discussion and exercises and/or classroom lecture styles.

#### ***GM — CASA Human Factors Training***

The provision of HF training should be training conducted by the maintenance organisation itself, or independent trainers or any training organisations acceptable to CASA and specified in the Exposition. The HF training arrangements should be specified in the AMOs Exposition.

#### ***GM — CASA Human Factors Training Resource Kit: ‘Safety Behaviours : Human Factors for Engineers’***

While all AMOs are required to develop and deliver HF training to their employees that reflect their specific organisational characteristics, this CASA HF resource has been developed with the smaller maintenance organisation as its target audience and therefore provides information relevant to the HF influences and hazards common to most non-complex maintenance organisations.

CASA has determined that the assumptions used during the development of the CASA resource sufficiently matches the training needs of non-complex maintenance organisations to at least meet the level required during entry control. CASA therefore accepts that the use of this resource for non-complex organisations will be an AMC with the requirements for the provision of HF initial training for employees.

The resource cannot however realistically be expected to cover every influence that a complex AMO may encounter. If an AMO does not meet the non-complex criteria (as outlined above and agreed with CASA personnel), it remains the AMO’s obligation to carry out an assessment to ensure that the CASA HF training material meets its training needs in relation to HF hazards and the influence of human performance limitations on safety.

CASA envisages that organisations may include a mix of methods of training delivery depending on organisational size, complexity, the identified HF influences within each organisation and the required learning outcomes.

The following are examples of an appropriate mix of delivery methods used to meet the safety outcome of improving organisational and workplace communication;

- For a non-complex organisation, members of the organisation tend to have greater awareness of all other parts of the organisation and have shorter and more accessible communication pathways. In this case, a self-paced learning method may be sufficient to improve individuals’ awareness of the organisation’s communication protocols or procedures and any changes that are made over time.
- For a complex organisation, individuals’ awareness of communicated messages and changes made is unlikely to be effectively achieved with self-paced learning alone. Interaction

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<sup>2</sup> Complex organisations are any organisations that do not meet the criteria set out for non-complex organisations.

between both individuals and different workgroups is likely to be necessary to practice the required communication skills; therefore facilitated workshops would be a more appropriate delivery method.

Appropriate selection of facilitators is crucial to whether the course is effective in delivering real improvements in human performance and a reduction in the number of errors and their consequences in an AMO. Selection criteria should include details of:

- Expected qualifications and/or experience in training delivery
- Experience in the relevant work environment
- An expected level of knowledge in HF, or an avenue to ensure an adequate level of understanding of the course material.

The CASA HF resource includes an assessment workbook. If this is to be employed as a primary source of individual assessment of learning outcomes, the exposition should include how its contents will be assessed and the criteria to be used to denote a satisfactory standard. Other measures to be used in assessing students' overall achievement of course goals should be listed and may include methods such as assessing attitude towards the course, its contents and safety message and the level of student participation (as assessed by the facilitator).

Evaluation of the course should centre on its effect on organisational safety performance indicators such as; improved safety culture, reduction in procedural non-compliance, reduction in error rates or improved error detection and improved reporting of incidents. Changes to safety performance indicators such as these are likely to reflect the influence of improvements in HF knowledge and greater understanding of the limitations of human performance. If the course is modified to target a particular HF hazard then a more targeted safety performance indicator could be employed to assess improvements in the particular error rate. It is also expected that use of the HF training resource in both complex and non-complex organisations will involve the use of feedback by the organisation to assist in ongoing continuous improvement process for the course.

AMOs should be encouraged to discuss the assessment of their size and complexity and use of '*Safety Behaviours: Human Factors for Engineers*' by their organisation with their nominated CASA CMT personnel.

**Summary:** '*Safety Behaviours: Human Factors for Engineers*' provides the core content for a suitable HF training program that should improve an organisation's ability to manage the influence of the characteristics and limitations of human performance on its overall level of safety. However, any AMO that seeks to use this publication must ensure that it is delivered and assessed in an appropriate manner in order to fully meet the requirements of MOS AMC 145.A.30 (e).

### **GM — *Human Factors Continuation Training***

The purpose of HF continuation training is to ensure that staff remain current in terms of HF knowledge, continue to develop non-technical skills and also to collect feedback on HF 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.

HF 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 available to the organisation on human errors in maintenance.

The provision of HF training should be training conducted by the maintenance organisation itself, or independent trainers or any training organisations acceptable to CASA and specified in the Exposition. The HF training arrangements should be specified in the AMOs Exposition.

Continuation training should concentrate upon those areas in the company where problems and errors are occurring; where hazards stemming from HF influences have been identified and where human factors guidance material details training is most necessary. These may be identified from the quality system, occurrence reporting/Maintenance Error Management system, or other mechanisms.

With respect to HF training procedures, the Exposition should contain details such as:

- scope and methodology for identifying HF training needs;
- facilitator/instructor selection criteria;
- instructional techniques; and
- assessment and evaluation methods.

### **MOS GM 145.A.30 (e) — Employee Qualifications**

The AMO is required to specify qualifications and levels of experience that it will recognise and use for authorising employees to carry out maintenance, perform maintenance certification or issue CRS. Procedures must also include arrangements, standards and provisions for initial and recurrent human factors training.

### **MOS AMC 145.A.30 (f) — Specialist Maintenance Certifying Employee**

An AMC with the requirement to have a register of Certifying Employees will be to maintain a list of authorised individuals including their name, the dates of authorisation validity and the authorisation number to enable cross-reference to the authorisation record required by section 145.A.35 of the Part 145 MOS.

It is acceptable for a register of Certifying Employees to be maintained as a document or computer record separate to the Exposition, provided that the management part of the Exposition contains clear cross references to the register.

This AMC lists qualifications that CASA finds acceptable for Part 145 AMOs to use as standards on which to base authorisations for the performance of specialist maintenance and maintenance certification of that specialist maintenance. Individuals that hold such qualifications may be trained, assessed and authorised in accordance with paragraph 145.A.35 (b) 3 of the Part 145 MOS to perform maintenance certification for the specialist maintenance for which the individual is competent.

### ***Non Destructive Testing (NDT)***

An AMC to this paragraph 145.A.30 (f) of the Part 145 MOS is for an AMO to set qualification standards for NDT employee authorisations based upon AS 3669 or other standards recognised by the National Aerospace Non-destructive Testing Board (NANDTB).

Note: A non-destructive penetrant test using portable equipment means those processes and equipment covered by AQF Competency unit 'MEA365 Assess structural repair/modification requirements and evaluate structural repairs and modifications', being a pre-requisite competency unit for the grant of a Part 66 B1 Category Licence. The authorisation for a B1 Category Licence holder is limited by the extent of training covered under this unit of competency, which is the colour contrast dye penetrant inspection technique.

### ***Organisations***

The AMO that carries out NDT during the course of maintenance will have acceptable procedures in place that ensure the NDT activities are carried out to Australian Standards (AS) and meet all the other applicable regulatory and/or statutory requirements. The AMO will have internal procedures to ensure personnel that carry out and/or issue maintenance certifications for NDT are qualified to standards mentioned in this AMC or as approved by CASA as an acceptable

alternative standard and assessed as competent for the purposes of the authorisation. A CRS will be issued following all NDT maintenance certifications.

### ***Personnel***

The AMO will appoint a person to control NDT (Responsible Level 3); that has the qualifications and experience recognised by the NANDTB as NDT Level 3 person, within the meaning of AS 3669 or other standards acceptable to the NANDTB.

The AMO will authorise individuals to perform NDT tasks who:

- are recommended by the Responsible Level 3 for the task;
- have completed a training program that has been checked by the Responsible Level 3 as meeting the requirements for the task;
- have been assessed as being competent to carry out the specific tasks by the Responsible Level 3; and
- have passed an annual visual acuity test prescribed in the standard.

The persons approved by the AMO to perform and certify the results of the NDT tasks are authorised in writing, under the AMOs Exposition procedures and in compliance with sections 145.A.30 and 145.A.35 of the Part 145 MOS to carry out the maintenance and to issue a Maintenance Certification for NDT tasks.

### ***Maintenance Data***

NDT data used for testing and inspection of aircraft or aeronautical products must be approved for use as with any other maintenance data. Data supplied with ICA may be accepted by an AMO if it is published by a 'Type Certificate' (TC) or 'Supplementary Type Certificate' (STC) holder, or the author of design data. Where adequate maintenance data is not available or detail is not sufficient to fulfil the desired outcome of the NDT function, it will be an AMC for the AMO to generate maintenance data and approve it for its own use as maintenance data, using a Responsible Level 3 to assess and approve the data under the provisions of section 145.A.45 of the Part 145 MOS.

### ***Welding***

[http://casa.gov.au/wcmswr/assets/main/download/caaps/airworth/33\\_1.pdf](http://casa.gov.au/wcmswr/assets/main/download/caaps/airworth/33_1.pdf)

An AMC is for the Part 145 AMO to test and qualify its employees to the standard contained in Civil Aviation Advisory Publication CAAP 33-1 (0)

### ***Surface Finishing***

Surface finishing may be carried out and certified by a holder of a B1 licence if the person is qualified to perform the maintenance.

#### **Surface Finishing - LAME with prior licence or airworthiness authority privileges - AMC-1:**

An AMC is for an AMO to authorise the holder of a subcategory of a B1 licence to carry out and certify surface finishing if that person previously held an aircraft maintenance engineer licence issued under regulation 31 or an airworthiness authority for surface finishing issued regulation 33B of CAR (1988) and the AMO is satisfied that the employee is competent to perform the maintenance.

#### **Surface Finishing - LAME trained in related field - AMC-2:**

An AMC is for an AMO to authorise the holder of a subcategory of a B1 licence to carry out and certify surface finishing if that person has attained competencies recognised by CASA in preparation of surfaces and application of air dried paint products in an aviation or automotive field.

Competencies recognised by CASA for the purpose of this AMC are the following:

- MEA412A Pre-treat aluminium alloy surfaces; or
- AURTVP2006 – Prepare vehicle components for paint repairs and MEA 415A Paint aircraft surfaces; or
- AURTVP3012 – Apply air dry and polyurethane enamel refinishing materials.

### **MOS GM 145.A.30 (f) — Specialist Maintenance Certifying Employee**

The provision that permits authorisation of specialist maintenance employees as certifying employees with specialist maintenance qualifications does not replace the requirement for Part 66 (or equivalent) maintenance certification licence holders, for the performance of maintenance or maintenance certification for maintenance that could normally be carried out by that individual.

The intent of a Maintenance Certification made for the Specialist Maintenance task is to provide assurance that the Specialist Maintenance was carried out to the standards required.

Specialist Maintenance personnel are trained and qualified in the specialist field and may not have a holistic understanding of the interrelationship of an aircraft's systems, or airworthiness implications, such that a Maintenance Certification Licence holder should have. For this reason, the Maintenance Certification for Specialist Maintenance work will only be for the scope of the specialist maintenance and is not intended to cover work normally performed and certified for by a Part 66 Maintenance Certification Licence holder who is a Certification Authorisation holder. Additionally the AMO may not authorise an employee to issue a CRS predicated on the Specialist Maintenance qualification.

Following Specialist Maintenance tasks, where an airworthiness determination is to be made regarding an aircraft, such an airworthiness determination and related Maintenance Certification should be made by the holder of an appropriate Part 66 Maintenance Certification Licence who is a Certification Authorisation holder, based on the Specialist Maintenance results and ICA including Maintenance Data.

Following the performance of a Maintenance Certification for Specialist Maintenance a CRS must be issued by an appropriately licensed and authorised Certifying Employee in accordance with CASR Part 42.

#### ***Non-Destructive Testing***

CASA recognises the NANDTB as the industry representative body for the purpose of Non-destructive testing – Qualification and approval of personnel – Aerospace.

AQF Competency unit 'MEA365 Assess structural repair/modification requirements and evaluate structural repairs and modifications', is a pre-requisite competency unit for the grant of a Part 66 B1 Category Licence. The authorisation for a B1 Category Licence holder is limited by the extent of training covered under this unit of competency, which is the colour contrast dye penetrant inspection technique. The intent of this provision is to aid in visual inspections that the LAME may be required to undertake to substantiate or discount a defect.

#### ***In-Flight Entertainment Systems (IFE)***

CASA may approve Exposition procedures for Specialist Maintenance approval for in-flight entertainment equipment that requires specialist software management and where such maintenance has no resultant effect on aircraft systems covered by a Category B Licence for the aircraft type, such as public address systems or aircraft power supply. Exposition procedures should show acceptable training, assessment and qualification standards.

#### ***Borescope inspections and other inspection Techniques***

Borescope and other inspection techniques such as delamination coin tapping are non-destructive inspections rather than non-destructive testing.

Structural inspections of metal or composite aircraft fall within the competency of the holder of a Part 66 or ICAO Annex 1 licence for the aircraft. Sheet metal and composite repairs (in particular simple and non-structural repairs) may also fall within the competency of the holder of a Part 66 or ICAO Annex 1 licence.

The AMO should have an Exposition procedure to ensure that employees who carry out and interpret such inspections are properly trained and assessed for their competence with the techniques.

#### **MOS AMC 145.A.30 (g) — Line Maintenance Certifying Employees**

An AMC to have a register of Certifying Employees will be to maintain a list of authorised individuals including their name, the dates of authorisation validity and the authorisation number to enable cross-reference to the authorisation record required by section 145.A.35 of the Part 145 MOS.

It is acceptable for a register of Certifying Employees to be maintained as a document or computer record separate to the Exposition, provided that the management part of the Exposition contains clear cross references to the register.

#### **MOS GM 145.A.30 (g) — Line Maintenance**

For subparagraph 1, ‘a sufficient number of employees’ means sufficient numbers as shown to be required by the AMO for its approved maintenance through its man-hour plan required by paragraph 145.A.30 (d) of the Part 145 MOS.

For subparagraphs 2 and 3, ‘where applicable’ refers to the AMO’s requirements for various authorisations for the work intended. The requirements will be based upon the type of Maintenance Services that the AMO is approved to provide at a particular location.

For example, at a location where an AMO intends to conduct overnight line maintenance and defect rectification, the AMO may determine that it needs a larger number of Category B Licence holders compared to Category A, than it might at a location where aircraft do not normally transit overnight.

Sufficient numbers of various Category A and B licence holders and supervisory ratios may be demonstrated by the AMO and outlined in the Man-hour plan under paragraph 145.A.30 (d) of the Part 145 MOS.

#### **MOS GM 145.A.30 (g) — Appendix II Category A Licence Tasks**

Category ‘A’ task training and assessment is intended to ensure that the individual is competent to perform the maintenance authorised on the particular aircraft type, as well as to perform Maintenance Certification and to issue CRS for that maintenance on the AMOs behalf.

#### **MOS AMC 145.A.30 (h) and (i) — Base Maintenance Certifying Employees**

An AMC to have a register of Certifying Employees will be to maintain a list of authorised individuals including their name, the dates of authorisation validity and the authorisation number to enable cross-reference to the authorisation record required by section 145.A.35 of the Part 145 MOS.

It is acceptable for a register of Certifying Employees to be maintained as a document or computer record separate to the Exposition, provided that the management part of the Exposition contains clear cross references to the register.

### **MOS GM 145.A.30 (k) — Individual Maintenance Certifications**

Under this paragraph, Certification Authorisations based on Part 66 Licence qualifications may be issued to authorise the holder to perform maintenance certification and issue CRS within the limitations of the licence. Additionally, the Part 145 AMO may authorise employees in locations outside Australian Territory, who hold foreign Maintenance Licences or authorisations that conform to the ICAO Annex 1 licence standard, as Certifying Employees authorised to perform maintenance certification and issue CRS within the limitations of their qualifications. These foreign licence based authorisations may only be issued for certification following maintenance in the locations described in the paragraph.

An AMO may be authorised for maintenance on Australian registered aircraft in facilities outside Australian Territory. Individuals may be authorised to perform Maintenance Certifications and issue CRS based on Maintenance Certification licenses held, provided the licence was granted under CASR Part 66 or a law of the foreign country where the AMOs primary main location is located or in which the facility is located. Additionally if the foreign country is a state under European Aviation Safety Authority (EASA), the licence may be granted under a law of any other EASA member state.

An organisation that has its primary main location in China may authorise under paragraph 145.A.30 (k) the holder of an ICAO Annex 1 type licence issued by any of The Civil Aviation Administration of China (CAAC), The Hong Kong Civil Aviation Department (HKCAD), The Civil Aviation Authority of Macau (CAAM), or which is issued by the aviation regulatory authority of the state where the facility is, at which the employee is normally employed.

Example: An organisation approved under CASR Part 145 that has its primary main location in Hong Kong, may authorise as Certifying Employees at its main location, holders of Maintenance Certification licenses issued under CASR Part 66 or Hong Kong Administrative Region (HKAR) 66. If the organisation has a facility in Singapore, the AMO may authorise as Certifying Employees at that location, holders of CASR Part 66, HKAR 66 or Civil Aviation Authority of Singapore (CAAS) 66.

### **MOS AMC 145.A.30 (l) — Single Maintenance Events**

In situations where an authorisation is required for the issue of a Maintenance Certification and CRS for ‘single maintenance event’ for an aircraft type for which a certifying employee does not hold a type-rated authorisation, the following procedure is an AMC:

- Flight crew will communicate details of the defect to the operator’s contracted supporting AMO, with full details of the defect. If necessary the supporting maintenance organisation will then request the use of an authorisation for a single maintenance event from the quality department.
- Before issuing an authorisation for a single maintenance event, the quality department will verify that:
  - Full technical details relating to the work required to be performed have been established and passed to the certifying employee;
  - The organisation has an approved procedure in place for co-ordinating and controlling the total maintenance activity undertaken at the location under the authority of the single maintenance event authorisation;
  - The individual to whom a ‘single maintenance event’ authorisation is issued has been provided all the 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 AMO and communicated to the ‘single maintenance event’ authorisation holder;
  - The individual holds authorisations of equivalent level and scope on another aircraft type of similar technology, construction and systems; and



- The ‘single maintenance event’ authorisation holder will 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 Part 145 AMO facility.

#### **MOS GM 145.A.30 (I) — Single Maintenance Events**

An authorisation under this provision for a ‘single maintenance event’ should only be considered for issue by the quality department of the contracted AMO after it has made a reasoned assessment that such a requirement is appropriate under the circumstances and at the same time maintaining the required airworthiness standards. The AMOs quality department will need to assess each situation individually prior to the issuance of a ‘single maintenance event’ authorisation

An authorisation under this provision should not be issued where the level of certification required could exceed the knowledge and experience level of the employee 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.

Under the provisions of paragraph 145.A.75 (a) of the Part 145 MOS, an individual contracted by an AMO is an employee of the AMO for the purposes of the contract.

## **MOS 145.A.35 — Issuing Certification Authorisations**

### **MOS GM 145.A.35 (a) — Authorisations**

An adequate understanding of organisation's procedures and the aircraft and/or aeronautical products referred to in their certification authorisation, means that the individual employee has received training and assessment and has relevant maintenance experience on the product type and associated organisation procedures such that the employee understands how the product functions, what the more common defects are and what the associated consequences of the defects are.

The organisation should hold copies of all documents that attest to employee qualification and recent experience.

### **MOS GM 145.A.35 (b) — Authorisations**

An AMO issues a certification authorisation when satisfied that compliance has been verified with the appropriate paragraphs of CASR Parts 145 and 66. If the AMO grants an authorisation to an employee predicated on the employee holding a Part 66 Licence or applicable qualification, the AMO must ensure the qualification is valid at the time of issue and that the authorisation clearly specifies that the authorisation's validity is predicated upon continued validity of the qualification.

### **MOS GM 145.A.35 (b) 3.— Specialist Maintenance Authorisations**

This provision empowers an AMO to train, assess and authorise employees in specialist maintenance functions for the purposes of issuing Maintenance Certification for specialist maintenance. The Exposition procedure should set standards for recognition of qualification for each specific specialist maintenance service it wishes to provide. This may include NDT, In Flight Entertainment (IFE) and Welding qualifications shown in paragraph 145.A.30 (f) of the Part 145 AMC

Additionally this provision may be used for training assessment and authorisation by an AMO of individuals for engine ground running, borescope inspection and flight control rigging, where the applicable type training course undertaken by the individual to be authorised did not include requisite training for the function.

### **MOS GM 145.A.35 (c) — Maintenance Experience**

Paragraph 145.A.35 (c) of the Part 145 MOS currency requirement is for experience in the carrying out of maintenance and/or certification duties for that maintenance for at least some of the aircraft type systems or aeronautical products specified in the employee's certification authorisation which the holder of the Certification Authorisation may certify. For example it would be expected that an employee authorised for CRS of aeronautical products would be required to carry out maintenance on at least some of the products for which he is authorised; a Part 66 Category B Licence holder would carry out maintenance and certification duties for at least some of the aircraft for which he is authorised and a Part 66 Category C Licence holder who is authorised to CRS large aircraft in Base Maintenance would certify for at least some of the aircraft types for which he or she is authorised.

### **MOS GM 145.A.35 (d) — Currency Training**

Continuation training is a two-way process to ensure that certifying employees remain current in terms of procedures, human factors and technical knowledge and that the AMO receives feedback on the adequacy of its procedures and maintenance instructions.

Continuation training should be of sufficient duration in each 2 year period to meet the intent of paragraph 145.A.35 (d) of the Part 145 MOS, but it is acceptable for the training to be split into a number of separate elements. Paragraph 145.A.35 (d) of the Part 145 MOS requires this training to keep certifying employees 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 and external sources of information available to the organisation on human errors in maintenance. For an AMO that maintains aeronautical products, 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 employees who release hydraulic pumps may only require a few hours of continuation training, whereas those who release turbine engines 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.

The intent is for the training to be interactive in nature and include the involvement of the quality department, to ensure that feedback is actioned. Alternatively, there may be a procedure to ensure that feedback is formally passed from the training department to the quality department to initiate action.

Continuation training covers changes in relevant requirements such as CASRs, changes in AMO procedures and the modification standard of the products being maintained plus HF issues identified from any internal or external analysis of incidents. It also addresses instances where employees failed to follow procedures and the reasons why particular procedures are not always followed. The continuation training reinforces the need to follow procedures and provides 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 AMO procedures.

### **MOS GM 145.A.35 (e) — Continuation Training**

The purpose of continuation training is to ensure that the certifying employee has, prior to certifying for maintenance for an AMO, up-to-date knowledge of the matters mentioned under paragraph 145.A.35 (d), which are relevant to the person's functions in the AMO. An acceptable programme for continuation training will list all certifying employees and when training will take place, the elements of the training and an indication that it was carried out as scheduled. This information should subsequently be transferred to the certifying employees records as required by paragraph 145.A.35 (j) of the Part 145 MOS.

However, if a CAR (1988) 30 Certificate of Approval holder gains a Part 145 approval, an employee who was authorised to certify for the completion of maintenance under the CAR 30 approval may be authorised by the AMO as a Part 145 certifying employee with the initial Part 145 certifying employee approval date coinciding with the AMO's Part 145 approval start date. Such an authorisation is acceptable if the employee satisfies the requirements for maintenance currency pursuant to paragraph 145.A.35 (c), has received training on the AMO's procedures under Part 145 and the employee's qualification on which the authorisation is predicated, remains in force for the period of authorisation. Continuation training for the matters mentioned in paragraph 145.A.35 (d) must be provided before the end of the authorisation period, which is to be a maximum of 2 years pursuant to paragraph 145.A.35 (b) of the Part 145 MOS.

For the AMO's initial authorisation of a new employee, authorisation may be issued if following the AMO's assessment or recognition of prior learning, the AMO is satisfied that the requirements of the Part 145 are satisfied for authorisation of the employee. However if the employee has not received initial human factors training, the AMO must ensure that the employee receives human factors training within 6 months of the initial authorisation.

### **MOS GM 145.A.35 (f) — Assessment of Certifying Staff**

Paragraph 145.A.35 (f) of the Part 145 MOS requires that all certifying employees except those authorised under paragraph 145.A.30 (l) of the Part 145 MOS are required to be assessed for competence, qualification and capability related to intended certifying duties. There are a number of acceptable means in which this assessment may be carried out, but the following points need to be considered to establish an assessment procedure that suits the particular AMO:

- Competence and capability can be assessed by working the employee under the supervision of either another certifying employee or a quality auditor for sufficient time to arrive at a conclusion as to the employee's competence. Sufficient time could be as little as a few weeks if the person is fully exposed to relevant work. It is not required to assess the employee against the complete spectrum of intended duties.
- When the individual has been recruited from another (second) AMO and was a certifying employee in that organisation then the first AMO may accept a written confirmation from the Quality Manager of the second AMO about the individual's competence and capability.
- Qualification and competency assessment may be achieved by collecting copies of documents that attest to qualification and competencies achieved, such as licences and authorisations held by an individual. This should be followed by a confirmation check with organisations that issued the documents and finally a comparison check for differences between any product type ratings on the qualification documents and the relevant product types maintained by the AMO. Product type differences may identify the need for additional training and assessment prior to certification authorisation by the AMO.

### **MOS GM 145.A.35 (h) — Issue of Certification**

A written form may include either paper or electronic form, provided that the authorisation holder has access to the authorisation and all the details of the authorisation in its most current form.

### **MOS GM 145.A.35 (i) — Certifying Authorisation Approvals**

The intent of paragraph 145.A.35 (i) of the Part 145 MOS is that in order to avoid conflicts of interest, approval of employee authorisations to certify on behalf of the AMO should be approved by an individual with responsibilities and accountabilities separated from the maintenance functions and from managers responsible for the maintenance functions for which the authorisation holder will certify.

### **MOS GM 145.A.35 (j) — AMO Records**

The following information forms an AMC to the record keeping requirements of this paragraph:

- Name;
- Date of Birth;
- Basic training;
- Type training;
- Continuation training;
- Experience;
- Qualifications relevant to the approval;
- Scope of the authorisation;
- Date of first issue of the authorisation;
- Expiry date of the authorisation; and
- Identification number of the authorisation.

It is acceptable for the record system to be controlled by the AMOs quality department to provide isolation from individuals concerned, and the records may be kept in any format. This does not mean that the quality department must run the record system.

Individuals authorised to access the record system will be kept to a minimum to ensure that records cannot be altered in an unauthorised manner or that such confidential records become accessible to unauthorised persons.

For the purposes of initial and continuation regulatory and compliance oversight, CASA is an authorised person with access to the record system.

## **MOS 145.A.37 — Training and Assessment**

### **MOS AMC 145.A.37 — Training**

An AMC for the training, assessment and authorisation of individuals to provide Maintenance Services on behalf of an AMO is for the AMO to have an Exposition procedure as required under subparagraph 145.A.70 (a) 13 of the Part 145 MOS, describing how the AMO will achieve this utilising its own resources or describing arrangements under which the AMO outsources or relies on a contracted organisation to train and assess individuals, providing that the training and assessment is carried out under the control and oversight of the AMOs Quality System, in line with the requirements outlined as acceptable for subcontracting of any maintenance function in section 145.A.75 of the Part 145 AMC.

### **MOS GM 145.A.37 — Training**

The training, assessment and authorisation of individuals for the purposes of providing Maintenance Services on behalf of the AMO must be in accordance with the Exposition procedures required by subparagraph 145.A.70 (a) 13 of the Part 145 MOS. The issue of authorisations to individuals to provide these Maintenance Services on behalf of the AMO must be under the authority of the Quality Manager as required by paragraph 145.A.35 (i) of the Part 145 MOS.

The authorisation of an individual to provide Maintenance Services on behalf of an AMO means that the AMO takes responsibility for what that individual does within the AMOs stated authorisation and in accordance with its Exposition procedures. As such the responsibility for an individual's authorisation cannot be contracted, and must remain under the authorisation and responsibility of the AMO's Quality Manager in accordance with paragraph 145.A.35 (i) of the Part 145 MOS.

An AMC for the control, delivery and assessment of training by an AMO (and CAR30 Certificate Of Approval holder for aircraft maintenance) is described within AC 145-04 *Control and delivery of training by a Part 145 AMO*, including category A type and task training and Permitted Training.

## **MOS 145.A.40 — Equipment, Tools and Material**

### **MOS GM 145.A.40 (a) — Tools and Equipment**

Once an applicant for approval has determined the intended scope of approval for consideration by CASA, it will be necessary to show that all tools and equipment as specified in the maintenance data are held or can be made available when needed.

All tools and equipment specified in maintenance data as being necessary to measure specified dimensions and torque figures etc., that require to be controlled in terms of servicing or calibration should be clearly identified and listed in a control register including any personal tools and equipment that the AMO agrees can be used.

### **MOS GM 145.A.40 (b) — Calibration**

A control procedure for these tools and equipment is one that ensures the calibration and testing of such items on a regular basis and that indicates 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 will be maintained for all precision tooling and equipment together with a record of calibrations and standards used.

Inspection, service or calibration on a regular basis should be in accordance with the equipment manufacturers instructions except where the organisation can show by results of an assessment process specified in its Exposition that a different time period is appropriate in a particular case. For example if a particular torque wrench is heavily utilised, the organisation may show through experience that the wrench requires more frequent calibration than as recommended by the manufacturer.

### **MOS AMC 145.A.40 (c) — Calibration**

If an AMO contracts another organisation to carry out equipment testing and calibration on its behalf, it is an AMC to this paragraph for the AMO to:

- confirm that the contracted organisations procedures require the calibration event record to be made at the time of the completion of the calibration event; and
- conduct quality audits or monitor the organisation in accordance with its contractor control procedure or Quality System procedures to confirm records are made in accordance with the contractor's procedures required under paragraph 145.A.65 (c) 5 of the Part 145 MOS.

### **MOS GM 145.A.40 (c) — Calibration**

The intent of this paragraph is to ensure that test and calibration results are recorded at or close to the time of the calibration event to ensure correctness and accuracy of the record.

### **MOS AMC 145.A.40 (d) — Equipment, Tools and Material**

An AMC to this provision is for the required procedure to show how the AMO will track aircraft or components that have been released to service following maintenance where tools or equipment have been used, which subsequently have been found to have been significantly out of tolerance at the time of the performance of the maintenance.

The procedure should also show how once tracked by the system, the affected aircraft or aeronautical products are reviewed for serviceability or airworthiness.

**MOS GM 145.A.40 (d) — Equipment, Tools and Material**

The degree to which tools and equipment may be out of tolerance will vary from item to item. Therefore it will be necessary for the procedure to show how items will be assessed and who will be responsible for the assessment.



## **MOS 145.A.42 — Acceptance of Aeronautical Products**

### **MOS AMC 145.A.42 — Dealing with Aeronautical Products**

An acceptable Exposition procedure will show compliance to Subpart 42.E of CASR Part 42 in all circumstances in which the AMO wishes to use aeronautical products including but not limited to such situations as where the AMO wishes to:

- fit parts to the same position of the same aircraft or aeronautical product from which the parts were removed when the parts were serviceable prior to removal;
- fit parts to an aircraft or aeronautical product, which have been removed serviceable from another aircraft or aeronautical product;
- fit unserviceable parts to an aircraft where the aircraft is permitted to fly under an minimum equipment list (MEL) for that aircraft; and
- fit parts to an aircraft or aeronautical product that have been fabricated in the course of maintenance by the AMO.

The AMO will have a supply system for receipt of parts and materials, which shows how the AMO receives, inspects and ensures that parts and materials conform to the requirements for which they were intended including for serviceability, conformity to design specifications and eligibility for fitment were appropriate.

The acceptable procedures will specify arrangements for segregation where required of serviceable, unserviceable, unsalvageable and suspected unapproved parts in accordance with Division 42.E.3 and 42.E.4.

### **MOS GM 145.A.42 — Dealing with Aeronautical Products**

The AMO must have Exposition procedures to show how it will comply with all the requirements of Subpart 42.E of CASR Part 42, for the handling of aeronautical products including requirements for:

- the determination of acceptability of aeronautical products for fitment to or use in aircraft or other aeronautical products in accordance with any provisions under Division 42.E.2;
- The control of unserviceable and unsalvageable parts in accordance with Division 42.E.3; and
- The control of unapproved parts in accordance with Division 42.E.4.

## **MOS 145.A.43 — Fabrication in the Course of Maintenance**

### **MOS AMC 145.A.43 (a) — Fabrication in the Course of Maintenance**

The agreement by CASA for the fabrication of aeronautical products by the AMO should be formalised through the approval of a detailed procedure mentioned in the AMOs Exposition. This AMC contains principles and conditions, which if taken into account for the preparation of a control procedure, will form an AMC to the intent of section 145.A.43 of the Part 145 MOS.

Fabrication, inspection, assembly and test should be clearly within the technical and procedural capability of the organisation.

All necessary data to fabricate a part should be approved either by CASA or the type certificate (TC) holder or a Part 21 design organisation approval holder, or supplemental type certificate (STC) holder. This data 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 an organisation approved under CASR Part 145. Care should be taken to ensure that the data include details of part numbering, dimensions, materials, processes; and any special fabrication techniques, special raw material specification and/or incoming inspection requirement and that the approved organisation has the necessary capability. That capability should be defined by way of Exposition content. Where special processes or inspection procedures are defined in the approved data that are not available at the organisation the organisation cannot fabricate the part unless the competent authority or the TC holder or Part 21 design organisation approval holder gives an approved alternative.

Items fabricated by an organisation approved under CASR Part 145 may only be used by that organisation in the course of maintenance of aircraft or aeronautical products undergoing work within its own facility. The permission to fabricate does not constitute approval for manufacture, to sell or supply externally and the parts do not qualify for certification on Authorised Release Certificate (CASA Form 1). This prohibition also applies to the bulk transfer of surplus inventory, in that locally fabricated products are physically segregated and excluded from any delivery certification.

Examples of fabrication under the scope of a Part 145 approval may include; but are not limited to the following:

- fabrication of bushes, sleeves and shims;
- fabrication of secondary structural elements and skin panels;
- fabrication of control cables;
- fabrication of flexible and rigid pipes;
- fabrication of electrical cable looms and assemblies; and
- formed or machined sheet metal panels for repairs.

All the above example aeronautical products are to be fabricated in accordance with data provided in overhaul or repair manuals, modification schemes and/ or service bulletins, drawings or otherwise approved by CASA.

### ***Inspection and Identification***

An acceptable procedure for the control of fabrication in the course of maintenance will ensure that any locally fabricated part is subjected to an inspection stage before, separately, and preferably independently from, any inspection of its installation. The inspection will establish full compliance with the relevant manufacturing data, and the part will be unambiguously identified as fit for use by stating conformity to the approved data. Adequate records will be maintained of all such fabrication processes including, heat treatment and the final inspections. All parts, except those having not enough space, will carry a part number that clearly relates it to the manufacturing/inspection data. Additional to the part number, the organisations identity will be marked on the part for traceability purposes.

#### **MOS GM 145.A.43 (a) — Fabrication in the Course of Maintenance**

These paragraphs give guidance to an AMO when controlling the fabrication of aeronautical products (FITCOM parts) for installation on aircraft or aeronautical products during the course of maintenance in accordance with section 145.A.43 of the Part 145 MOS. Aeronautical products fabricated as described in this Guidance Material do not require the AMO to hold an Australian Parts Manufacturer Approval (APMA).

Maintenance organisations approved under CASR Part 145 often need to be able to fabricate aeronautical products (e.g. hoses, brackets, cables etc.) during the course of maintenance of a particular aircraft or aeronautical product.

If an AMO has been approved to maintain aircraft or aeronautical products under CASR Part 145, it may only fabricate a part for an aircraft or aeronautical product covered by its certificate of approval, and only if it has the capability to fabricate the particular part with respect to appropriate facilities, tools and trained and competent employees.

Fabrication in the course of maintenance (FITCOM) is maintenance and the privileges of an AMO outlined in paragraph 145.A.75 (b) of the Part 145 MOS apply. However, with respect to FITCOM, the responsibilities of an AMOs Quality system that pertain to a contracted organisation as detailed in subparagraph 145.A.65 (c) 4 of the Part 145 MOS also apply and effectively, the subcontracted organisations facilities, tools and equipment, personnel and data used with respect to the contracted work are the AMOs while the contracted work is being conducted for the AMO. The effect of this is that the AMO is responsible for compliance to CASR Part 145 within the subcontracted facilities while they are being used for the AMO.

Such fabrication activity by an AMO is limited to a specific need at a particular time rather than to the production of aircraft parts for commercial reasons. The provision for fabrication of aeronautical products is not intended to permit the fabrication of products or modification kits etc. for onward supply and/or sale by an organisation approved under CASR Part 145, but if an AMO maintains a fleet of aircraft or a particular type of aeronautical product, it is acceptable to fabricate and stock parts for a known need relating to future maintenance by the AMO of that fleet or type of aeronautical product.

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 CASA in accordance with a procedure specified in the Exposition. Similarly, where a design organisation approves a replacement as part of a design or repair that part may be used.

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 CASA.

### **MOS AMC 145.A.43 (b) — Fabrication in the Course of Maintenance**

As fabrication of aeronautical products (FITCOM parts) under this provision is in the course of maintenance, it is appropriate and acceptable that the release to service of the FITCOM part be incorporated in the CRS for that maintenance. This is true for either maintenance of an aircraft for which the part is to be fitted, or maintenance of another aeronautical product to which the part is to be fitted.

If an AMO uses an approved system of internal release documentation described in paragraph 145.A.50 (b) of the Part 145 MOS for the issue of a CRS for aeronautical products that it maintains for its own use, it is an AMC to paragraph 145.A.43 (b) of the Part 145 MOS for the AMO to utilise that system for release and control of products fabricated in the course of maintenance. For an AMOs Internal Release Documentation procedures to be acceptable for the record and control of products fabricated in the course of maintenance, the system must clearly differentiate between products maintained and products fabricated and must preclude the possibility of an Authorised Release Certificate being issued for the product at any time, or the supply of the product to another organisation in the future.

The use of an AMOs system of internal release documentation for the release and control of FITCOM parts may provide for any airworthiness control requirements for the FITCOM part. It does not circumvent the requirements of paragraphs 145.A.43(c) and (d) of the Part 145 MOS. These requirements provide a link between the maintenance record and any airworthiness control for the aircraft or higher product.

### **MOS GM 145.A.43 (b) — Fabrication in the Course of Maintenance**

This provision intends that records must be made of all parts fabricated in the course of maintenance. The AMOs Exposition procedure must specify how the AMO will record the information listed in subparagraphs 145.A.43 (b) 1 to 5 of the Part 145 MOS and how the AMO will meet the certification requirements for release of the product mentioned in subparagraph 145.A.43 (b) 6 of the Part 145 MOS.

Fabrication in the course of maintenance (FITCOM) is considered part of maintenance and the privileges of an AMO outlined in paragraph 145.A.75 (b) of the Part 145 MOS apply. However with respect to FITCOM, the responsibilities of an AMOs Quality system that pertain to a contracted organisation as detailed in subparagraph 145.A.65 (c) 4 of the Part 145 MOS also apply and as far as the approval is concerned, the subcontracted organisations facilities, tools and equipment, personnel and data are the AMOs while the facilities are being used for the AMO. Additionally the AMO is responsible for compliance to CASR Part 145 within the subcontracted facilities while they are being used for the AMO.

## **MOS 145.A.45 — Instructions for Continuing Airworthiness, including Maintenance Data**

### **MOS AMC 145.A.45 (a) — Maintenance Data**

Where an AMO is approved to maintain a class of aircraft or aeronautical product and specific aircraft or aeronautical products are not individually listed on the approval certificate, it is an AMC for the AMOs Exposition to show how it accesses the maintenance data for a particular aircraft or aeronautical product when it is required to perform maintenance of the particular aircraft or aeronautical product. The Exposition procedure will show how the AMO ensures that the maintenance data it accesses is current. Sources of data access may be from the Registered Operator (RO), vendors, subscription services or an aircraft owner.

An AMO 'holds' maintenance data if it has subscribed to an online provider of maintenance data, provided that the AMO Exposition specifies the source and details of the subscription and method of access; as well as methods of verifying that the data is both current and applicable to the aircraft or aeronautical product for which the AMO is approved. The AMO will be able to demonstrate that whenever access is required to the data by maintenance employees, it is available.

### **MOS GM 145.A.45 (a) — Maintenance Data**

It is intended that an AMO should hold any maintenance data applicable to specific aircraft or aeronautical products that it is approved to maintain, which are listed on the AMOs Approval Certificate or in its Exposition capability statement. If a specific aircraft or aeronautical product is listed in the AMOs capability statement as being approved for maintenance at a particular location, the data would be expected to be held at that location.

### **MOS AMC 145.A.45 (b) — Generation of Maintenance Data**

An acceptable Exposition procedure would show how a person responsible for continuing airworthiness of an aircraft or management of an aeronautical product is consulted regarding the use of generated maintenance data and would provide a record of evidence that agreement was provided by that person.

An acceptable Exposition procedure will specify whether the data will be retained in paper form or electronically in a computer database, describing the system of retention.

An acceptable procedure will describe a control system for communicating with manufacturers, TC holders or STC holders if applicable, to ensure that they are notified of the new data.

The acceptable control procedure will also provide assurance that:

- if any data that pertains to the maintenance is produced by a manufacturer, TC holder or STC holder after the AM's generation of data, that TC holder or STC holders data is adopted for the maintenance instead of the AMOs generated data;
- that the generation of the data does not involve the creation of wear limits;
- an effective process is in place for the approval of the data by the AMOs Quality Manager or Delegate; and
- generated or altered maintenance data and records of any required communications with the TC holder or STC holder or manufacturer are retained by the AMO.

### **MOS GM 145.A.45 (b) — Generation of Maintenance Data**

An AMO may generate new maintenance data for maintenance tasks only where no data currently exists (in any form) for the maintenance. For example if maintenance data exists in a Component Maintenance Manual or similar document, an AMO may not generate data under this provision for that maintenance to be carried out in an Aircraft maintenance environment. However if Aircraft Maintenance data such as an Aircraft Maintenance Manual contains data for the maintenance of an aeronautical product and there is no existing aeronautical product maintenance data for that product an AMO may generate data under this provision for workshop maintenance of the aeronautical product that is more extensive and detailed than the existing aircraft maintenance data, provided that the generation of the data does not involve creating or setting wear limits pertaining to the aeronautical product or any part of the product.

Under the intent of this provision, if an aeronautical product's serviceability is managed under an aircraft maintenance program or an organisations internal release documentation procedure, the person responsible for the control of the aeronautical product management must be notified and must agree to the use of the generated maintenance data for the product.

### **MOS AMC 145.A.45 (d) — Maintenance Data — AMC-1**

An acceptable Exposition procedure will describe how the approval process for the alteration of Maintenance Data verifies that:

- the maintenance can be carried out in a more practical or efficient manner than as described in the existing data;
- the existing maintenance data cannot be complied with by following the maintenance instructions; or
- the alteration of the existing maintenance data is for the use of tools or equipment not specified in that data.

An acceptable Exposition procedure would show how a person responsible for continuing airworthiness of an aircraft or management of an aeronautical product is consulted regarding the use of altered maintenance data and would provide a record of evidence that agreement was provided by that person for the use of the data.

An acceptable Exposition procedure will specify whether the data will be retained in paper form or electronically in a computer database, describing the system of retention.

An acceptable procedure will describe a control system for communicating with manufacturers, TC holders or STC holders if applicable, to ensure that they are notified of the altered data. The acceptable control procedure will also provide assurance that if any original data that pertains to the maintenance is altered by a manufacturer, TC holder or STC holder to accommodate the AMOs requirement to alter the original data after the AMOs alteration; that altered original data is adopted for the maintenance.

### **Maintenance Data Alteration AMC-2**

If an AMO wishes to use tooling or equipment that is different to that specified by current maintenance data, it may approve the use of this alternative equipment or tooling if it has procedures in its exposition for the assessment and approval of alternative tooling and equipment in accordance with paragraph 145.A.45 (d) 3. The procedures for assessment and approval of the alternative tooling will be an acceptable means of compliance if it includes:

- establishment of a method for proposing alternative tooling when a need is recognised for its use in lieu of the tooling or equipment specified by current maintenance data
- an approval process including a stage for peer review

- identification of potential hazards associated with the use of the alternative tooling or equipment; analysis and mitigation of risks through the AMO's SMS
- establishment that the alteration provides an equivalent or improved safety standard
- agreement for the change by the Continuing Airworthiness Management Organisation for the aircraft
- approval of the change by the Quality Manager
- notification of the change to the data's author
- traceability, retention and control of the process and altered data.

The altered maintenance data will clearly identify its revision status or currency of the data and traceability to the:

- source of the altered data
- approval process used for the alteration
- peer review process accomplishment.

#### **MOS GM 145.A.45 (d) — Maintenance Data**

The intent of this provision is to permit an AMO to alter existing maintenance data only where:

- the maintenance can be carried out in a more practical or efficient manner than as described in the existing data;
- the existing maintenance data cannot be complied with by following the maintenance instructions; or
- the alteration of the existing maintenance data is for the use of tools or equipment not specified in that data.

The Exposition procedure should show how the approval process verifies how the altered maintenance data satisfies these criteria.

This provision is not intended to permit alteration of data to make it available in a different maintenance environment than for which it was originally intended. For example, Component Maintenance Manual data may not be altered or adapted for application and use in an Aircraft Maintenance environment.

#### **MOS AMC 145.A.45 (e) — Maintenance Records**

An AMO may have various methods of recording maintenance dependent upon the work environment in which the task is performed, whether or not the task was generated from an aircraft maintenance program, the length of the task and the complexity of the task.

#### **MOS AMC 145.A.45 (e) — AMC 1**

For non-complex maintenance tasks, where the competency to complete the maintenance is held by one individual certifying employee, the AMO may provide records that provide for only one signature, that being for the maintenance certification itself. AMO maintenance records may include in the record, one or more signature fields for AMEs or other individuals who performed the maintenance under the supervision of the certifying employee who performed the maintenance certification.

### **MOS AMC 145.A.45 (e) — AMC 2**

Item 145.A.45 (e) 3 provides that for complex maintenance tasks, where the competency to complete the maintenance is held by more than one individual, the maintenance record accommodates the recording of stages of maintenance and the need for more than one maintenance certification; one being required for each part of the maintenance performed, by the individual competent for that part; or supervised by the individual competent for that part of the maintenance for which he or she is competent. The maintenance record may include signature fields for AMEs or other individual who performed the maintenance under the supervision of the certifying employee who performed the maintenance certification for that part of the maintenance.

### **MOS GM 145.A.45 (e) — Maintenance Records**

CASRs require that the employee who provides a maintenance certification, must be either the employee who performed the maintenance or who supervised its performance (regulation 42.690); and that employee must be competent for the performance of that maintenance (regulation 42.315). Many aircraft maintenance events may involve work for which no one individual is competent. Under such circumstances, the AMO must ensure that the individual employee who performs a maintenance certification for any portion of the maintenance, must be competent for that portion of it. Therefore unless an individual is competent for the whole maintenance event or task, the task must be broken up into portions, to facilitate the performance of maintenance certifications by the particular individuals who are competent for each portion.

It is necessary for an AMO to differentiate between complex and non-complex maintenance for the purposes of maintenance records, because an employee may only provide maintenance certification for maintenance for which they either carried out themselves; or for maintenance the performance of which they supervised. In order for an individual to either perform the maintenance or supervise it, they must be competent to perform it. This then necessitates that if a task is complex to the extent that more than one individual holds the competency to complete the task; more than one maintenance certification will be needed to record the completion of the task.



## **MOS 145.A.47 — Production Planning**

### **MOS AMC 145.A.47 (a) — Production Planning**

For the purposes of CASR Part 145, a system of production planning is acceptable if it gives consideration to:

- logistics;
- inventory control;
- square meters of accommodation;
- certifying employee and supervisory levels relevant to the work planned;
- certifying employee and supervisory availability;
- man-hours estimation;
- man-hours availability;
- preparation of work;
- hangar availability;
- environmental conditions (access, lighting standards and cleanliness);
- scheduling of safety-critical tasks during periods when employees are likely to be most alert;
- co-ordination with internal and external suppliers and contractors; and
- shift changeover/handover.

An acceptable procedure for shift changeover/handover of information is one that ensures effective communication when handing over the continuation or completion of maintenance actions, with consideration of three basic elements:

- The outgoing individuals ability to understand and communicate the important elements of the job or task being passed over to the incoming individual;
- The incoming individual's ability to understand and assimilate the information being provided by the outgoing individual; and
- A Formalised process for exchanging information between outgoing and incoming individuals, which includes a planned shift overlap and place for such exchanges to take place. Where an overlap is not possible, information is sufficiently documented and stages of maintenance sufficiently certified to ensure effective communication of all information relevant to the continuation of the maintenance.

### **MOS GM 145.A.47 (a) — Production Planning**

Depending on the amount and complexity of work generally performed by the AMO, the production planning system may range from a very simple procedure to a complex organisational arrangement including a dedicated planning function in support of the production function.

It is intended that where an AMO is a provider of maintenance services to a RO, the AMOs forecasting of maintenance work would necessitate lines of communication with that operator to ascertain what maintenance the operator anticipates will be required within the forecasting period.

Human performance limitations in the 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) of which employees should be aware.

## **MOS 145.A.50 — Certification of Maintenance**

### **MOS AMC 145.A.50 — Certification of Maintenance**

An acceptable System of Certification will be procedures detailed in the AMOs Exposition which show how the AMO provides for the certification requirements outlined in CASR Part 42 including performance of Maintenance Certifications and the issue of CRS.

All aircraft maintenance carried out will be covered by a Maintenance Certification, performed by Certifying Employees qualified and authorised by the AMO in accordance with CASR Part 145.

CRS will be issued following all maintenance of aircraft and aeronautical products in accordance with CASR Part 42. All aircraft CRS will be made in the Technical Log in accordance with regulation 42.760 of CASR 1998.

Where an AMO requires the use of Category A Licence holders under provisions of subparagraph 145.A.30 (g) 2 of the Part 145 MOS, the AMOs System of Certification will specify procedures and limitations applied to such Certifying Employees with respect to:

- training assessment and authorisation of individuals;
- performance of maintenance tasks and Maintenance Certifications; and
- issue of CRS.

Where an AMO requires the use of Specialist Maintenance qualified employees under the provisions of subparagraph 145.A.30 (g) 3 of the Part 145 MOS, the AMOs System of Certification will specify procedures and limitations applied to such Certifying Employees with respect to:

- training assessment and authorisation of individuals; and
- performance of maintenance tasks and Maintenance Certifications.

The procedures will show, where an airworthiness determination is required to be made regarding an aircraft following Specialist Maintenance, such an airworthiness determination will be made by a Category B qualified Certifying Employee.

**MOS GM 145.A.50 — Certification of Maintenance**

**Table 1 – Maintenance Verification and Certification Overview**

Note: This table is an overview only for guidance. For full details of provisions and requirements, refer to Subpart H of CASR Part 42 and the Part 145 MOS

Function	Part 145	
	Base	Line
To carry out maintenance	Regulation 42.315 requires an AMO to ensure that any individual who carries out maintenance on its behalf (either aircraft or aeronautical product maintenance) is assessed as competent to carry out the maintenance, or is supervised by an individual who is assessed as competent. Any AMO requirement for employees to sign for maintenance for which they are authorised cannot abrogate the requirement of regulation 42.695, which requires the Maintenance Certification to be signed by an authorised individual having either carried out the maintenance or supervised the maintenance.	
Maintenance Certification	Maintenance Certifying employees will be authorised to issue Maintenance Certifications for work carried out to give assurance that all the maintenance was performed in accordance with maintenance performance rules of Part 42 of the CASR 1998. Principally qualification required for this authorisation will be as set out in paragraph 145.A.30 (k) of the Part 145 MOS. However for specialist maintenance, e.g. NDT and Welding, nationally recognised qualifications may be acceptable; refer to paragraph 145.A.30 (f) of the Part 145 AMC. Maintenance Certifications require subsequent CRS.	
Certification of Release to Service (CRS)	A CRS is a certification evidencing appropriate completion of Maintenance, made by Part 66 Licensed persons authorised by the AMO for the purpose of CRS. For Base Maintenance of large aircraft this would be Category C Licence holders. For Small aircraft B1 and B2 may be authorised for this purpose.	A CRS is a certification evidencing appropriate completion of Maintenance, made by Part 66 Licensed persons authorised by the AMO for the purpose of CRS. In Line Maintenance, only Category A, B1 and B2 Licensed employees may be authorised for this purpose.
CRS (ARC)– Aeronautical Products	The AMO may authorise individuals to sign for tasks that they have carried out following confirmation of competence to perform the task. Additionally the AMO will have to ensure that employees that issue CRS for aeronautical products are appropriately qualified for the scope of work for which they are authorised. This may be on the basis of either external qualifications as mentioned within the Exposition or by a CASA approved procedure for training, assessment and qualification by the organisation as specified in the Exposition.	

### **MOS GM 145.A.50 — Certification of Maintenance**

An AMO may develop a System of Certification that includes provisions for compliance of various regulatory requirements such as:

- training, assessment, qualification and authorisation of employees;
- maintenance certification and CRS requirement;
- work card or worksheet requirements; and
- procedures to show how maintenance records are made, how they are made available to the RO of an aircraft, and how copies of the maintenance record are retained.

To facilitate correct function of its System of Certification, an AMO may train and authorise personnel to carry out maintenance on its behalf and sign for that maintenance after its completion or after completion to a stage of the maintenance. The AMOs System of Certification may incorporate standards for various levels of authorisation as well as a description of the worksheet and records processes used. Where individuals are authorised to carry out maintenance, the individual must have been assessed by the AMO in accordance with regulation 42.315 as being competent to carry out the maintenance.

The provisions of CASR Part 42 for individuals approved for carrying out of maintenance are as follows, Regulation:

- 42.295 approves individuals to carry out maintenance on behalf of the AMO of an aircraft for which the AMO holds an approval to maintain;
- 42.305 approves individuals to carry out maintenance on behalf of the AMO of an aeronautical product for an Australian aircraft in Australian Territory, for which the AMO is approved; and
- 42.315 requires an AMO to ensure that any individual who carries out maintenance on its behalf (either aircraft or aeronautical product maintenance) is assessed as competent to carry out the maintenance, or is supervised by an individual who is assessed as competent.

However:

- 42.695 requires that an individual must not perform a maintenance certification for maintenance on behalf of an AMO unless he or she is a certifying employee of the organisation whose certification authorisation permits him or her to perform the certification and he or she either carried out the maintenance, or supervised the maintenance; and
- 42.705 requires that an individual must not perform a Maintenance Certification unless he or she has ensured that the maintenance has been carried out in accordance with CASR Parts 42 and 145 and the information required by regulation 42.395 has been recorded.

A maintenance record for an aircraft is a record for the maintenance required to be recorded under regulation 42.395 and any Maintenance Certification for the maintenance.

For the performance of Maintenance Certification after Aircraft Maintenance, an AMO must authorise employees that are Licensed in accordance with paragraph 145.A.30 (k) of the Part 145 MOS or for Specialist Maintenance Certifying Employees, qualified to a standard acceptable to CASA.

For the issue of Aircraft CRS, employees must be Part 66 License (or equivalent) holders holding:

- for Line Maintenance, a Category B Licence for the aircraft or Category A Licence if required by the AMO;
- for Base Maintenance of Large Aircraft, a Category C Licence for the aircraft; and
- for Base Maintenance of Small Aircraft, a Category B Licence for the aircraft.

The System of Certification should provide an effective trail of accountability to show which employee carried out maintenance, who issued Maintenance Certifications and CRS, including the authorisation identification numbers of the employees involved; the date of the accomplishments and the maintenance data used.

Specialist Maintenance Certifying employees are particularly trained and qualified in the specialist field and may not have a holistic understanding of the interrelationship of an aircraft's systems, or airworthiness implications that the work may have, which a Maintenance Certification Licence holder should have. For this reason the Maintenance Certification for Specialist Maintenance work will only be for the scope of the specialist maintenance and is not intended to cover work or airworthiness determinations normally performed and certified for by a Part 66 Licence holder, nor can the AMO authorise an employee to issue a CRS predicated on the Specialist Maintenance qualification.

The System of Certification should incorporate all legislative requirements for work cards or worksheets, and enable effective completion of operators own worksheet systems if they are required to be utilised. This may include the ability for the AMOs supplementary work card or defect reports to be appended to an operators task cards.

#### **MOS AMC–1 145.A.50 (a) — Certificate of Release to Service Authorised Release Certificate**

The normal form required for use for the CRS for aeronautical products is the Authorised Release Certificate known as CASA Form 1. The purpose of the CRS is to declare the serviceability of aeronautical products following maintenance by an AMO. The CASA Form 1 ARC is the primary form of CRS for an aeronautical product that has been maintained by an AMO. This form must be used unless there is an approved alternative in-house release document for the AMO included in its Exposition.

The ARC does not constitute approval to install the item on a particular aircraft or aeronautical product, but helps the end user determine its airworthiness approval status. The Authorised Release Certificate is not a delivery or shipping note and aircraft are not to be released using the ARC.

#### **MOS AMC–2 145.A.50 (a) — Certificate of Release to Service In-house Release Document**

An AMO may use an approved in-house release document if it is included in the AMOs Exposition, which specifies how the approved in-house release document meets all the requirements of CASR Part 42. The in-house release document does not constitute approval to install the item on a particular aircraft or aeronautical product, but helps the end user determine its airworthiness approval status.

**MOS GM 145.A.50 (a) — Certificate of Release to Service - Authorised Release Certificate**

An aeronautical product that has been maintained whilst not fitted to the aircraft requires the issue of a CRS for that maintenance and the aircraft requires a CRS for the installation of the product on the aircraft when that occurs.

The normal form required for use for the CRS for aeronautical products is the ARC, known as CASA Form 1. The purpose of the CRS is to declare the serviceability of aeronautical products following maintenance by an AMO. The CASA Form 1 ARC is the primary form of CRS for an Aeronautical Product that has been maintained by an AMO. This form must be used unless there is an approved alternative system of internal release documentation for the AMO included in its Exposition.

The ARC is not a delivery or shipping note.

Aircraft are not to be released using the ARC.

The ARC 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.

**MOS GM 145.A.50 (b) — Certificate of Release to Service before flight**

Whenever an AMO carries out maintenance on an aircraft, it must issue a CRS following completion of the maintenance and prior to any flight in accordance with regulation 42.760. If no maintenance is carried out by the AMO after a flight, the AMO is not required to issue a CRS before the next flight.

**MOS AMC 145.A.50 (c) — New Defects**

An AMOs certification documentation and procedures will be acceptable to CASA if they provide appropriately for notification of particulars of newly identified defects and maintenance not completed on the continuing airworthiness record to the person responsible for the continuing airworthiness of the aircraft or aeronautical product.

Newly identified defects that effect the operation of an aircraft will be entered into the Aircraft Technical Log along with any deferral details for the defect.

Scheduled maintenance tasks that the RO or CAMO agrees may be deferred to a later time within the constraints of the approved Aircraft Maintenance Program (AMP) will be deferred on documentation that is forwarded to the RO or CAMO for rescheduling in sufficient time to enable compliance with the AMP.

**MOS GM 145.A.50 (c) — New Defects**

Written notifications of the particulars of incomplete maintenance or newly identified defects need to be provided to the person responsible for continuing airworthiness on the continuing airworthiness record. The notifications should be made in a form that is appropriate to the nature of the deferral. If a defect is identified that effects the operation of the aircraft, the defect should be entered in the aircraft's Technical Log, where it is visible to the crew and maintenance employees involved in the operation of the aircraft. For example if a defect requires the application of an MEL item, it must be entered in the aircraft's Technical Log. However if the deferral is for scheduled maintenance and the CAMO has agreed that it can be deferred to a subsequent time and the CAMO is able to reschedule the maintenance within the limitations of the aircraft's approved AMP, the deferral may be on alternative documentation not carried on board the aircraft.

## **MOS AMC 145.A.50 (d) — Certificate of Release to Service — Aeronautical Products**

### ***In-House Release Documentation***

An acceptable in-house release documentation system will be one where the AMOs Exposition procedures ensure that an aeronautical product released under the documentary system is for the AMOs own use only, for fitment to an aircraft or other aeronautical product by the AMO that issued the in-house release document.

The acceptable system of documentation includes all of the information required by an (CASA Form 1), but not all the information required for the ARC needs be included on the label that accompanies the aeronautical product. The label that accompanies the product must confirm the serviceability of the product and provide any information needed to enable determination of the product's eligibility for fitment.

The system of documentation includes information additional to what is on the label that accompanies the product. The additional information may be in paper or computer records, traced to the particular aeronautical product, to provide for control of the aeronautical product's maintenance and operational history including:

- duplication of information included in the label that accompanied the product;
- the identity and revision status of maintenance documentation used as the approved standard for the maintenance;
- compliance or non-compliance with ADs or SBs;
- details of maintenance work carried out or reference to a document where this is stated;
- details of modifications carried out and approved data used (SBs, STCs etc.);
- replacement parts installed and/or parts found installed, as appropriate;
- concessions/exemption/exclusion, as applicable;
- life-limited product's history; and
- identity of CAR compliance.

Note: The control of the aeronautical product's maintenance and operational history may be accomplished by the RO as part of its Continuing Airworthiness Maintenance function. In this case the Exposition procedure will have to show how the internal system of documentation is interfaced with the ROs system of CAMO.

## **MOS GM 145.A.50 (d) — Certificate of Release to Service — Aeronautical Products**

A CRS for an aeronautical product must be made on a CASA Form 1 (ARC) except for those circumstances in which a Part 145 AMO may use an in-house release document. If the CASA Form 1 is used, it must be completed in accordance with the instructions set out in the Part 42 MOS. If an in house release is used, it must be in a form approved by CASA.

## **MOS 145.A.55 — Maintenance Records**

### **MOS AMC 145.A.55 — Maintenance Records and Continuing Airworthiness Records**

An AMC for the requirements for this section of the Part 145 MOS will be for Exposition procedures to specify how the AMO will retain maintenance documentation and certifications sufficient to show that all legislative requirements pertaining to maintenance including tooling and calibration requirements have been met.

The procedures will show how the AMO meets the requirements of subparagraph 145.A.65(c) 3 of the Part 145 MOS for records including provisions for archiving and protection of the records.

The procedures will show how the AMO provides any records required to be provided to a RO or person responsible for continuing airworthiness of any aircraft for which the AMO provides maintenance services.

### **MOS GM 145.A.55 — Maintenance Records and Continuing Airworthiness Records**

Maintenance Records are defined at regulation 42.015 as:

- for maintenance carried out on an aircraft — a record that contains the information required under regulation 42.395 and the maintenance certification for the maintenance; and
- for maintenance carried out on an aeronautical product — a record required to be made under regulation 42.400.

Maintenance records form part of the continuing airworthiness record for an aircraft.

A continuing airworthiness record for an aircraft is defined in subregulation 42.015 (3).

The AMO must have control processes for identification, legibility, storage, protection, archiving, retrieval and retention of all records associated with the requirements of the Part 145 MOS, in accordance with subregulation 145.A.65 (c) 3 of the Part 145 MOS, including maintenance records. The intent of this provision is that records must be protected from any possibility of damage or destruction by fire, flood or interference and tampering.



## **MOS 145.A.60 — Occurrences and Major Defect reporting**

### **MOS AMC 145.A.60 (a) — Occurrences and Major Defects**

An acceptable internal occurrence reporting system will enable and encourage free and open reporting of any actual or potentially unsafe occurrence. This will be facilitated by the establishment of a just culture, which will ensure that employees are not inappropriately punished for reporting or co-operating with occurrence investigations. Conditions under which punitive disciplinary action would be considered (e.g. illegal activity, negligence or wilful misconduct) are clearly defined and documented. The functionality of the just reporting culture policy will be widely disseminated and understood within the organisation and documentation of the reporting and investigation process will confirm the effectiveness of its application.

The acceptable internal reporting process will be closed-loop, ensuring that actions are taken internally to address maintenance errors and safety hazards. Feedback to reporters, both on an individual and more general basis, ensures their continued support for the scheme.

### **MOS AMC 145.A.60 (b) — Occurrences and Major Defects**

An AMC for the requirements of major defect reporting is for the reports that are submitted to the RO or CASA to:

- describe the defect;
- set out the date on which the defect was discovered;
- set out the circumstances under which the defect was discovered;
- set out any action that has been taken or that is proposed to be taken:
  - to rectify the defect; or
  - to prevent the defect from recurring;
- set out what the person making the report thinks is the cause of the defect;
- if the defect is in an aircraft – set out:
  - the type, model, serial number and registration mark of the aircraft;
  - type, model and serial number of the aircraft's engine, if relevant;
  - if the aircraft has a propeller – the type, model and serial number of the aircraft's propeller, if relevant to the defect; and
  - time in service of, number of landings, or number of cycles completed by, the aircraft since new;
- if the defect is in an aeronautical product – set out:
  - the identity of the product, including (if applicable) the part number and serial number of the product;
  - time in service, or the number of cycles completed by, the product since new;
  - if the product has been overhauled – the time in service of, or the number of cycles completed by, the product since its most recent overhaul; and
  - if the product is a turbine engine – the number of cycles completed by the engine since new.

## **MOS 145.A.65 — Safety and Quality Policy, Maintenance Procedures and Management Systems**

### **MOS AMC 145.A.65 — Safety and Quality Policy, Maintenance Procedures and Management Systems**

The management system of an organisation may comprise two separate but complementary systems; the Quality Management System (QMS) and the SMS. The QMS and SMS should correspond to the size, nature and complexity of the organisation, being appropriate to its maintenance capability and all the hazards and risks associated with its activities. While CASR Part 145 requires that a QMS and an SMS be written management systems, it is an AMC to the requirements of CASR Part 145 to integrate resources used for organisational management systems. Clear benefits of integration include;

- reduction of duplication and therefore of costs;
- reduction in overall organisational risks and increase productivity;
- balance of potentially conflicting objectives;
- elimination of potentially conflicting responsibilities and relationships; and
- diffusion of power systems.

Integration of QMS and SMS resources may result in synergistic realisation of organisational goals and in particular to the organisations safety goals. These management systems share many commonalities including that they:

- have to be planned and managed;
- depend upon measurement and monitoring;
- involve every function, process and person in the organisation; and
- strive for continuous improvement.

### **MOS GM 145.A.65 — Safety and Quality Policy, Maintenance Procedures and Management Systems**

Because SMS and QMS share many commonalities, there may be a tendency to assume that an organisation that has established and operates a QMS does not need, or already has, an SMS. However, although SMS and QMS share commonalities, there are also important differences between both, as well as shortcomings in the effectiveness of QMS to achieve by itself the overarching objective of managing the safety risks or the consequences of hazards the organisation must confront during the activities related to the delivery of services.

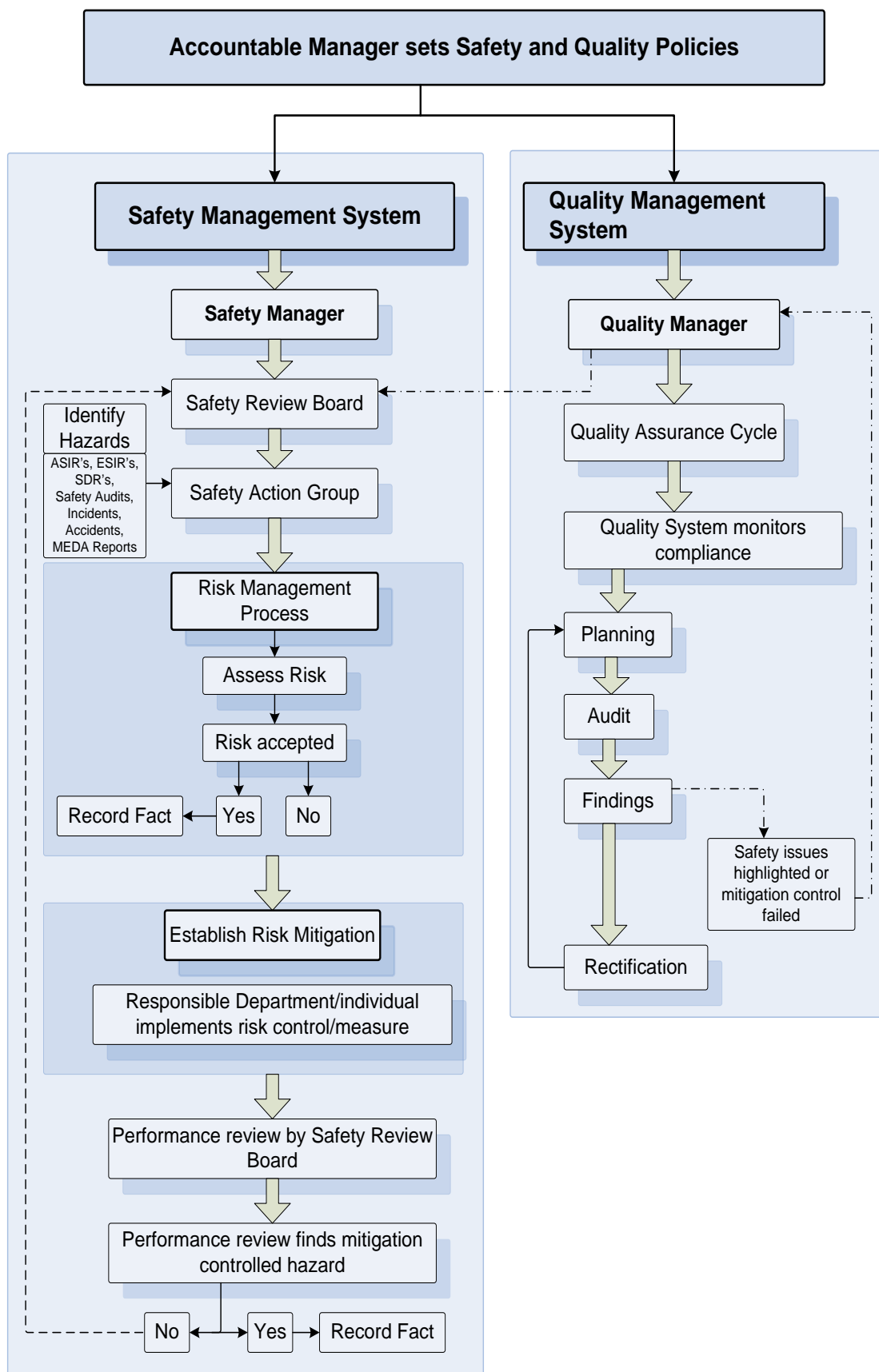
The objective of a QMS is to provide systemic assurance that the processes and procedures used by the organisation will result in the provision of products or services that meet a predetermined standard and hence customers' expectations. It does this by ensuring adequacy of and compliance to approved procedures. SMS differs from QMS in that SMS focuses on HF and organisational factors, and integrates into these, quality management techniques and processes, to contribute to the achievement of safety satisfaction. The objective of SMS is to identify the safety hazards the organisation must confront and in some cases generates during delivery of services, and to bring the safety risks or the consequences of these hazards under organisational control.

The AMOs Exposition must include documented safety and quality policies in accordance with paragraph 145.A.65 (a); as well as an organisation chart and clear definition of duties and responsibilities of managers in accordance with paragraph 145.A.70 (a) of the Part 145 MOS. The purpose of these requirements is to define and clearly delineate the system of authority and responsibility within the organisation for ensuring safety of aviation maintenance.

The organisation may utilise common resources and facilities for compliance to legislative requirements other than those prescribed by CASA, such as Occupational Health and Safety (OH&S). However an AMOs Exposition is intended to show how the organisation meets the requirements and outcomes specified in CASR Part 145 and the Part 145 MOS, as well as the performance rules for maintenance prescribed in CASR Part 42.

These legislative documents focus on the outcomes needed to ensure aviation safety, as directed by the *Civil Aviation Act 1988*. Where an AMO utilises a management system for compliance to such legislation as State OH&S requirements and that system also forms a means of compliance to aviation safety outcomes required in aviation safety legislation, that management system may form part of the AMOs Exposition.

*Organisational Management Structure – Summary*



*Figure 145.A.65.1 - Organisational Management System Structure*

### **MOS AMC 145.A.65 (a) — Safety and Quality Policy**

An acceptable safety and quality policy is one that as a minimum includes a statement committing the organisation to:

- recognise safety as a prime consideration at all times;
- apply HF principles;
- encourage employees to report maintenance related errors/incidents;
- recognise that compliance with procedures, quality standards, safety standards and regulations is the duty of all employees; and
- recognise the need for all employees to cooperate with the quality and safety auditors.

The statement below may be used as it appears or may be altered so long as intent remains the same.

#### ***Sample Safety Policy Statement***

Safety is the first priority in all our activities. We are committed to implementing, developing and improving strategies, management systems and processes to ensure that all our aviation activities uphold the highest level of safety performance and meet national and international standards.

Our commitment is to:

- develop and embed a safety culture in all our aviation activities that recognises the importance and value of effective aviation safety management and acknowledges at all times that safety is paramount;
- clearly define for all staff their accountabilities and responsibilities for the development and delivery of aviation safety strategy and performance;
- minimise the risks associated with aircraft operations to a point that is as low as reasonably practicable/achievable;
- ensure that externally supplied systems and services that impact upon the safety of our operations meet appropriate safety standards;
- actively develop and improve our safety processes to conform to world-class standards;
- comply with and, wherever possible, exceed legislative and regulatory requirements and standards;
- ensure that all staff are provided with adequate and appropriate aviation safety information and training, are competent in safety matters and are only allocated tasks commensurate with their skills;
- ensure that sufficient skilled and trained resources are available to implement safety strategy and policy;
- establish and measure our safety performance against realistic objectives and/or targets;
- achieve the highest levels of safety standards and performance in all our aviation activities;
- continually improve our safety performance;
- conduct safety and management reviews and ensure that relevant action is taken; and
- ensure that the application of effective aviation SMS is integral to all our aviation activities, with the objective of achieving the highest levels of safety standards and performance.

### ***Topics Acceptable for Inclusion in a CEO Statement of Corporate Safety Commitment***

Listed below are topics that may be covered in statements of corporate safety commitment. Following each topic are subjects that are commonly addressed to amplify the corporate position on that topic.

- **Core values.** Among our core values, we will include:
  - safety, health and the environment;
  - ethical behaviour; and
  - valuing people;
- **Fundamental safety beliefs.** Our fundamental safety beliefs are:
  - safety is a core business and personal value;
  - safety is a source of our competitive advantage;
  - our business will be strengthened by making safety excellence an integral part of all aviation activities;
  - all accidents and serious incidents are preventable; and
  - all levels of management are accountable for our safety performance, starting with the Chief Executive Officer/Managing Director;
- **Core elements of our safety approach.** The six core elements of our safety approach include:
  - Top management commitment:
    - safety excellence will be a component of our mission; and
    - senior management will hold line management and all employees accountable for safety performance;
  - Responsibility and accountability of all employees:
    - safety performance will be an important part of our management/employee evaluation system;
    - we will recognise and reward safety performance; and
    - before any work is done, we will make everyone aware of the safety rules and processes, as well as each one's personal responsibility to observe them;
  - Clearly Communicated expectations of zero accidents:
    - we will have a formal written safety goal and we will ensure that everyone understands and accepts that goal; and
    - we will have a communications and motivation system in place to keep our employees focused on the safety goal;
  - Auditing and measuring performance for improvement:
    - management will ensure that regular safety audits are conducted;
    - we will focus our audits on the behaviour of people, as well as on the conditions of the workplace; and
    - we will establish performance indicators to help us evaluate our safety performance;
  - Responsibility of all employees:
    - each of us will be expected to accept responsibility and accountability for our own behaviour;
    - each of us will have an opportunity to participate in developing safety standards and procedures;
    - we will openly communicate information about safety incidents and will share the lessons learned with others; and
    - Each of us will be concerned for the safety of others in our organisation;

- Objectives of the safety process. Our objectives include:
  - all levels of management will be clearly committed to safety;
  - we will have clear employee safety metrics, with clear accountability;
  - we will have open safety communications;
  - we will involve all relevant staff in the decision-making process;
  - we will provide the necessary training to build and maintain meaningful safety leadership skills; and
  - the safety of our employees, customers and suppliers will be a strategic issue of the organisation.

### **MOS GM 145.A.65 (a) — Safety and Quality Policy**

Management's commitment to safety should be formally expressed in a statement of the organisation's safety policy. This should reflect the organisation's philosophy of safety management and become the foundation on which the organisation's SMS is built. The safety policy outlines the methods and processes that the organisation will use to achieve desired safety outcomes, and it serves as a reminder as to 'how we do business here'. The creation of a positive safety culture begins with the issuance of a clear, unequivocal direction.

A safety policy may take different forms but will typically include statements concerning:

- the overall safety objective of the organisation;
- the commitment of senior management to the goal of ensuring that all aspects of the operation meet safety performance targets;
- a commitment by the organisation to provide the necessary resources for the effective management of safety;
- a commitment by the organisation to make the maintenance of safety its highest priority; and
- the organisation's policy concerning responsibility and accountability for safety at all levels of the organisation.

The safety policy should be a written document that is issued under the authority of the highest level of management of the organisation and communicated to all staff. A sample corporate safety policy statement is included below as an AMC. This statement presents a tangible indication of senior management's commitment to safety. An alternative to this type of safety policy is a statement of commitment by the CEO to the maintenance of the highest standards of safety. An example of topics that might be included in a CEO statement of commitment to safety is included below as an AMC.

In preparing a safety policy, senior management should consult widely with key staff members in charge of safety critical areas. Consultation ensures that the document is relevant to staff and gives them a sense of ownership in it. Corporate safety policy must also be consistent with relevant CASA regulations.

### **MOS AMC 145.A.65 (b) 2 — Maintenance Documentation**

It is acceptable for a Part 145 AMO to have procedures where all employees report any differences between their procedures and how the work is performed through their organisation's occurrence reporting system or another dedicated feedback mechanism.

### **MOS GM 145.A.65 (b) 2 — Maintenance Documentation**

Maintenance procedures should be kept current such that they are an accurate reflection on how the organisation performs maintenance.

All procedures and changes to those procedures should be verified and approved by the applicable Exposition procedure or by CASA before use.

All technical procedures should be designed and developed with consideration of HF principles.

## **MOS AMC 145.A.65 (b) 1,6 — Fatigue and Impairment Management**

An AMC to the requirement for an AMO to ensure that any employee capacity to perform maintenance is not significantly impaired, is for the AMOs Management System to include

- a Drug and Alcohol Management Plan (DAMP) as required by CASR Part 99;
- the uses of a defined set of guidelines on maximum duty hours to be worked within set periods (daily/weekly/monthly) and rostering practices to be employed to ensure that employees do not become, or accumulate an excessive level of fatigue from their rostered and overtime duty periods; or
- a Fatigue Risk Management System (FRMS).

## **MOS GM 145.A.65 (b) 1,6 — Fatigue and Impairment Management**

### ***Fatigue Risk Management Systems for Maintenance Organisations***

#### ***Background***

The following guidance material is developed from material presented by **Simon Folkard D.Sc.** from the Body Rhythms and Shiftwork Centre of the Department of Psychology, University of Wales Swansea, Singleton Park Swansea SA2 8PP, Wales, U.K. in a report to the United Kingdom Civil Aviation Authority. The report makes recommendations of guidelines for ‘good practice’ based on a large-scale survey that was undertaken of Licensed Aircraft Maintenance Engineers in the UK, and parallel surveys that were conducted of both employers and contract employers. These surveys yielded substantial evidence on the range of shift systems in operation in aircraft maintenance.

This guidance material is recommended for consideration in the development of Fatigue Risk Management Systems for AMO’s that employ individuals to maintain aircraft in a shift environment.

#### ***Guidelines for ‘Good Practice’***

#### ***Underlying Principles***

Wherever possible, the guidelines proposed here are based on established trends in risk. These were derived from reviewing large-scale studies of accidents and/or injuries in many different types of industry and country. However, there are many features of work schedules that may give rise to concern with respect to their impact on sleep and/or fatigue, but for which there are, as yet, no good studies showing their impact on risk. In these cases, and in the absence of objective risk data, the guidelines have been based on the available evidence relating these features to sleep and/or fatigue. The aims in these cases have been threefold, namely to:

- Minimise the build-up of fatigue over periods of work;
- Maximise the dissipation of fatigue over periods of rest; and
- Minimise sleep problems and circadian disruption.

#### ***Daily Limits***

There is good evidence that risk increases over the course of a shift in an approximately exponential manner such that shifts longer than about 8 hours are associated with a substantially increased risk. Thus, for example, it has been estimated that, all other factors being equal, the risk on a 12-hour shift system is some 27.6% higher than that on an 8-hour system. Shifts longer than 12-hours should thus clearly be considered as undesirable. For the same reason, it would seem wise to limit the extent to which a shift can be lengthened by overtime to 13 hours. Likewise, it would seem prudent to ensure that the break between two successive shifts is sufficient to allow the individual concerned to travel home, wind-down sufficiently to sleep, have a full 8-hour



sleep, have at least one meal, and travel back to work. The EU's Working Time Directive sets this limit at 11 hours, and this would be consistent with a maximum work duration, including overtime, of 13 hours. Three daily limits are thus recommended, namely:

- no scheduled shift should exceed 12 hours;
- no shift should be extended beyond a total of 13 hours by overtime; and
- a minimum rest period of 11 hours should be allowed between the end of shift and the beginning of the next, and this should not be compromised by overtime.

### ***Breaks***

There is surprisingly little evidence on the beneficial effects of breaks on risk. However, there is evidence that fatigue builds up over a period of work, and that this can be, at least partially, ameliorated by the provision of breaks. There is also recent, and as yet unpublished, evidence that risk behaves in a similar manner, increasing in an approximately linear fashion between breaks. It would thus seem sensible to recommend limits on the duration of work without a break, and on the minimum length of breaks. It should be emphasised here that there is some evidence to suggest that frequent short breaks are more beneficial than less frequent longer ones. However, it is recognised that work demands may prevent the taking of frequent short breaks. In the light of this, and of the findings from the survey regarding the provision of breaks, two limits are thus recommended, namely:

- a maximum of four hours' work before a break; and
- a minimum break period of ten minutes plus five minutes for each hour worked since the start of the work period or the last break.

### ***Weekly Limits***

Fatigue accumulates over successive work periods and it is thus necessary to limit not only the daily work hours, but also the amount of work that can be undertaken over longer periods of time. The aim here is to ensure that any accumulation of residual fatigue is kept within acceptable limits, and can be dissipated over a period of rest days. However, if these limits are simply related to the calendar week this can result in unacceptably high numbers of shifts or work-hours between successive periods of rest days. It is thus necessary to express the limits with respect to any period of seven successive days. In the light of this, and the findings from the survey, the following recommendations are made:

- scheduled work hours should not exceed 48 hours in any period of seven successive days;
- total work; including overtime, should not exceed 60 hours or seven successive work days before a period of rest days; and
- a period of rest days should include a minimum of two successive rest days continuous with the 11 hours off between shifts (i.e. a minimum of 59 hours off). This limit should not be compromised by overtime.

### ***Annual Limits***

Some residual fatigue may accumulate over weeks and months despite the provision of rest days, therefore annual leave is important. There is, however, little evidence to indicate what might be considered an ideal number of days annual leave.

### ***Drug and Alcohol Management Plan (DAMP)***

Approved Maintenance Organisations by virtue of their approval scope will be involved in Safety Sensitive Aviation Activities (SSAA) as defined in CASR Part 99. Any organisation partaking of SSAA specified in Part 99.015 will be required by Part 99.030 to develop a Drug and Alcohol Management Plan (DAMP) in accordance with Part 99.045 and by Part 99.035 to implement it as described.

## **MOS GM 145.A.65 (b) 8 — Maintenance Errors**

### ***Human Factors and Human Performance limitations influences***

Human fallibility is widely accepted in the aviation industry. Error potential is present in any task; it is the likelihood (probability) component of the risk of human error.

The second risk component; the consequence of any error committed, is dependent on the design of the system in which it occurs. In one system an error may only result in rework or correction, while the same error in another system may go uncorrected and lead to a catastrophic consequence.

Effective error management is designed with these principles at its core, that while some error potential will always be present the system must actively attempt to reduce it and prevent any errors committed becoming catastrophic in consequence.

To achieve this, error management can be divided into three distinct components.

#### ***Error reduction***

- Identify and reduce the conditions that promote errors to reduce the errors committed:
  - This may include specialised technical training, authorised publications and procedures which when followed, provide guidance on the steps and sequence to complete a task with the minimum potential for error.

#### ***Error capture***

- Detect errors and correct or compensate for them before they have adverse impact:
  - This includes inspection and functional testing of systems and components to detect incorrect fitment of items or completion of maintenance.

#### ***Error tolerance (or system resilience)***

- Identify and eliminate single points of failure within the system so that errors that are not captured do not progress to an accident:
  - As well as system design and redundancy, this also includes policy such as non-concurrent maintenance on critical systems.

These functions may already be in place with the technical process, procedures and certification requirements already mandated. It is the consideration of HF and the limitations of human performance that should be also be included in MOS65(b)8 to ensure they are as effective as possible.

The purpose of this procedure is to minimise the rare possibility of an error being repeated whereby identical aircraft components may be incorrectly reassembled thereby compromising more than one system. An example is the remote possibility of failure to reinstall engine gearbox access covers or oil filler caps on all engines of a multi-engine aircraft resulting in oil loss from all engines.

Procedures should be established to detect and rectify maintenance errors that could, as a minimum, result in a failure, malfunction or defect endangering the safe operation of the aircraft if not performed correctly. The procedure should identify the method for capturing errors, and the maintenance tasks or processes concerned.

In order to determine the work items to be considered, the following should primarily be reviewed to assess their impact on safety:

- installation, rigging and adjustments of flight controls;
- installation of aircraft engines, propellers and rotors; and

- overhaul, calibration or rigging of components such as engines, propellers, transmissions and gearboxes.

Additional information should also be considered arising out of such systems as the occurrence reporting system and maintenance error investigations.

In order to prevent omissions, a maintenance certification should be performed for each maintenance task or group of tasks. To ensure the task or group of tasks is completed, it should only be certified for after completion. Where a maintenance certification is performed following the completion of a group of tasks, the AMO's procedures should provide a means by which the certifying employee may verify completion of each of the steps. The grouping of tasks for the purpose of maintenance certification should allow critical steps to be clearly identified and a maintenance certification should be performed for each critical step.

### **MOS GM 145.A.65 (c) — Quality Management Systems**

1. The primary objectives of the quality system are to enable the organisation to ensure that it can deliver a safe product and that the 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 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 requirement for certifying employees 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 sub-paragraphs 7 and 9, the independent audit should ensure that all aspects of Part-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 sub-paragraphs 7, the independent audit should sample check on 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 or serviceable product.
6. For the purpose of the independent audit a product line includes any product under an approval class rating as specified in the approval schedule issued to the particular organisation. It therefore follows for example that a maintenance organisation approved under Part-145 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. 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 sub-paragraph 9, where a small 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 145.065 (c) (1) it is conditional on the audit being carried out twice in every 12 month period.

8. Except as specified otherwise in sub-paragraph 9, where the organisation has line stations listed as per 145.075 (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 sub-paragraph 9 the maximum period between audits of a particular line station should not exceed 24 months.

9. Except as specified otherwise in sub-paragraph 5, CASA may agree to increase any of the audit time periods specified in the 145.065 (c) (1) of the Part 145 AMC by up to 100% provided that there are no safety related findings and subject to being satisfied that the 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 maintenance organisation approved under Part-145, being an organisation with more than about 500 maintenance employees 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 maintenance organisation approved under Part-145, being an organisation with less than about 500 maintenance employees, it is acceptable to use competent personnel from on 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. Organisations with a maximum of 10 maintenance employees actively engaged in carrying out maintenance may contract the independent audit element of the quality system to another organisation or a qualified and competent person approved by CASA.

### **MOS AMC 145.A.65 (c) 1 — Independent Surveillance**

An acceptable procedure for an independent surveillance auditing program is one that ensures all aspects of CASR Part 145 compliance are checked every 12 months by quality audit individuals who are independent of and not responsible for the maintenance functions, procedures or products that are being checked and who reports to the Quality Manager. The independent surveillance programme may be carried out as a complete single exercise or subdivided over the 12 month period in accordance with a scheduled plan. The independent surveillance program need 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 non-conformances have been identified, the particular procedure will be rechecked against other product lines until the non-conformances have been rectified after which the independent audit procedure may revert back to 12 monthly for the particular procedure. For the purpose of the independent surveillance auditing program, a product line includes any product under an Appendix I of the Part 145 MOS approval class rating as specified in the approval schedule issued to the particular organisation.

An acceptable independent surveillance audit program will generate a report each time an audit is carried out describing what was checked and the resultant findings against applicable requirements, procedures and products.

An AMC for a large AMO that employs more than about 500 individuals for the performance of maintenance is to have a dedicated quality audit group whose sole function is to conduct audits, raise non-compliance reports and follow up to check that the findings are addressed by effective corrective and remedial actions.

For a medium sized AMO with less than about 500 employees involved in maintenance, it is acceptable to use competent employees from one section or department not responsible for the production function, procedure or product to audit the section or department that is responsible subject to the overall planning and implementation being under the control of the Quality Manager.

Providing that the Quality Manager retains the responsibilities and oversight of the system as outlined in paragraph 145.A.30 (c) 1 of the Part 145 MOS, including overall planning and implementation, the functions of the quality system may be achieved in a number of ways, including:

- for a medium sized AMO with less than about 500 employees involved in maintenance, it is acceptable to use competent employees from one section or department not responsible for the production function, procedure or product to audit the section or department that is responsible;
- for a small AMO where independence of the quality monitoring functions cannot be achieved, the organisation may have procedures that allow another AMO or a person with appropriate technical knowledge and audit experience to perform the audits mentioned in paragraph 145.A.65 (c) 1 of the Part 145 MOS; and
- where one or more Part 145 AMOs exist within a business group or operator, a department of the group may provide the quality functions (including the monitoring and surveillance functions) for any or all of the groups Part 145 AMOs, providing that the manager responsible for the department that provides the quality functions must be the Quality Manager nominated for each of the Part 145 AMOs.

### **MOS GM 145.A.65 (c) 1 — Independent Surveillance**

The primary objectives of the quality systems are to enable the organisation to ensure that it can deliver a safe product and that the organisation remains in compliance to the requirements.

An essential element of the quality system is the independent audit. This is an objective process of routine sample checks of all aspects of the 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 requirement of paragraph 145.A.50 (a) of the Part 145 MOS 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 should be conducted during the night if the organisation provides maintenance services at night.

It is intended that the requirements for independent quality surveillance and 12 monthly audits be provided by a department or group separate from the maintenance department, in order to achieve compliance determinations independent from the standpoint of the maintenance department, or commercial imperatives that may affect the judgement of maintenance management of the organisation. CASA would expect that an organisation that has 10 or more employees involved in aircraft or aeronautical product maintenance should have a quality management system that is capable of achieving satisfactory independence of quality monitoring functions by virtue of its structure.

### **MOS AMC 145.A.65 (c) 2 — Quality Audit Feedback**

An acceptable quality feedback system will ensure that audit reports referenced in paragraph 145.A.65(c) 1 of the Part 145 MOS are sent to relevant departments for rectification action. Target rectification dates will have been discussed with such relevant departments prior to inclusion in the audit reports.

### **MOS GM 145.A.65 (c) 2 — Quality Audit Feedback**

An essential element of the quality system is the quality feedback system. By virtue of the nature of this system requirement, it cannot be contracted to outside persons. The principal function of the quality feedback system is to ensure that all non-compliance findings resulting from the independent surveillance audit programme are properly investigated, 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 CASR Part 145.

### **MOS AMC-1 145.A.65 (d) — Safety Management Systems**

Providing that the Safety Manager retains the responsibilities and oversight of the system as outlined in paragraph 145.A.30 (c) 2 of the Part 145 MOS, the functions of the safety management system may be achieved in a number of ways:

- Where one or more Part 145 organisations exist within a business group or in a business group with an RPT operator, a department of the group may provide the safety management functions (including any monitoring and surveillance functions) for any or all of the organisations, if the manager responsible for the department that provides the safety management functions is the Safety Manager nominated for each of the Part 145 organisations.

- For a small AMO where the independence of any safety assurance functions within the SMS cannot be achieved, the organisation may have procedures that allow for the provision of those safety audit and investigation functions by:
  - another AMO or a person with appropriate technical knowledge and audit experience; or
  - an operator that holds an SMS as a requirement of its AOC to provide the safety management functions referred to in paragraph 145.A.65 (d) of the Part 145 MOS.

### **MOS AMC–2 145.A.65 (d) — Safety Management Systems**

An AMC for the organisation is to establish a SMS that covers the following elements and demonstrates the attributes associated with each of the elements:

#### ***Management Commitment and Responsibility***

- There is commitment of the organisation’s senior management to the development and ongoing improvement of the SMS.
- A disciplinary policy has been defined that clearly identifies when punitive action would be considered (e.g. illegal activity, negligence or wilful misconduct).
- There is evidence that the organisation is applying its disciplinary policy.
- Evidence of decision making, actions and behaviours that reflect a more positive safety culture.

#### ***Safety Accountabilities of Managers***

The Accountable Manager:

- must (among other things) establish and promote the safety and quality management policies required by paragraph 145.A.65 (a) of the Part 145 MOS;
- has been appointed with full responsibility and ultimate accountability for the SMS to ensure it is properly implemented and performing to requirements;
- has control of the financial and human resources required for the proper implementation of an effective SMS;
- has an awareness of their SMS roles and responsibilities in respect of the safety policy, safety standards and safety culture of the organisation; and
- must nominate an individual or individuals for the position of Safety Manager.

The Safety Manager:

- must have a direct line of corporate accountability to the Accountable Manager;
- must ensure that the Accountable Manager is kept properly informed on safety matters; and
- must have responsibility for the SMS as required by paragraph 145.A.65 (d) of the Part 145 MOS.

General:

- safety accountabilities, authorities and responsibilities are defined throughout the organisation;
- staff at all levels are aware and understand their safety accountabilities, authorities and responsibilities in regards to all safety management processes, decisions and actions;
- safety management is shared across the organisation (and is not just the responsibility of the Safety Manager and his/her team); and
- there are documented management organisational diagrams and job descriptions for all personnel, including non-certified personnel.

### ***Appointment of Key Safety Personnel***

- an appropriately competent person with the appropriate knowledge, skills and experience has been nominated to manage the operation of the SMS;
- the person managing the operation of the SMS fulfils the required job functions and responsibilities;
- there is a direct reporting line between the Safety Manager and the Accountable Manager;
- the organisation has allocated sufficient resources to manage the SMS, including manpower for safety investigation and safety analysis; and
- staff in key safety roles are kept current through additional training and attendance at conferences and seminars.

### ***SMS Implementation Plan***

- a documented procedure has been established and maintained for managing the implementation plan; and
- development of the SMS is being progressed satisfactorily and in accordance with the implementation plan.

### ***Third Party Relationships and Interactions***

- a documented procedure to establish and managing third party interfaces;
- contract or service level agreements specify the safety standards to be met;
- responsibility and safety oversight capability for ensuring the contractors comply with safety standards prescribed in the contract; and
- the provision of services supporting maintenance involving third party interfaces (service providers, contractors, suppliers) in such areas as refuelling; component and aircraft line servicing and overhaul; construction and repair; training; planning, have been considered in the development of the SMS.

### ***Coordination of Emergency Response Plan***

- an emergency response plan that reflects the size, nature and complexity of the operation has been developed defining the procedures, the roles, responsibilities and actions of the various agencies and key personnel;
- key personnel in an emergency have easy access to the Emergency Response Plan (ERP) at all times;
- the organisation has a process to distribute the ERP procedures and to communicate the content to all personnel; and
- the ERP is periodically tested for the adequacy of the plan and the results reviewed to improve its effectiveness.

### ***Documentation***

Any information that affects all employees of the organisation in their day to day work is contained within the management part of the Exposition. For example, the AMO's safety policy concerns all employees and will be included in the management part of the Exposition, whereas SMS and procedures may be included in a separate document or electronic file. The following is an AMC for the organisation's SMS documentation:

- there is documentation that describes the SMS and the interrelationships between all of its elements;
- the SMS documentation is regularly reviewed and updated;
- SMS documentation is readily available to all personnel; and
- the SMS documentation details and references the means for the storage of other SMS related records.



### ***Safety Risk Management Plan***

The organisations safety risk management plan includes documented details of the following:

- hazard identification processes;
- risk assessment and mitigation processes, including procedures for the remedial, corrective and preventative actions for the mitigation of risk of identified hazards; and
- the AMO developed processes to understand the critical characteristics of its systems and operational environment and applied this knowledge to the identification of hazards, risk analysis and risk assessment, and the design of risk controls.

### ***Hazard Identification***

- the organisation has a reporting system to capture errors, hazards and near misses;
- the reporting process is simple, accessible and commensurate with the size and complexity of the organisation;
- the organisation proactively identifies the major hazards and risk related to its current activities;
- the safety reporting system provides feedback to the reporter of any actions taken (or not taken) and where appropriate to the rest of the organisation;
- safety investigations are carried out to identify underlying causes and potential hazards;
- safety reports are actioned in a timely manner;
- hazard identification is an ongoing process and involves all key personnel and appropriate stakeholders;
- personnel responsible for investigating reports are trained on investigation techniques;
- investigations establish causal /contributing factors (why it happened, not just what happened); and
- personnel express confidence and trust in the organisation's reporting-policy and process.

### ***Risk Management***

- There is a structured process for the management of risk that includes the assessment of risk associated with identified hazards, expressed in terms of severity and probability of occurrence.
- There are criteria for evaluating the level of risk and the tolerable level of risk the organisation is willing to accept.
- The organisation has risk control strategies that include risk control, risk acceptance, risk mitigation, risk elimination and where applicable a corrective action plan.
- Corrective actions resulting from the risk assessment, including timelines and allocation of responsibilities are documented.
- Risk management is routinely applied in decision making processes.
- Smart and robust mitigations and controls are implemented.
- Risk assessments and risk ratings are appropriately justified.
- Senior management have visibility of medium and high risk hazards and their mitigation and controls.

### ***Safety Assurance***

Includes documented procedures for:

- safety performance monitoring and measurement;
- the management of change;
- communication of safety findings to individuals mentioned in paragraph 145.A.30 (b), to the Accountable Manager and to authors of safety reports; and
- continuous improvement, including regular reviews, of the SMS.

### ***Safety Performance Monitoring and Measurement***

- Safety objectives have been established.
- Safety performance indicators have been defined, promulgated and are being monitored and analysed for trends.
- Safety performance indicators are relevant and appropriate and are linked to the organisation's safety objectives (reflect state SPIs where appropriate).
- Risk mitigations and controls are being verified/audited to confirm they are working and effective.
- Safety audits are carried out that focus on the performance of the organisation and its services and assess normal operations.
- Safety objectives and performance indicators are reviewed and updated periodically.
- Safety objectives and goals are specific, measurable, agreed to, relevant and time-based.
- The analysis and allocation of resources are based on outputs from the performance measurement.
- Safety Assurance and Compliance Monitoring activities feedback into the hazard identification process.
- Safety assurance takes into account activities carried out in all directly contracted organisations.
- The organisation is monitoring its current, future and third party safety risks and is taking action to address unacceptable safety risks.

### ***Change Management***

- The organisation has established a process and conducts formal hazard analyses/risk assessment for: - major operational changes, major organisational changes and changes in key personnel.
- Safety Case/Risk assessments are aviation safety focused.
- Key Stakeholders are involved in the change management process.
- During the change management process previous risk assessments and existing hazards are reviewed for possible effect.

### ***Communication of Safety Findings***

- The AMO employs a formal process to communicate safety findings to groups and /or individuals affect by the safety findings.
- Safety findings are reviewed at appropriate level(s) of the AMO's management.
- A feedback process exists which ensures notified groups and individuals are able to report receipt of safety findings.

### ***Continuous Improvement***

- The Safety Review Board or equivalent has the necessary authority to make decisions related to the improvement and effectiveness of the Safety Management System.
- The Safety Management System is periodically reviewed for improvements in safety performance.

### ***Safety Promotion***

- The AMO's senior management promote the growth of a positive safety culture through publication and promotion of their stated commitment to safety.
- Clear and regular promotion of safety policy, goals, expectations, standards, and performance to all employees of the organisation.
- An effective employee reporting and feedback system that provides confidentiality as necessary.

### ***Training and Education***

- There is a documented process to identify SMS training requirements so that personnel are competent to perform their duties.
- There is a validation process that measures the effectiveness of training and takes appropriate action for improvement.
- There is a process that evaluates the individual's competence and takes appropriate remedial action when necessary.
- Training includes initial, recurrent and when applicable update training.
- A training record is maintained for each employee trained.

### ***Safety Communication***

- Safety plans and strategies are communicated throughout the organisation to all staff.
- Significant events and investigation outcomes are communicated to staff, including contracted organisations, where appropriate.

### ***Internal Reporting and Investigation***

Refer to the following section for additional guidance on the AMC for the organisation's internal reporting system and investigation capability:

- AMO's internal reporting system (refer section 145.A.60);
- operators or third parties (refer sub-subparagraph 145.A.65 (d) 1 (v));
- hazard identification and reporting processes (refer sub-subparagraph 145.A.65 (d) 2 (i)); and
- integration into the safety assurance system (refer subparagraph 145.A.65 (d) 3).

### ***Reporting***

- Established and maintains a confidential employee safety reporting and feedback system.
- Encourages employees to use the safety reporting and feedback system without fear of punishment and to encourage submission of solutions /safety improvements where possible.
- Monitors data from the safety reporting and feedback system to identify emerging hazards.
- Ensures data collected in the employee reporting and feedback system is included in the analysis conducted under SMS.

### ***Investigation***

- There are procedures in place for the conduct of investigations.
- Measures exist to ensure that all reported hazards, incidents and accidents are reviewed and, where required, investigated.
- There is a process to ensure that hazards, incidents and accidents are analysed to identify contributing and root causes.
- When identifying contributing and root causes, the organisation considers individual human factors, the environment, supervision and organisational elements.
- Has competent investigator(s) commensurate with its size and complexity.
- Results of the analysis are communicated to the Responsible Manager for corrective action and to other relevant managers for their information.

- There is a process to capture information from an investigation that can be used to monitor and analyse trends.
- There is evidence that the AMO has made every effort to complete the investigation and analysis process in the established timeframe.

### **MOS GM 145.A.65 (d) — Safety Management Systems**

It is intended that a SMS Safety Assurance provisions include procedures for independent safety audits and safety investigation, to be provided by a department or group separate from the maintenance department, in order to achieve safety assurance determinations independent from the standpoint of the maintenance department, or commercial imperatives that may affect the judgement of maintenance management of the organisation. CASA expects an organisation that does not meet the criteria presented below for small non-complex organisations, to have a SMS that is capable of achieving satisfactory independence of safety assurance functions by virtue of its structure.

Size and complexity considerations of an AMO for consideration as non-complex

Organisations may be assessed as non-complex in relation to their use of the CASA HF training and/or SMS Micro business resources by the following criteria:

- The number of SSAA employee positions.
  - Organisations with 10 or fewer safety sensitive aviation activity (SSAA) employees are considered a micro-business and are therefore automatically considered to be a non-complex maintenance organisation; or
  - Organisations with up to 20 SSAA<sup>3</sup> employees, which do not exceed any of the other criteria for non-complex organisations.
- The number of operators and other organisations to which the AMO provides maintenance services as established customers—which may be represented by the list of operators provided in the AMO's exposition pursuant to subparagraph 145.A.70 (a) 14. Of the Part 145 MOS. If the number is low then the AMO could be considered non-complex.
- The number of areas within the Part 145 exposition in which the organisation's SMS is relied upon to take an active role in terms of hazard identification and risk analysis. If the number is low then the AMO could be considered non-complex.
- In terms of risk criteria, the number and variety of aircraft (A), engine (B), component (C) maintenance ratings, and specialist maintenance (D) ratings.

Note: Consistent with the policy direction given to CASA through the Government's National Aviation Policy White Paper: Flight Path to the Future (December 2009), the variety of the ratings should be of particular focus. For example for an A1 rating, an AMO's approval will be for defined aircraft types (or a series of a type) specified on the approval certificate, reflecting a high level of oversight by CASA. However for an A2 rating, an AMO's approval certificate may list broader groups of aircraft types such as 'single engine Cessna'. Two specific aircraft types listed under an A1 rating would necessitate a more complex organisational structure than two whole groups of aircraft listed under an A2 rating.

The following organisations should typically be considered as non-complex:

- organisations holding only a D rating, where no training, assessment and authorisation of Certifying Employees exists for the purposes of providing Maintenance Certification for aircraft types listed on another AMO's A1 rating; and
- organisations who hold three or less of the following C ratings:
  - C2, C3, C4, C5, C6, C9, C12, C13, C14, C15, C17, C18, C19, or C20; and

<sup>3</sup> An AMO with more than 20 SSAA employees would generally be assumed to be a complex organisation. AMO's with more than 20 SSAA employees may still wish to discuss assessment of their organisation as non-complex with CASA if they feel they meet all of the other criteria.

- Who do not have procedures for management of their own capability list (i.e. procedures to manage and change the scope of maintenance for which they are approved within those C ratings listed on their Approval Certificate).

AMOs should be encouraged to discuss the assessment of their size and complexity and use of *'Safety Behaviours: Human Factors for Engineers'* by their organisation with their nominated CASA CMT personnel.

#### **MOS AMC 145.A.65 (d) 1 (vi) — Emergency Response Plan**

Where an AMO SMS includes an ERP, it must be documented as part of the SMS in accordance with section 145.A.65 of the Part 145 MOS. ERP accountabilities must be assigned to management personnel in accordance with subparagraph 145.A.65 (d) 1 (ii) of the Part 145 MOS and a tangible demonstration of effectiveness of the ERP may be demonstrated by the conduct of drills and exercises with all key personnel at intervals defined in the approved control documentation to comply with the requirements of subparagraph 145.A.65 (d) 3 (iv) of the Part 145 MOS.

#### **MOS AMC 145.A.65 (d) 3 (i) — Safety Assurance**

An AMOs SMS will include an acceptable safety assurance system in which safety performance monitoring and measurement will provide tangible demonstration that the SMS processes result in outcomes that are consistent with the documented policy and objectives required by subparagraph 145.A.65 (d) 1 of the Part 145 MOS.

## **MOS 145.A.70 — Maintenance Organisation Exposition**

### **MOS AMC 145.A.70 (a) 10 — Capability of the AMO**

The following information may be included in the AMOs Exposition as an AMC.

The information specified in paragraphs 145.A.70 (5), (6) and (13) to (16) inclusive of the Part 145 MOS, 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 the Exposition containing a clear cross reference to such documents or electronic data files. Regulation 145.080 requires that an AMO must make available to an employee the part of the Exposition that relates to the employee's duties.

Any information that affects all employees of the organisation in their day to day work will be contained within the management part of the Exposition. For example, the organisations quality and safety policy concerns all employees and will be included in the management part of the Exposition, whereas QMS and SMS and procedures may be included in a separate document or electronic file.

An acceptable Exposition will 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 an organisation uses a different format, for example to allow the Exposition to serve for more than one approval, then the Exposition should contain a cross reference Annex using the list below as an index with an explanation as to where in the Exposition the subject matter can be found.

Small maintenance organisations may combine various items to form a simple Exposition more relevant to their needs.

## **PART 1 — Management**

- 1.1 Accountable Managers Statement
- 1.2 Safety and Quality Policy
- 1.3 Management Personnel
- 1.4 Management Organisation Chart.
- 1.5 Certifying employees
- 1.6 Manpower Resources
- 1.7 Facilities
- 1.8 Scope of Maintenance Services to be Provided
- 1.9 Significant Changes
- 1.10 Changes that are Not Significant
- 1.11 Exposition

## **PART 2 — Maintenance Procedures**

- 2.1 Supplier Evaluation and Subcontract Control Procedure
- 2.2 Receipt/Inspection/Acceptance of Aeronautical Products
- 2.3 Storage, Tagging and Release of Aeronautical Products
- 2.4 Tools and Equipment
- 2.5 Calibration of Tools and Equipment
- 2.6 Use of Tooling and Equipment by Employees
- 2.7 Cleanliness Standards of Maintenance Facilities
- 2.8 Instructions for Continuing Airworthiness
- 2.9 Repair Procedure
- 2.10 Airworthiness Directives Procedure
- 2.11 Optional Modification Procedure
- 2.12 Maintenance Documentation In Use and Completion
- 2.13 Technical Record Control
- 2.14 Rectification of Defects Arising During Base Maintenance
- 2.15 Maintenance Certification and Certificate of Release to Service
- 2.16 Records for the Operator
- 2.17 Reporting of Defects to CASA/Operator/Manufacturer
- 2.18 Return of Defective Aeronautical Products to Store
- 2.19 Defective Aeronautical Products to Outside Contractors
- 2.20 Control of Computer Maintenance Records System
- 2.21 Man-Hour Planning Versus Scheduled Maintenance
- 2.22 Control Procedures for Critical Tasks
- 2.23 Specific Maintenance Procedures:
  - Engine running procedures;
  - Aircraft pressure run procedures;
  - Aircraft towing procedures; and
  - Aircraft taxiing procedures
- 2.24 Procedures to Detect and Rectify Maintenance Errors
- 2.25 Shift/Task Handover Procedures
- 2.26 Procedures for Maintenance Data
- 2.27 Production Planning Procedures

**PART 2L — Additional Line Maintenance Procedures**

- L2.1 Control of Aeronautical Products, Tools, Equipment etc.
- L2.2 Procedures Related to Servicing /Fuelling/De-Icing etc.
- L2.3 Control of Defects and Repetitive Defects.
- L2.4 Procedures for Completion of Technical Log.
- L2.5 Procedure for Pooled Parts and Loan Parts.
- L2.6 Procedures for Return of Defective Parts Removed from Aircraft.
- L2.7 Procedure for Control of Critical Tasks.

**PART 3 — Quality and Safety Management**

- 3.1 Quality Management Systems
- 3.2 Quality Audit of Organisation Procedures.
- 3.3 Quality Audit of Aircraft (or Equipment).
- 3.4 Quality Audit Remedial Action Procedure.
- 3.5 Certifying Employees — Qualification and Training
- 3.6 Certifying Employees' Records.
- 3.7 Quality Audit Employees.
- 3.8 Manufacturer's and Other Maintenance Working Teams.
- 3.9 Human Factors Training Procedure.
- 3.10 Competence Assessment of Employees.
- 3.11 Safety Management Systems (SMS).

**PART 4 — Operations**

- 4.1 Contracted Operators.
- 4.2 Operator Procedures and Documentation.
- 4.3 Operator Records Completion.

**PART 5 — Training and Assessment**

- 5.1 Facilities
- 5.2 Personnel
- 5.3 Training and Assessment Procedures
- 5.4 Training Sources and Quality Control
- 5.5 Authorisation and Reporting
- 5.6 Records

**PART 6 — Appendices**

- 6.1 List of Documents.
- 6.2 List of Sub-Contractors
- 6.3 List of Line Maintenance Locations
- 6.4 List of Contracted Part 145 Organisations
- 6.5 Provision of Maintenance Services for Aircraft under the CAR 1988
- 6.6 Compliance matrix



### **MOS GM 145.A.70 (a) 10 — Capability of the AMO**

An AMOs approved scope of maintenance will be defined by the Approval Certificate issued by CASA. The Approval Certificate will also list main locations nominated by the organisation and Classes, Ratings and their limitations for the maintenance services that the AMO is approved to provide. This scope of maintenance and limitations apply to the organisation as a whole and the subparagraph 145.A.70 (a) 10 of the Part 145 MOS requirement is for the organisation to specify the scope of maintenance it can perform at each of its normal locations, those being locations listed under subparagraph 145.A.70 (a) 15 of the Part 145 MOS, and those listed on the Approval Certificate.

Note: In accordance with paragraph 145.A.75(c) the AMO may carry out unscheduled maintenance and repairs in accordance with an Exposition procedure at locations other than those listed under the requirement of this paragraph.

The scope of maintenance at any location may not exceed the statements of limitation on the certificate. If an AMO wishes to perform maintenance beyond the limitations stated on its approval certificate, an application for significant change (being a change to the existing rating limitation) to its approval is required under paragraph 145.010 (2) (d) of CASR 1998.

Where an AMO has a procedure in its Exposition for changes to the organisation that are not significant changes and which cover changes to the capability statement, such changes need not be directly approved by CASA; they are approved by the AMO under the CASA approved procedure. In such a case and in accordance with regulation 145.010 (2) (d) of CASR 1998, only changes to capability that require a change to the limitation on the approval certificate, are significant changes that require CASA approval.

## **MOS 145.A.75 — Privileges of the Approved Maintenance Organisation**

### **MOS AMC 145.A.75 (a) — Sub-contracting Maintenance**

It is acceptable for a Part 145 AMO to subcontract other organisations that are not themselves approved Part 145 AMOs, to carry out work if the AMO has a Subcontractor Control Procedure that includes:

- a pre-audit procedure whereby the AMO assesses the capabilities of the subcontracting organisation to meet the required standards and specifications applicable to the intended work. This assessment will ensure that:
  - employees that will undertake the work are acceptably qualified and capable;
  - measuring and test equipment meet calibration standards acceptable to CASR Part 145;
  - any required special tooling is either held by the subcontracting organisation or made available when required for the work;
  - any materials or parts procurement or handling processes meet the standards of traceability and conformity to relevant specifications required by CASR Part 145;
  - any required stage inspections are recorded in a manner acceptable to CASR Part 145; any special processes are able to be performed to the same standard as if they were to be performed by an AMO approved under CASR Part 145;
  - the maintenance is recorded in accordance with the AMOs approved system of recording maintenance; and
- a procedure for the issue of work orders, diagrams, specifications and data to the subcontractor;
- progress inspections of maintenance if required;
- acceptance inspections of the completed work; and
- assessment to show to what extent the AMO will use the subcontractor's facilities.

As a general rule the organisation should require its own paperwork, approved data, materials and parts to be used, but it could permit the use of tools, equipment and personnel from the subcontractor if such tools, equipment and personnel meet the requirement of CASR Part 145. In the case of subcontractors who provide specialist maintenance, it may for practical reasons be necessary to use their specialist maintenance personnel, approved data and materials, subject to acceptance by the AMO.

Unless the subcontracted maintenance work can be fully inspected on receipt by the AMO it will be necessary for the AMO to supervise the inspection and release from the subcontractor. Such activities will be fully described in the Exposition procedure.

The CRS may be issued either at the subcontractor or AMO facility by employees holding appropriate Certification Authorisation issued under section 145.A.30 of the Part 145 MOS by the AMO. The CRS will always be issued under the AMOs Approval Reference.

The subcontract control procedure will record audits of the subcontractor, have a corrective action follow-up plan and ensure that records are kept of when the subcontractor is used. The procedure will have a clear process for revocation of subcontractor approvals where subcontractors do not meet the AMO requirements, or take corrective and preventative action to ensure that non-compliance findings are satisfactorily addressed.

The AMOs quality department will manage the Subcontractor Control Procedure requirements and may incorporate all the control procedure requirements, schedules and records of audits as well as records of findings and their acquittal in a Contractor Quality Plan.

A contract between an AMO and a subcontractor will contain a provision for CASA compliance audit staff to have right of access to the subcontractor and its facilities.

### **MOS GM 145.A.75 (a) — Sub-contracting Maintenance**

A RO of large aircraft or aircraft operated for passenger operations will have to contract a Part 145 AMO-1 to carry out the maintenance required on the aircraft and their aeronautical products, provided that AMO-1 has the approval rating for the aircraft and/ or products concerned as part of its approval. However if the AMO-1 does not have an approval rating for part of the required work or components, it may subcontract out that portion of work to another AMO (AMO-2) that does have the approval to do so.

In this case, AMO-2 must also be a Part 145 AMO with the contracted scope of work covered within its approval rating.

AMO-1 may subcontract to another organisation a portion of the work that it was contracted by an operator to carry out, if AMO-1 has the approval scope for the aircraft or aeronautical product for which the outsourced maintenance is to be provided. The subcontracted organisation does not have to be an approved organisation for the scope of work undertaken; however AMO-1 must have an approval rating for the aircraft or aeronautical product to be maintained and AMO-1 must have a procedure in its Exposition showing how it will control and monitor the subcontractor. When work is carried out under this provision, the quality system of AMO-1 is considered to be extended to include the subcontractor for that maintenance and AMO-1 must ensure that the subcontractor meets the requirements of CASR Part 145 for that time.

Where a subcontracted organisation is not CASR Part 145 approved, part of the control and oversight by the AMO includes monitoring and surveillance by the AMOs quality system, as any maintenance provided by the subcontractor is performed under the approval of the AMO. To facilitate subcontracting such non-approved organisations and to ensure compliance with paragraph 145.A.65 (c) 5 of the Part 145 MOS, the AMO's Exposition will need to include a control procedure that details the process for control of sub-contractors, including;

- a pre-audit procedure whereby the AMO will determine whether the subcontractor will be able to meet the intent of CASR Part 145 in providing the services that the AMO wishes to utilise and; details of quality audits planned and performed are recorded;
- findings, corrective and preventative actions;
- records are kept of when the sub-contractors are utilised; and
- a clear revocation process for sub-contractors that fail to maintain the AMOs requirements.

The intent of the provision to allow an AMO to subcontract certain maintenance tasks is:

- To permit the acceptance of maintenance processes such as, but not limited to plating, heat treatment, plasma spray, fabrication of specified parts for minor repairs and modifications without the need for direct approval by CASA in such cases;
- To permit the acceptance of aircraft maintenance up to but not including a base maintenance check in accordance with subparagraph 145.A.75 (a) 3 (i) of the Part 145 MOS by organisations not themselves approved under CASR Part 145 when it is unrealistic to expect direct approval by CASA. CASA will determine when it is unrealistic, but in general it is considered unrealistic if only one or two organisations use the subcontract organisation.
- To permit the acceptance of component maintenance.
- To permit the acceptance of engine maintenance up to but not including a workshop maintenance check or overhaul of an engine, engine module or propeller in accordance with subparagraph 145.A.75 (a) 3 (ii) of the Part 145 MOS by an organisation not itself approved under CASR Part 145 when it is unrealistic to expect direct approval by CASA. The determination of unrealistic is as per subparagraph 145.A.75 (a) 2 of the Part 145 MOS.

In order to subcontract maintenance to an organisation not approved under CASR Part 145, an AMO must have an approval Rating that covers any aircraft or aeronautical product to which the contracted maintenance relates, in accordance with paragraph 145.A.75 (a) of the Part 145 MOS. However the AMO need not itself have complete facilities for the work that it wishes to subcontract. For example the AMO may wish to contract the plating of a part to be used in the maintenance of an aeronautical product that it is maintaining, where the plating capability is not considered necessary by CASA for the approval rating for the aeronautical product. Nevertheless the AMO should have its own expertise to determine that the subcontractor does meet the necessary standards.

CASA will not approve an organisation for a Class of maintenance or Rating, unless it has the facilities, procedures and expertise to carry out the majority of the maintenance for which it wishes to be approved.

If an AMO wishes to utilise individuals provided by contract arrangement with a third party maintenance personnel provider to work for the AMO, it may do so within the AMC stated for paragraph 145.A.30 (d) of the Part 145 MOS.

Authorisation to subcontract is indicated by CASA accepting the AMOs Exposition containing a specific procedure for the control of subcontractors.

As a general guideline, a third party contract or service level agreement should include the following as a minimum standard:

- any agreement for the provision of services should be supported by a written contract prior to services commencing;
- all third party providers should hold the appropriate qualifications/credentials or approvals for the work being outsourced;
- all written service level agreements should contain a schedule of oversight to monitor the third party's performance on a regular basis; and
- where a service being provided is conducted under a licence or certificate approved by CASA, the written agreement should contain a statement requiring the third party to advise the contracting organisation of any regulatory action undertaken by CASA that may impact on the third party's ability to provide the required services.

#### **MOS GM 145.A.75 (c) — Line Maintenance Privileges**

This paragraph provides that the AMO may through an Exposition control procedure, evaluate a location listed in its Exposition as an approved location, and if appropriate, approve that location for the purposes of scheduled line maintenance. Scheduled line maintenance may only be planned at locations that have been evaluated to ensure facilities, equipment and tooling, data and personnel available at the location are appropriate for the work planned. Subparagraph 145.A.70 (a) 10 of the Part 145 MOS requires the capability of each location to be stated in the Exposition and subparagraph 145.A.70 (a) 15 of the Part 145 MOS requires the locations to be listed in the Exposition. Subregulation 145.010 (2) defines the change of the location of an AMOs facility, or the addition of a facility as being a significant change (for which an application to CASA must be made).

This provision does not exclude the AMO from being able to carry out unscheduled line maintenance and defect rectification at locations other than those listed for alleviation of breakdown situations. Such maintenance is permitted under paragraph 145.A.75 (b) of the Part 145 MOS.