# GUERNSEY ADVISORY CIRCULARS (GACs)

## GAC AIR-3

## AIRCRAFT MAINTENANCE PROGRAMMES

Office of the Director of Civil Aviation

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Guernsey Advisory Circulars (GACs) are issued to provide advice, guidance and information on standards, practices and procedures necessary to facilitate the application and processing of applications for services related to the Guernsey Aircraft Register.

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Processing of applications will be done by the Guernsey Aircraft Registry, which operates as '2-REG'. For further information consult http://www.2-reg.com or send a message to info@2-reg.com.

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# Revisions

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# Contents

## 1 Purpose

This Circular provides information and guidance for the development of an Aircraft Maintenance Programme, and its submission for approval by the Director.

## 2 Related laws, regulations, and requirements

This Circular relates to:

GAR Part 39.

*No rights can be derived from this document. For exact details please refer to The Air Navigation (Bailiwick of Guernsey) Law, 2012 (The Law). In case of conflict between this guidance document and the Law, the latter shall prevail.*

## 3 Definitions

Definitions, in the context of this GAC shall have the meanings listed in GAR Part 1 (Definitions, Abbreviations and Units of Measurement).

## 4 Introduction

4.1 All aircraft registered in Guernsey must be effectively maintained in an airworthy condition. The approval of a Maintenance Programme by the Director provides a mechanism to record minimum standards of airworthiness that the owner/operator must comply with.

4.2 An approved Aircraft Maintenance Programme (AMP) will be the source of all scheduled inspections, relevant controls and supporting data. The AMP should always be active (subject to review and amendment) and utilised to enable effective maintenance to be carried out in a logical, concise, clear, and controllable manner.

4.3 Some of the material in this Circular may not apply to each particular aircraft. This can only be confirmed by carrying out a detailed assessment, as the aircraft may be affected by subsections of a larger section. Caution should be exercised before assuming that particular guidance will be 'not applicable'.

## 5 Application by direct approval

5.1 In all cases, a suitable GAR Part 39 Organisation or Technical Coordinator shall be responsible for the initial and subsequent development and control of the AMP, this should include ensuring that the AMP will be amended following regular and annual reviews.

5.2 The applicant should review this guidance material to support their application in electronic format via the 2-REG Application Portal at: www.2-reg.com/application.

The application for the initial approval of an AMP should be sent to 2-REG for full review, with the following:

- The AMP draft.
- All source documents for the AMP (eg; TC/STC holder ICAs, modifications and repair data, etc).
- If applicable, payment of the appropriate application fee.

Each AMP should feature a unique document reference number, issue number and date, and revision number and date.

5.3 Following a satisfactory review, 2-REG will provide an AMP approval certificate, issued by the Director.

5.4 Note: Whilst each AMP must be initially approved by the Director, subsequent minor amendments may be 'indirectly' approved by a CAMO with the appropriate privilege. Major changes to the AMP must always be approved by the Director through the direct approval procedure.

Definition of major changes to the AMP:

- Addition of aircraft to the AMP.
- Deviation from AD compliance intervals or Alternative Means of Compliance (AMOCs).
- Deviation (escalation) of intervals for safety related tasks that are greater than those recommended by the Type Certificate holder (eg; CMRs, ALIs, MRBR FEC 5, 8 and 9 tasks).
- Deviation (escalation) of intervals for non-safety related tasks that are larger than recommended by the Type Certificate holder, except for optional maintenance tasks.
- Deviations (escalation) from other significant continuing airworthiness tasks such as, but not limited to:
  - Supplemental Structural Inspection Document (SSID)
  - Fuel tank safety inspections
  - Ageing aircraft inspections
  - Widespread fatigue damage
  - Electrical Wiring Interconnection Systems (EWIS)
  - Corrosion Prevention Control Programmes

Definition of minor changes to the AMP:

- Those not defined as major changes.

## 6 Amendments by indirect approval

6.1 When an aircraft is managed by a Continuing Airworthiness Management Organisation (CAMO) validated in accordance with GAR Part 39 Subpart G, or approved in accordance with GAR Part 39 Subpart H, or when there is a limited contract between the owner and an organisation, the AMP (amendments only) may be approved by the CAMO under an 'indirect approval' privilege.

6.2 The applicable indirect approval procedure should be prescribed in the approved CAMOs Maintenance Control Manual (MCM), or validated

CAMOs Continuing Airworthiness Management Exposition (CAME) 2-REG Supplement, and must be approved by the Director.

6.3 Once an AMP amendment is approved indirectly by the CAMO, this is the 'current' AMP. Each AMP amendment should be furnished with an amendment approval certificate issued by the CAMO to clearly identify the AMP is approved via their indirect approval procedure.

6.4 Each AMP amendment and its approval certificate should be transmitted with the amended AMP to the 2-REG as soon as possible (but no later than 7 days after its issuance), in electronic format via the 2-REG Application Portal at: www.2-reg.com/application. 2-REG shall acknowledge receipt to the CAMO respectively.

## 7 Maintenance Programme format

7.1 The AMP should contain a preface to record the process of controls and explanations of the AMP contents.

7.2 The manufacturer's Standard Maintenance Practices (SMP) describes the inspection philosophy of the manufacturer. These must be included and should become part of the introduction section of the AMP. Where the manufacturer has not adequately defined an SMP, the applicant should provide for acceptable standards derived from typical and relevant data. This material should be made available to 2-REG.

7.3 Where the AMP relies on other published documentation, references should be made to this documentation and, if requested, copies of this supporting documentation should be made available to 2-REG.

7.4 The AMP shall be in the English language in a format that is readily understandable to maintenance personnel.

7.5 It is understood that organisations accustomed to AMPs may have an established format. The Director does not object to organisations adopting their own proven formats, subject to the applicable requirements of GAR Part 39 being satisfied.

7.6 Note: The AMP should be submitted in electronic format.

## 8 Maintenance Programme basis

8.1 The AMP is usually based upon the applicable Maintenance Review Board Report (MRBR), the Type Certificate holder's Maintenance Planning Document (MPD), or Chapters 4 and 5 of the applicable Maintenance Manual.

8.2 The structure and format of these maintenance recommendations may be rewritten by the contracted GAR Part 39 Organisation or Technical Coordinator responsible for the AMP to better suit the operation and thereby establish control of the AMP.

8.3 For a newly type-certificated aircraft for which no previously approved AMP exists it will be necessary for the contracted GAR Part 39 Organisation or Technical Coordinator to comprehensively appraise the manufacturer's recommendations (and the MRB report where applicable), together with other airworthiness information, in order to produce a realistic AMP for approval.

8.4 For existing aircraft types, the operator can make comparisons with previously approved AMPs; however, it should not be assumed that a programme for one operator is automatically approved for another.

8.5 Note: The contracted GAR Part 39 Organisation or Technical Coordinator responsible for the AMP should have in place an appropriate subscription service to ensure any revisions made to the Maintenance Planning Document (MPD), Maintenance Review Board Report (MRBR) or Maintenance Manual Chapters 4 and 5 inspection requirements are received for analysis to establish applicability and an effective inspection regime.

## 9 Maintenance Programme applicability

9.1 It is acceptable for one operator to maintain more than one aircraft of the same type to the same AMP. The advantages of this are: fleet optimisation, reliability data gathering and balancing scheduled maintenance tasks such as optimising engine life. In this case each individually registered aircraft would be identified in the programme under its registration markings.

9.2 If more than one aircraft of the same type is placed on an AMP, a comparison check will be necessary. This should be recorded in a supplemental section of the AMP and utilised to identify the differences. Reference to the supplement should be clearly identified in the contents and introduction sections of the AMP.

9.3 Where no aircraft can yet be assigned to an AMP, a ‘baseline’ or ‘generic’ AMP should be produced. Once an aircraft is to be assigned to the AMP, approval, the applicant should apply for direct approval of the applicable aircraft AMP.

9.4 Note: A baseline / generic AMP can only be held by an approved CAMO in

accordance with GAR Part 39 Subpart H. For a validated organisation, the aircraft type should first be detailed on the host CAMOs Scope of Approval.

## 10 Regular reviews and evaluation of effectiveness

10.1 The AMP should be fully reviewed at least annually. All supporting documents referenced in the AMP should be considered during the annual review. It is recommended that if an amendment to an AMP is required, then a full review is carried out to reset the annual periodicity.

10.2 For aircraft subject to reliability analysis, the AMP review should be conducted at intervals commensurate with the Reliability Programme.

10.3 It is the responsibility of the contracted GAR Part 39 Organisation or Technical Coordinator to ensure that Instructions for Continued Airworthiness (ICA), regarding mandatory and non-mandatory requirements, incorporated design changes (modifications and repairs) and any requirements deemed necessary by the Director, are evaluated for applicability. Once evaluated, suitable amendments to the AMP must be developed and approved.

10.4 Full reviews of the AMP should include as a minimum:

a) Applicable Airworthiness Directives (AD)

b) Applicable evaluations of reliability analysis

c) Operational issues

d) Maintenance findings

e) Type Certificate holder's recommendations

f) Revisions to the MRB report

g) Revisions the MPD

h) Revisions to Chapters 4 and 5 of the Maintenance Manual

i) Supplemental Type Certificate holders (STC) revisions to ICA

j) Changes to type design (SB's, modifications and repairs) revisions to ICA

k) Review of aircraft and equipment life limits

l) Review of the Corrosion Prevention Control Programme (CPCP) tasks and findings (if applicable)

m) Changes to aircraft operational use (type of operation and climatic conditions)

n) Aircraft utilisation (hours/cycles, etc)

Note: The MRBR and MPD or Maintenance Manual usually specify a utilisation for which the MRBR/MPD is valid; beyond this the Type Certificate holder should be consulted. If actual utilisation differs from anticipated utilisation by 25% or more, it should be considered during the AMP annual review. A "Low Utilisation Maintenance Programme" should be used for operation with utilisation below the range stated in the MRBR/MPD.

10.5 For aircraft types where the AMP was not derived using the maintenance review board process, condition monitoring and Reliability Programmes may not apply. In such cases, pilot reports (PIREPS), component removal, Times Between Overhauls (TBO), Minimum Equipment List (MEL) usage, defect worksheets, Mandatory Occurrence Reports (MOR), Air Safety Reports, should be reviewed for trends or patterns.

10.6 The contracted GAR Part 39 Organisation or Technical Coordinator responsible for the AMP should maintain records of all applicable continued airworthiness information. Following a review of this information, records should be maintained of technical justification supporting the amendment decisions for both inclusion and non-inclusion in the AMP.

10.7 It is expected that each operator will according to its own operating context, validate the effectiveness and applicability of each task and interval through a continuing cycle of surveillance, investigation, data collection, analysis, corrective action, and corrective action monitoring. Consistent with this continuing cycle, it is expected that those adjustments, necessary to ensure maximum task effectiveness, as well as optimum task intervals, are made.

## 11 Migrating aircraft between Maintenance Programmes

11.1 When transferring aircraft between AMPs, the transfer should be carried out in a controlled manner which is also approved by the Director.

11.2 A 'bridging check' should be determined and form the basis of the technical justification required by the Director for approval of the aircraft transfer.

A bridging check is not in itself a maintenance package; it is the result of a detailed analysis of the transfer aircraft maintenance history in relation to the AMP the aircraft is to be placed under. Typically, there may be some maintenance activity at the time of transfer; the amount will clearly be influenced by the current maintenance status of the subject aircraft and to the extent the AMP has been developed.

11.3 The transfer proposal to the Director should detail the immediate

maintenance activities, the duration of the transition encompassing the scheduled maintenance activities, and any variations including escalations to inspection periods.

11.4 Consideration should be given to Reliability Programmes and any significant changes in operation.

11.5 Records of any Corrosion Prevention Control Programme (CPCP) or SSID programme should form part of the transfer analysis.

11.6 In order to allow an aircraft to change operators in a timely manner it may be necessary to have an aircraft recorded against two AMPs for a limited time. This is allowable, provided the circumstances and controls associated with the duplication and a suitable end date is clearly annotated and agreed by all parties including the Director.

11.7 Aircraft records should make reference to the approved transfer arrangements quoting the approval reference.

## 12 Human performance factors

Consideration should be given to human factors within the AMP, in particular:

a) Maintenance planning: Data required to effectively produce maintenance inputs including the arrangement of inspections in a manner that avoids conflict of inspection/maintenance activities, typically known as task orientation.

b) Mandatory inspection tasks: Ensuring maintenance planning personnel have clear visibility of such tasks preventing any unauthorised escalation.

c) Required reporting: Tasks associated with reporting such as the Aging Aircraft Programme Supplemental Structural Inspection Document (SSID) are readily identified.

d) Critical task controls: Ensuring tasks that are critical in nature are planned and allocated in a segregated manner that prevents the possibility of multiple error maintenance.

e) Maintenance resource planning: Tasks requiring specialised tooling and or techniques are readily identified with reference to required resources.

## 13 Pre-flight inspections

13.1 Pre-flight inspection tasks should remain part of the AMP order to control their effectiveness.

13.2 The AMP should identify inspection pre-flight tasks requiring a Certificate of Release to Service (CRS). For example, Extended Diversion Time Operations (EDTO) pre-flight inspections performed by maintenance personnel.

13.3 Any task included in the AMP requires a CRS and is normally identified by the Type Certificate holders and any applicable STC holders and APU ETSO/TSO holders. Where this identity is not clear or is ambiguous, 2-REG should be consulted to establish if a particular maintenance task shall require a CRS.

13.4 Pre-flight checks performed by the crew do not require the issue of a CRS.

## 14 Inspection standards

14.1 All significant terms and abbreviations used within the AMP to define each maintenance task should be relevant to the programme and are those defined in accordance with the Type Certificate holders and any applicable STC holder's and APU ETSO/TSO holder's definitions, current GARs or, in the absence of formal definitions, those quoted in the airline industry standard World Airlines Technical Operations Glossary.

14.2 The inspection standards applied to individual tasks must meet the requirements of the Type Certificate holders, and any applicable STC holder's and APU ETSO/TSO holder's recommended standards and practices. In the absence of such guidance, refer to UK CAA CAP 562 Civil Aircraft Airworthiness Information and Procedures or FAA AC 43-13-1A Aircraft Inspection and Repair or other approved data, as appropriate for the aircraft.

14.3 The AMP should include a paragraph describing in detail mandatory items such as independent inspections (either at main base or at third party maintenance organisations that may be unfamiliar with the format of independent inspection philosophy). In addition, consideration should also be given to assessment of vital points and critical task inspections.

## 15 Permitted variations to maintenance periods

15.1 Periods prescribed by the AMP may only be varied with the approval of the Director, or through a procedure developed in the AMP and approved by the Director. Normally, only the variations, or 'tolerances' prescribed by the Type Certificate / STC holder should be recognised and applied accordingly.

15.2 Note: Tolerances must not be exceeded, and therefore variations cannot be applied to tasks that already have a prescribed tolerance.

15.3 Where the TC/STC holder does not prescribe any variation interval, the contracted GAR Part 39 Organisation or Technical Coordinator should first consider engaging with the TC/STC holder to obtain the required support and then subsequently with 2-REG.

15.4 It is the responsibility of the contracted GAR Part 39 Organisation or Technical Coordinator to ensure that variations are appropriately managed to maintain the aircraft in accordance with the AMP.

15.5 Inspection periods should only be varied in accordance with the Type Certificate holder's and any applicable STC holder's and APU ETSO/TSO holder's approved data.

15.6 Variations shall not be used routinely to extend maintenance periods and shall be used for exceptional circumstances.

15.7 Variations shall not be applied to:

a) Airworthiness Limitation Items (ALI) and Certification Maintenance Requirements (CMR)

b) Life limits

c) Airworthiness Directives

d) Tasks which have been classified as mandatory by the Type Certificate / STC holder

15.8 Particulars of variations granted shall be entered into the aircraft records. The use of tolerances is not required to be recorded, but must be strictly in accordance with the manufacturer's procedures.

15.9 In the absence of such information and subject to approval by the Director for inclusion in the AMP, inspection periods may be varied in accordance with the Table 1;

**Table 1 – Variation of Inspection Periods**

| PERIOD | MAXIMUM VARIATION |
|---|---|
| **Items controlled by flying hours** | |
| 5,000 flying hours or less | 10% |
| More than 5,000 flying hours | 500 flying hours |
| **Items controlled by calendar time** | |
| One year or less | The lesser of 10% or one month |
| More than 1 year but less than 3 years | 2 months |
| More than 3 years | 3 Months |
| **Items controlled by cycles or landings** | |
| 500 cycles/landings or less | The lesser of 10% or 25 cycles/landings |
| More than 500 cycles/landings | The lesser of 10% or 500 cycles/landings |
| **Items controlled by more than one limit** | |
| the more restrictive limit shall apply | |

## 16 Escalation of maintenance task intervals

16.1 The Director may approve escalations or de-escalations for maintenance/inspection periods based on sufficient justification, such as supporting data from the operator's approved Reliability Programme.

16.2 Unlike variations, escalations are permanent increases to task intervals. As service experience is accumulated, task intervals (thresholds/ repeats) may be adjusted to reflect the results of actual in-service data.

16.3 MRBR task interval optimisation is based on principles that reflect the criticality of airplane systems, components, identified during MSG-3 analysis. Failure Effect Categories should be accounted for during the analysis. Care should be taken regarding escalation of tasks with a MRB Failure Effect Category of 5 and 8.

16.4 The escalation of maintenance tasks must be substantiated and justified by the GAR Part 39 Organisation or Technical Coordinator, prior to approval by the Director.

## 17 Task cards

17.1 An important feature of Task cards is recognising their role in achieving the required maintenance standard.

17.2 Task Cards should be manageable, offer clear sections for correct certification (i.e. sign and stamp) and give clear instructions to maintenance personnel regarding tasks. This includes ensuring that references to other documents have been previously assessed and, if not applicable, the task is amended.

17.3 Where task cards contain actual maintenance instruction data, arrangements must be made to ensure appropriate document controls.

17.4 Critical task controls particularly regarding error maintenance can be effectively mitigated. Task cards can be formatted in such a manner that provides production maintenance planners appropriate indicators and data to make provisions for segregation, appropriate resources and task orientation.

17.5 Task frequencies should be clearly identified within the introductory parts of the AMP such as hour, cycle, calendar, or letter checks such as 'A' Check or "first flight of the day", to major inspection periods/intervals.

## 18 Environmental considerations

18.1 Fuel systems are susceptible to microbiological growth in hot humid conditions and increased water content when the aircraft sits on the ground in hot humid climates. Fuel system water sampling tasks and fuel tank structural inspection may need to take into account the likelihood of microbiological contamination and corrosion.

18.2 Consideration should be given to routinely monitoring aircraft utilisation and adverse weather conditions (i.e. salt laden atmosphere, high humidity, extreme heat etc). Consideration should include increasing maintenance inputs for cleaning, lubrication and inspection of protective finishes as an example.

18.3 There should be mitigations for the effects of operating aircraft on runways that have been categorised as rough surfaces. Type Certificate holder's and any applicable STC holder's and APU ETSO/TSO holder's ICAs such as Service Letters and maintenance requirements should be appropriately incorporated into the AMP. Typical mitigations are increased lubrication frequencies of undercarriage components and fittings due to the possibility of increase in lubrication migration from bearing surfaces. Where published

data is not available, guidance should be sought from the Type Certificate holders and any applicable STC holders and/or APU ETSO/TSO holders.

## 19 Corrosion of aircraft structure

19.1 Corrosion Prevention Control Programmes (CPCP) require specific controls, procedures and reporting protocols. The AMP should provide details of specific requirements including clear instructions regarding the inspection tasks in order that production maintenance planning is able to resource the tasks appropriately.

19.2 Where the Type Certificate holders, any applicable STC holders and APU ETSO/TSO holders make no specific reference to a CPCP, this should be considered when inspecting structure for condition. The assessment may require adjustment of AMP periods. Applying corrosion inhibitors during maintenance may greatly improve the airframe's duration.
Note: Any MRBR/MPD derived from MSG-3 revision 2 or above will not make any reference to CPCP since the tasks are already considered in the structures and zonal programmes.

## 20 Mandatory requirements

20.1 The inclusion of repetitive Airworthiness Directives (AD) or Service Bulletins (SB) in the AMP should be considered to reduce the use of the ‘Out of Phase’ task management functions.

20.2 Fatigue lives and mandatory life limits published by Type Certificate holders and any applicable STC holders and APU ETSO/TSO holders, or by the Director, should be included in the AMP.

20.3 For aircraft types where Certification Maintenance Review (CMR) tasks are identified as part of the Type Certification process, these tasks should be subject to separate procedures for escalation.

20.4 Visibility of mandatory tasks such as Certificate of Maintenance Requirements (CMR) and Failure Effect Categories (FEC) safety route 5 or 8, found within the MSG-3 logic flow path should be identified in the AMP in order that these requirements are not the subject of unauthorised variations to the frequency of inspection (i.e. escalation).

20.5 Fuel Tank System Safety is a feature for many aircraft types. Mandatory requirements are now published with compliance times. The rectification actions are complex, involving many disciplines. The AMP should be amended accordingly, ensuring that the ICAs are referred to.

## 21 Design changes

21.1 Approved modifications or repairs incorporated on an aircraft may also have ICAs. These should be assessed and included in the AMP.

21.2 Significant structural changes may have an effect on structural programmes that may not have been finalised at the time of incorporation. This may be due to a fatigue damage assessment that only affects the fatigue lives from a total cycle/hour amount not yet achieved. In such circumstances it is important to ensure there is a marker in the AMP. This is to ensure that nearer the operational life when fatigue becomes effective, material required to amend the structural programme is obtained from the Type Certificate holder.

21.3 Where an STC (e.g. cabin interior) has established the configuration of the aircraft, the applicable configuration inspection manual should be appropriately referred to for aircraft inspections affected by the configuration changes. These would typically be for gaining access and planning for task orientation.

## 22 Identification of critical parts

22.1 The failure of a critical part(s) has been highlighted as the cause for numerous fatal accidents, particularly in rotorcraft. Where the continuing airworthiness regulations may only refer to life-limited parts, correctly managing the continuing airworthiness and maintenance of critical parts plays an essential role in civil aviation safety.

22.2 Critical parts are listed, as applicable on the basis for certification, within the respective ICA. Dependent upon the Type Certificate holder, these parts may include, but not limited to, components such as bearings, gearboxes and sub-assemblies, flight controls, and tail rotor drive systems. GAR Part 39 Organisations and Technical Coordinators are advised to review the respective ICAs for their aircraft types managed, to ensure there is an understanding of the parts identified as critical and how these should be maintained and managed.

22.3 In order for operators to carry out the appropriate analysis of the effectiveness of their approved AMP under GAR 39.55(j), in relation to critical parts and report any defects in life-controlled critical parts causing retirement before completion of its full life, GAR Part 39 Organisations and Technical Coordinators are recommended to identify in the respective AMP, which parts are classified as critical. For the identification of critical

parts, refer to the information published by the respective design approval holders (aircraft, engines, propellers). This may also include Design Approval holders of STCs for any major changes.

22.4 For those aircraft that are required to have a formal Reliability Programme under GAR 39.65, GAR Part 39 Organisations and Technical Coordinators are recommended to specifically monitor the reliability of critical parts and feed this information back to the applicable Design Approval holder to enable them to take any necessary actions to improve their reliability.

22.5 Where the system allows, GAR Part 39 Organisations and Technical Coordinators should identify life-controlled critical parts in their computerised maintenance control systems (e.g. AMOS, CAMP, Aerotrac, etc.) to assist with analysing the effectiveness of the AMP and producing the necessary reliability data, if applicable.

22.6 In addition to paragraph 22.3 above, identifying critical parts within the systems used in the storage facilities under GAR Part 145, will assist organisations with meeting their responsibilities for ensuring the correct handling and storage of critical parts.

22.7 All operators and organisations managing aircraft fitted with critical parts should report all occurrences of early removal of life-controlled critical parts to the Director under the Mandatory Occurrence Reporting (MOR) system. In addition, there is also a responsibility to report any identified condition of an aircraft or component which endangers or has the potential to endanger flight safety, to the organisation responsible for type design or supplemental type design. Without this important link, the design organisation will be unable to effectively discharge its responsibility of identifying unsafe conditions.

## 23 Special operations

23.1 Special operational approvals granted by the Director such as EDTO, RVSM, etc may involve changes to maintenance inspection requirements, frequencies, or tasks introduced by modification to the aircraft.

23.2 In order to satisfy the approval process of special operations, the inspection tasks supporting the aircraft capability should be referenced.

## 24 Equipment carriage

24.1 GAR Parts 91, 121, 125 and 135 detail mandatory equipment requirements for certain types of aircraft operation. With regard to the equipment fitted

and in order to conform to GAR requirements, ICAs should be incorporated into the AMP.

24.2 Any other equipment carried should also have ICAs incorporated into the AMP.

24.3 The 'installation modifications' of additional equipment should identify any required continued airworthiness inspections. These may be in the form of suitable vendor manuals. In the absence of such instructions suitable inspection techniques should be identified.

## 25 Safety equipment

25.1 Where the aircraft is required to carry safety equipment, this should be checked for serviceability at regular intervals. The equipment manufacturer should specify overhaul and life limit periods.

25.2 The AMP can make provision for fleet sampling of emergency equipment such as slide rafts. When sufficient operating aircraft numbers allow for a fleet sampling programme, this should be established for its introduction in line with information promulgated by the safety equipment manufacturer.

## 26 Flight Recorder systems

26.1 For each installed CVR/FDR, Data Link Recorder and/or Airborne Image Recorder, arrangements for data acquisition and verification of recorded data should be established with a recognised playback facility. The final analysis is the responsibility of the responsible GAR Part 39 Organisation or Technical Coordinator.

26.2 The type acceptance standards should be applied with regard to periods of testing and recorded data verification for each installed recorder system.

26.3 Instructions from equipment manufacturers and continued airworthiness organisations should be integrated as scheduled requirements of the AMP.

26.4 Records should be maintained for a minimum period of 24 months for all testing undertaken.

26.5 A non-commercial operator, operating complex motor-powered aircraft may also need to recognise and demonstrate compliance with EASA non-commercial with complex motor-powered aircraft regulations (EASA Part NCC). In which case, consideration should also be given as to how they satisfy NCC.GEN.145(b), including AMC1 NCC.GEN.145(b).

## 27 Battery capacity checks

27.1 Routine capacity checks should be carried out at periods specified in accordance with Type Certificate holder's and any applicable STC holder's and APU ETSO/TSO holder's ICAs.

27.2 In the event of no such published criteria, the following periods shall apply:

- Lead acid Battery: 3 months
- Ni-Cad Battery: 4 months.

## 28 Mandatory markings and placards

29.1 All mandatory placards that should be installed as detailed in the TCDS and/or AFM must be checked for integrity and clarity on an annual basis. This task should form part of the AMP, which should also detail what source documents should be used to undertake this task.

## 29 Aircraft Weighing

29.1 Aircraft should be weighed in accordance with the frequency and manner defined in GAR Part 39.81 and should be included within the AMP. Aircraft weighing intervals are dependent on the aircraft operating rules and described in Subpart D of GAR Part 91, 125, 135 and 121.

29.2 For GAR Part 91 and 125 operations (General Aviation), the operator shall ensure that the mass and the Center of Gravity (CofG) of the aircraft have been established by actual weighing prior to the initial entry into service of the aircraft.

29.3 For GAR Part 121 and 135 operations (Commercial Air Transport) the operator shall establish the mass and the CofG of any aircraft by actual weighing prior to initial entry into service, and thereafter at intervals defined in GAR Part 39.81.

29.4 The cumulative effects of modifications and repairs on the mass and balance shall be accounted for and properly documented, for example with the use of a Maintenance Statement. Such information shall be made available to the crew (ideally, placed in the Technical Log).

29.5 Any permanent, non-operational role changes to the aircraft either by modification or repair that either adds or reduces weight needs to be assessed, calculated, and if necessary, the aircraft weight records including the CofG Schedule and/or Weight/Mass and Balance Statement amended.

29.6 Aircraft shall be reweighed if the effect of modifications on the mass and balance is not accurately known.

29.7 Detailed guidance on aircraft weighing and fleet mass (weight and balance control system) is available in Regulation (EU) No 965/2012 AMC CAT.POL.MAB.100(b) and FAA Advisory Circular No: 120-27.

## 30 Low Utilisation Maintenance Programmes

30.1 A Maintenance Planning Document (MPD) is produced by the Type Certificate holder, which is based on an aircraft's average annual utilisation based on commercial/marketing criteria. This is applied during type certification.

30.2 It is acknowledged that the annual utilisation of certain operators may be beyond the range, termed 'average' for that aircraft's operation.

30.3 Providing the annual utilisation declared by the operator and included in the front of the AMP is within the definition of the 'average' (in other words, what the aircraft was designed for) there is no need for a Low Utilisation Maintenance Programme (LUMP).

30.4 Where it is determined that the actual aircraft utilisation will be below the type certified utilisation, the Type Certificate holder may have developed a LUMP that may be suitable for the specific operation and environment.

30.5 An operator proposing to use a LUMP should have consulted the Type Certificate holder for technical support in developing their AMP.

30.6 It is possible that 'hard time' and component overhauls may be additional features.

30.7 A Reliability Programme will be less effective due to lack of statistical data and the MEL may need a review due to changes in the reliability of components.

30.8 Generally, the aircraft is assessed for exposure to risk of failures that are dependent on:

a) Flight cycle / flight hours ratio

b) Average sector length

c) Operating environment

d) Flight hours vs airframe design life

e) Structures and systems loading

f) Reliability predictions

For an aircraft maintained on a LUMP, normal assessments of the above

may prove inadequate. It is important that special consideration is given to these in view of compromises and associated factors of low utilisation.

30.9 Recommended lubrication tasks are based on average utilisation predictions therefore lubrication tasks triggered by flight cycles or flight hours will be less frequent on aircraft with low utilisation, allowing corrosion growth which could be accelerated in a harsh environment.

30.10 The operator must consult the Type Certificate holder who may only provide feedback on world fleet reports; therefore, the operator will need to add its own experience from its Reliability Programme to include its own specific experience.

30.11 Low utilisation may lead to accumulation of moisture, reduced distribution of oil/grease and possible chemical breakdown of oil/grease. This could lead to increased internal corrosion of structures, power plants and components.

30.12 A LUMP should address the accumulation of moisture in cargo holds, door sills and require drains to be regularly checked. This is even more important in winter conditions. The lack of protective oil/grease on exposed surfaces i.e. landing gear oleos will increase corrosion growth.

30.13 Seal leakage is a common fault when aircraft sit around in cold conditions for long periods. Some hydraulic fluids, especially reclaimed fluids, would break down and separate, causing internal leaking of actuators when overheated or left for long periods.

30.14 Low distribution rates of oil/grease may lead to an increase in the predicted mechanical wear-out rate and corrosion of control cables and mechanical systems. Corrosion is accelerated in moist ground conditions and slower when aircraft are operating in dry cold atmospheres.

30.15 Fuselage insulation blankets will be prone to moisture accumulation requiring additional inspections as they are likely to accumulate large quantities of water on the ground due to humidity or inclement weather. If the insulation blankets are not sealed, they will soak this water up causing corrosion and increase the aircraft's weight.

30.16 Structural areas may not be opened up and inspected for long periods of time as they normally would for servicing and therefore corrosion will progress undetected.

30.17 When structural areas are opened up inspection standards may need to be modified from 'general visual' to 'detailed' in order to identify known

vulnerable areas.

30.18 Low utilisation may affect electronic component reliability due to relatively long periods of power down. In a low voltage electronic system, a small amount of resistance due to corrosion build up, possibly due to inactivity, could damage a sensitive system.

30.19 BITE functionality may be affected, invalidating the statistical assumptions. Some BITE functions only take place on boot up of an electronic system and if this is not happening regularly there may be dormant failures which also means the systems are not checked and exercised on a regular basis.

30.20 Battery reliability may be significantly affected by loading profile changes; this includes implanted cells within equipment.

30.21 Exposure to corrosion will affect terminals, bond joints and plug breaks, so terminals and joints such as Engine Fire detection systems, which are particularly susceptible to break down from corrosion, and deposits should be considered.

30.22 Avionics systems work and function better when used regularly. If left for long periods of time they are susceptible to spurious interference.

30.23 Manometric elements in aircraft instrument systems may require additional maintenance due to moisture ingress and fungi contamination. Most instruments are ventilated on a regular basis during normal operation and predominately remain free from contamination; this may not be the case for a low utilised aircraft.

## 31 Aircraft parking, storage, and return to service

31.1 An aircraft which has been taken out of operation and is parked or stored the parking/storage procedures described in AMM shall be followed.

31.2 Some maintenance tasks which become due during the parking/storage period, may be postponed as detailed in the AMM until the end of the parking period. It is important that non-deferable tasks are carried out when due during parking/storage as these tasks form part of the preservation process.

31.3 Before the aircraft is returned to service, all postponed maintenance tasks defined in the AMP, all component changes, AD's, etc. and rectification or deferred complaints/open items overdue, must be performed.

## 32 Reliability

32.1 A Reliability Programme should feature in an AMP under the following circumstances:

a) The AMP is based upon MSG-3 logic.

b) The AMP includes condition monitored components.

c) The AMP does not contain overhaul time periods for all significant system components.

d) When specified by the manufacturer's MPD or MRBR.

33.2 For further information on Reliability Programmes, see GAC AIR-13.

**END**