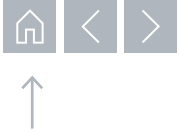
UK Civil Aviation Authority

THE AIRWORTHINESS CODE

A MAINTENANCE GUIDE FOR

Light Aircraft

Launch



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FOREWORD

Communication is one of the key pillars of our relationship with the General Aviation community. With around 18,000 GA aircraft and 30,000 pilots, it is important that key messages around safety and risk management are clear and concise. Feedback from the community indicated that in the realm of maintenance and continuing airworthiness management, there has sometimes been room for improvement.

Since the first edition of the 'Part-M' maintenance regulations nearly 20 years ago, the requirements in continuing airworthiness have evolved several times. While this evolution has been with the aim of improvement, change has also brought the necessity to familiarise and understand – not always welcome alongside the practical challenges of keeping aircraft airworthy. The CAA recognises this reality and the frustration sometimes experienced in the past.

The 2019 Part-ML and Part-CAO regulations provide a proportionate framework for the maintenance and continuing airworthiness management of light aircraft. The regulations also provide more privileges for pilots, owners, independent certifying staff and small maintenance organisations. However, devolving these responsibilities to the GA community has inevitably prompted debate around standards and best practice. To that end, we encourage owners and airworthiness professionals to educate and appraise themselves of the relevant considerations before making airworthiness decisions.

Even though Part-ML was specifically written for the GA environment, there can still be a gap between theory and practice. An owner may have an excellent understanding of the regulations, but that needs to be married to a knowledge of their aircraft and the practicalities of airworthiness management. The Airworthiness Code aims to bridge this gap and given owners not only a better understanding of Part-ML itself, but how to apply it to their aircraft.

We would like to thank in particular the AOPA Maintenance Working Group and other members of the GA community who contributed to the Airworthiness Code and hope that you will find it useful.

Rob Bishton
Group Director, Safety and Airspace
UK Civil Aviation Authority

INTRODUCTION

The **Airworthiness Code for Maintenance** is intended to provide practical guidance on the key airworthiness topics for owners and operators of general aviation aircraft.

The publication primarily addresses:

- Part 21 aeroplanes and rotorcraft subject to the Part-ML regulation; and
- Part 21 aircraft operating on an enduring permit to fly.

The aim is:

BETTER INFORMED OWNERS AND OPERATORS

SAFE AND INFORMED AIRWORTHINESS DECISIONS

Readers should understand that the publication is a guide and not a definitive statement of the law. In some places the legal text has been paraphrased for the purpose of clarity and explanation.

References to source regulations are made throughout this guide and include any associated acceptable means of compliance, certification specifications and guidance material.

i Part-ML and Part-CAO information and UK regulations can be found at caa.co.uk.

THE AIRWORTHINESS SYSTEM

01.

CHAPTER 1: THE AIRWORTHINESS SYSTEM

Key Regulations

CONTINUING AIRWORTHINESS

Continuing Airworthiness requirements for Part 21 aircraft are set out in **UK Regulation (EU) 1321/2014**. This consists of a 'cover regulation' setting out the high level structure, followed by a series of annexes containing the detailed technical requirements:

Annex	Subject	Nature
Annex I – Part-M	Continuing Airworthiness for Complex Motor-Powered Aircraft and / or aircraft used as part of a Licensed Air Carrier	Airworthiness Requirements
Annex II – Part-145	Maintenance Organisation Requirements	Organisation Approval
Annex III – Part-66	Aircraft Maintenance Licence	Personal Qualification
Annex IV – Part-147	Aircraft Maintenance Training Organisations (Basic Training & Type Training)	Organisation Approval
Annex Va – Part-T	Part T – Aircraft Registered in a Third Country, short term leasing – airworthiness requirements	Airworthiness Requirements
Annex Vb – Part-ML	**Continuing Airworthiness for Light Aircraft**	**Airworthiness Requirements**
Annex Vc – Part-CAMO	Continuing Airworthiness Management Organisation	Organisation Approval
Annex Vd – Part-CAO	**Combined Airworthiness Organisation**	**Organisational Approval**

Annex Vb (Part-ML) and Annex Vd (Part-CAO) are the focus of this guide. They contain the continuing airworthiness and organisational approval requirements applicable to light aeroplanes and helicopters, when not operated by a licensed air carrier*.

Part-66 is also addressed when explaining the qualifications necessary to perform or certify airworthiness tasks. The detailed requirements for obtaining Part-66 qualifications are beyond the scope of the guide.

*'Licensed air carrier' refers to an air transport undertaking that is required to hold an operating licence issued by the CAA. An operating licence relates to the nature, ownership and financial health of an airline business. It is separate from an air operator certificate (AOC), although most commercial air transport operators are required to hold both.

Key Regulations

CONTINUING AIRWORTHINESS (CONTINUED)

Part-ML

Part-ML (or 'M-Light' as it is sometimes referred to) is essentially the regulatory code for the continuing airworthiness management and maintenance of light aircraft. It was specifically developed for GA and is applicable to:

- Aeroplanes of 2730 kg MTOM or less;
- Rotorcraft of 1200 kg MTOM or less, certified for a maximum of four occupants; and
- Other 'ELA2' aircraft.

Although not the subject of this guide, 'other ELA2' aircraft includes manned balloons, sailplanes, hot airships and gas airships. Part-ML is not applicable to aircraft listed on the air operator certificate (AOC) of a licensed air carrier.

Part-ML is broken down into Section A (Technical Requirements) and Section B (Procedures for the CAA). It is Section A that applies to owners, operators and airworthiness staff.

Section A includes:

- Subpart A - General
- Subpart B – Accountability (responsibilities)
- Subpart C – Continuing Airworthiness
- Subpart D – Maintenance Standards
- Subpart E – Components
- Subpart H – Certificate of Release to Service
- Subpart I – Airworthiness Review Certificate

The absence of a Subpart F or G from the above list is to keep the indexing consistent with the equivalent Part-M structure, where Subparts F and G have been replaced with the Part-CAO and Part-CAMO approvals.

Part-CAO

Part-CAO contains the requirements for obtaining approval as a 'Combined Airworthiness Organisation'. This can consist of one or more of the following privileges:

1. Maintenance
2. Continuing Airworthiness Management
3. Airworthiness Review
4. Permit to Fly

The approval is GA specific and applies to non-complex motor-powered aircraft not listed on the AOC of a licensed air carrier. Complex motor-powered aircraft is defined as*:

(i) an aeroplane:

- with a maximum certificated take-off mass exceeding 5700 kg, or
- certificated for a maximum passenger seating configuration of more than nineteen, or
- certificated for operation with a minimum crew of at least two pilots, or
- equipped with (a) turbojet engine(s) or more than one turboprop engine, or

(ii) a helicopter certificated:

- for a maximum take-off mass exceeding 3175 kg, or
- for a maximum passenger seating configuration of more than nine, or
- for operation with a minimum crew of at least two pilots, or

(iii) a tilt rotor aircraft;

*Note that the definition "complex" for airworthiness may differ from that used in flight crew licensing and aircraft operations.

Key Regulations

CONTINUING AIRWORTHINESS (CONTINUED)

Part-CAO (continued)

The privileges of a Part-CAO organisation could include both Part-M (for example fixed wing non-complex motor-powered aircraft up to 5700kg) and Part-ML aircraft.

In this case the organisation must have appropriate privileges included on the approval certificate (Form 3-CAO) and exposition procedures covering both Part-M & Part-ML aircraft.

The organisation will be described in the Combined Airworthiness Exposition (CAE), including how it will operate in compliance with the Part-ML / Part-M regulations.

A Part-CAO organisation may in some circumstances authorise commercial pilots for specific and limited maintenance tasks away from the home base of the aircraft's operator. This should not be confused with pilot-owner maintenance, but is maintenance performed by a commercial pilot based on an authorisation issued by the organisation.

Part-M

Part-M now effectively applies to all aircraft not covered by Part-ML and is only discussed further to give context. Previously Part-M applied to all aircraft, with some alleviations for GA aircraft. Part-ML is a standalone annex and Part-M requirements do not apply to aircraft that are subject to Part-ML.

Part-CAMO

Part-CAMO is the equivalent of Part-CAO for organisations managing the airworthiness of aircraft that are not covered by Part-ML. Part-CAMO replaced the Part-M, subpart G organisations. Unlike a Part-CAO approval, the Part-CAMO does not have a maintenance privilege. Complex motor powered aircraft or aircraft on the AOC of a licensed air carrier must be maintained by a Part-145 organisation. Although aimed at the more complex aircraft and operators, a Part-CAMO organisation with appropriate privileges can manage light aircraft in accordance with the Part-ML requirements.

Part-145

A Part-145 approval is a standalone maintenance organisation approval. In some limited cases it can include the privilege to perform an airworthiness review and issue an airworthiness review certificate (ARC) for Part-ML aircraft. A Part-145 organisation without an appropriate Part-CAMO or Part-CAO cannot perform continued airworthiness management under contract.

A Part-145 organisation may authorise commercial pilots for specific and limited maintenance tasks on aircraft away from the home base of the aircraft's operator. This should not be confused with pilot-owner maintenance, but is maintenance performed by a commercial pilot based on an authorisation issued by the organisation.

Key Regulations

CONTINUING AIRWORTHINESS (CONTINUED)

Part-66 (Independent Certifying Staff)

Part-66 contains the requirements for the licensing of airworthiness personnel, including Independent Certifying Staff (ICS).

Often referred to as a Licensed Engineer or LAE, ICS may work independently of an organisational approval. Under Part-ML, aircraft may be maintained and released by ICS, but only if operated non-commercially. An ICS is still bound by the requirements of Part-ML which define how the maintenance must be controlled, performed, documented and released.

The person performing the maintenance must be qualified, have access to and use the correct manuals, use the correct tools (including calibration if required) ensure proper facilities in the case of inclement weather or lengthy maintenance, and ensure error capturing after critical tasks (e.g., independent inspections). The work must be performed in a clean and well organised area with no dirt or contamination.

Where an ICS is assisted in performing the work, the persons assisting must be under direct and continuous control, as is the case for an approved organisation employing non-certifying staff.

When specifically authorised by the CAA, the ICS may hold a Part-ML authorisation allowing the holder to perform an Airworthiness Review and issue an ARC (Form 15c). This is limited to the Part-ML types held on the ICS Part-66 Aircraft Maintenance License and excludes aircraft that are used commercially (e.g., Commercial ATO or DTO). More detail on this subject is provided later on.

A Part-66 Aircraft Maintenance License with appropriate ratings is also a pre-requisite for the authorisation to release aircraft maintenance under an approved organisation.

INITIAL AIRWORTHINESS

Initial Airworthiness for Part 21 aircraft in the UK is governed by UK Regulation (EU) 748/2012. The substantive technical requirements are contained in Annex I - Part 21.

Part 21 covers numerous subjects, including type certificates, supplemental type certificates (STC), European Technical Standards Order (ETSO), production organisations, design organisations, certificates of airworthiness (C of A), noise certificates, new parts and appliances, repairs, technical standard orders and permits to fly.

This guide will not cover Part 21 in detail, however will explain some common topics such as modifications and repairs.

PART 21 VS NON-PART 21 AIRCRAFT

Part 21 aircraft are regulated in accordance with UK Regulation (EU) 2018/1139 (known as the 'UK Basic Regulation') and the implementing regulations made under it. The UK Basic Regulation derives from the UK's retained EU law. Part 21 aircraft would have been 'EASA aircraft' while the UK was still a member of EASA. Most factory-built aircraft (other than microlights and gyroplanes) are Part 21.

Non-Part 21 aircraft are outside the scope of the UK Basic Regulation. Non-Part 21 aircraft were never subject to EASA regulation and are covered by the UK Air Navigation Order (ANO) 2016. Vintage and ex-military aircraft, amateur built aircraft, microlights, gyroplanes are normally non-Part 21. Such aircraft will have a certificate of airworthiness or permit to fly issued under the ANO 2016, unless exempt from airworthiness regulation. Small foot-launched aircraft such as hang gliders, paragliders and self-propelled hang or paragliders are also non-Part 21. A full description of the non-Part 21 criteria can be found in the UK CAA's GA webpages.

Key Regulations

PART-NCO

Part-NCO refers to the regulations for non-commercial operations with other than complex-motor-powered aircraft. It forms part of the UK Regulation (EU) 965/2012 - the UK Air Operations Regulation. Part-NCO will apply to the operation of most aircraft maintained under Part-ML. Flight training operations provided on a commercial basis normally comply with Part-NCO, even if they are considered commercial for the purpose of Part-ML.

RETAINED EU LAW

Part-ML and the other regulations detailed in this guide originally applied in the UK via EU law. Under the terms of the European Union (Withdrawal) Act 2018, such regulations transfered into UK law at the point at which the UK left the EU.

Unless otherwise specified, references to regulations in this guide are to the version in force in the UK. Readers should ensure that they refer to the UK version of any regulations or associated AMC or GM, since it may differ from that of the EU.

FINDING REGULATIONS

UK regulations can be found at caa.co.uk/uk-regulations – those relevant to Part 21 aircraft will be under Aviation Safety > Basic Regulation, the Implementing Rules and UK CAA AMC GM CS.

Within the Basic Regulation and Implementing Rules section, the regulations are separated into functional area such as Initial Airworthiness, Continuing Airworthiness, Air Operations or Aircrew. The regulations made under the UK Basic Regulation are often referred to collectively as 'the Implementing Rules'.

'Part-ML' is Annex Vb within the Continuing Airworthiness Regulation – UK Reg (EU) 1321/2014, which can be found via Basic Regulation, the Implementing Rules and UK CAA AMC GM CS > Continuing Airworthiness.

Individual provisons within a regulation follow a lettering and number system. For example, the first entry in Part-ML is 'ML.1' and subsequently within ML, Section A, the provisions are numbered ML.A.101, ML.A.201 and so on.

ACCEPTABLE MEANS OF COMPLIANCE

Acceptable Means of Compliance (AMC) and Guidance Material (GM) is designed to assist the reader in understanding and complying with the regulations. AMC sets out the more detailed means by which compliance may be achieved. GM typically assists in understanding the meaning and interpretation of an implementing rule.

AMC is sometimes referred to as 'soft law'. To provide uniform implementation, the CAA has decided that AMC will constitute a means by which the requirements in the applicable retained EU legislation can be met. However, compliance may be demonstrated by other means.

AMC and GM are published separately alongside each regulation – for Continuing Airworthiness see Aviation Safety > Basic Regulation, the Implementing Rules and UK CAA AMC GM CS > Continuing Airworthiness > CAA 1321/2014 Continuing Airworthiness – AMC GM.

CAPS AND FORMS

Throughout this guide reference is made to various CAA publications (CAPs) and Forms. CAPs can be found online via caa.co.uk/[capnumber] - for example caa.co.uk/cap747. CAA online forms can be found here.

Design and Manufacture

The design and certification of aircraft and related products is referred to as Initial Airworthiness. Whilst the focus of this guide is on continued airworthiness and maintenance, some understanding of initial airworthiness concepts will be useful for the owner or operator of an aircraft.

AIRCRAFT CERTIFICATION

The Certificate of Airworthiness (C of A) is an internationally recognised standard and a legal requirement for most aircraft to fly. To be eligible for a C of A, an aircraft must normally be in conformity with a certified aircraft type design.

The high-level framework for certified aircraft is established through ICAO and then implemented nationally by ICAO contracting states, or in the case of EASA member states, through the EASA Implementing Rules. Certified aircraft are designed to regulatory requirements and Certification Specifications (CS). The CS are the more detailed airworthiness requirements that an aircraft design is assessed against.

When it has been established that an aircraft design and prototype complies with the applicable requirements, a Type Certificate is issued by the responsible aviation authority, such as the UK CAA or EASA. The Type Certificate confers type approval on the aircraft and permits the production of individual airframes that conform to the Type Certificate. There is an associated Type Certificate Data Sheet (TCDS) – this records the basis of the type approval and gives information concerning the design, airworthiness, and operation of the aircraft.

The Type Certificate is issued to an organisation that becomes the Type Certificate Holder or Design Approval Holder (DAH). Throughout this guide the term Design Approval Holder (DAH) will be used. The DAH is normally the manufacturer of the aircraft, although the DAH may change, for example if the original manufacturer is taken over by another organisation.

The state which has jurisdiction over the DAH is known as the 'state of design'.

When an individual aircraft is manufactured the new aircraft is issued with a 'Form 52' which certifies conformity to the type design. It also confirms the aircraft is in a condition for safe operation and has been satisfactorily flight tested.

ORPHAN AIRCRAFT

Type Certificates are sometimes surrendered by the DAH. The affected aircraft are often referred to as 'orphans'. Normally the loss of the DAH would render the C of A invalid. However, a concept known as the 'Specific Airworthiness Specification' (SAS) was used in the EASA system to allow continued flight for aircraft without a DAH. The SAS effectively replaces the aircraft TCDS and the aircraft may be issued with a Restricted C of A. Types such as the Slingsby T67 or Beagle Pup now fly under this arrangement. As far as the owner or operator are concerned, the continued airworthiness procedures are similar to those associated with a full C of A.

EASA and UK regulations no longer permit the issue of a new SAS. A SAS issued by EASA prior to 1st January 2021 remains valid for UK registered aircraft. A list of existing SAS documents is published on the CAA website.

ENDURING PERMITS

Some factory-built Part 21 aircraft have not demonstrated compliance with the requirements for issue of a C of A. Under EASA, an alternative to full certification was the 'enduring' permit to fly. Such aircraft were approved on the basis of 'flight conditions', including specific airworthiness requirements that differ from those under Part-ML. More detail is included on p.79.

Reference: *UK Regulation (EU) 748/2012, Part 21, Section A*

Continuing Airworthiness Management

Continuing airworthiness management can be defined as "the processes by which an aircraft is kept in a condition where it remains airworthy throughout its operational life". To be considered airworthy, the aircraft must continue to meet the build standard and requirements of the type design. Part-ML and Part-CAO apply a framework of requirements to support this process.

Part-ML, ML.A.301 identifies various tasks to ensure the ongoing airworthiness of the aircraft:

- Pre-flight inspections;
- Rectification of defects and damage in accordance with approved data;
- Repairs and modifications in accordance with approved data;
- Performing the maintenance required by the aircraft maintenance programme;
- Applicable airworthiness directives or other mandatory requirements; and
- Maintenance check flights.

INSTRUCTIONS FOR CONTINUED AIRWORTHINESS

The DAH for the aircraft supplies the data to carry out the airworthiness tasks for maintaining the aircraft in an airworthy condition. This is normally in the form of manuals and referred to as the Instructions for Continued Airworthiness (ICA).

The ICA is normally updated throughout the life of the aircraft type. This will typically be in response to operational experience, incidents or accidents and additional considerations as the average age of the type increases. Updates to the ICA can be in the form of amended manuals or via service bulletin, instruction or letter.

MANDATORY ITEMS

During the initial design and certification of the aircraft, some airworthiness tasks are identified by the DAH as mandatory and designated as Certification Maintenance Requirements or Airworthiness Limitation Items. These items must always be incorporated into the relevant Aircraft Maintenance Programme (AMP).

Airworthiness Directives (ADs) may be issued by the state of design or the state in which an aircraft is registered. These are mandatory airworthiness actions, normally issued in response to a safety risk associated with an aircraft or component. For example they may require inspection or replacement of a component that has suffered a high failure rate.

The UK also has the airworthiness 'Generic Requirements' which are mandatory for a range of light aircraft on the UK register. Some relate to continuing airworthiness and can be found in CAA CAP 747.

RESPONSIBILITIES

Part-ML, ML.A.201 states that the aircraft owner is responsible for the continued airworthiness of the aircraft.

It is possible for the owner to delegate the continued airworthiness of the aircraft to an organisation approved under Part-CAO or Part-CAMO. Such an arrangement is often known as a 'CAMO contract'. If an aircraft is used for commercial operations, it is a requirement for the aircraft operator to enter into a CAMO contract.

If the aircraft is leased, the lessee takes on the management responsibilities of the owner, if so identified in the lease contract or on the aircraft's registration certificate.

Reference: *Part-ML, Section A; Part 21, 21.A.7, 21.A.3B*

Maintenance

Whilst continuing airworthiness management is the process of managing the various tasks that are required to keep the aircraft in an airworthy condition, maintenance is the actual performance of those tasks.

ML.A.401 and ML.A.402 set out the principles for the performance of maintenance. It must be in accordance with the applicable maintenance data, using the methods, techniques and practices defined by the DAH. Personnel and organisations must have the appropriate qualifications, knowledge, tools and facilities for the task being performed.

AIRCRAFT MAINTENANCE

Depending on the aircraft or maintenance task, the work may be performed by an approved organisation (for example under Part-CAO) or independent certifying staff (ICS). Certain tasks may also be conducted by a pilot-owner who is familiar with the applicable requirements - see p.71 for more details.

On completion of the maintenance task, a Certificate of Release to Service (CRS) is issued confirming that the work has been performed in accordance with the applicable requirements (for example Part-ML or Part-145). The requirements applicable to the CRS are set out in ML.A.801.

COMPONENT MAINTENANCE

Maintenance of components is addressed at ML.A.502. Maintenance to engines, propellors and other components must also be performed in accordance with the techniques and practices defined by the DAH or individual manufacturer.

Major component maintenance such as overhaul of engines and propellors must normally be conducted by an approved organisation, other than the exceptions noted in ML.A.502. Components that have been overhauled by an approved organisation are issued with a CAA Form 1 or equivalent.

This signifies that the work has been performed in accordance with the applicable requirements. Note that the use of the Form 1 is for component release, not the release of the entire aircraft, which must be via a CRS.

APPROVALS AND QUALIFICATIONS

ICS must have the appropriate Part-66 maintenance licence and be rated for the relevant aircraft type. Approved organisations must also use personnel qualified and rated under Part-66, as well as having the aircraft type within their organisational exposition. The exposition of an approved organisation is essentially the company manual and sets out the nature, scope, procedures and responsibilities for the organisation.

ML.A.801(d) does permit qualified certifying staff to be assisted by other personnel, provided they work under direct and continuous control.

In the case of aircraft operating on a Part 21 enduring permit to fly, there is a permit maintenance release authorisation system defined in British Civil Airworthiness Requirement (BCAR) Section A, Chapter A3-7 that allows holders of that authorisation to perform and certify maintenance. See CAP 553 for more details.

RESPONSIBILITIES

Although a CRS must not be issued when the aircraft is known to be unairworthy, the personnel or organisation assigned to a maintenance task are only responsible for correctly performing the work ordered by the person or organisation managing the airworthiness of the aircraft. Only the owner or a contracted organisation can take overall responsibility for the airworthiness of the aircraft. This is sometimes misunderstood but is a critical point in understanding the airworthiness system.

Reference: *Part-ML, Section A; Part-145; Part-CAO; CAP 553, BCAR Section A*

CHAPTER 1: THE AIRWORTHINESS SYSTEM

The Airworthiness Review

A key element of the Part-ML system is the Airworthiness Review. The review process examines the airworthiness status of the aircraft to ensure that the C of A remains valid.

When an airworthiness review has been completed and any associated compliance findings closed, the aircraft is issued with an Airworthiness Review Certificate (Form 15c) – referred to as the ARC. The ARC has a 12 month validity period. Whilst the C of A document for a UK registered aircraft does not expire, the aircraft cannot fly without a valid ARC.

In practical terms, the review is a safety health check of the aircrafts continuing airworthiness management and to some extent, maintenance.

The process and requirements are set out in Subpart I, ML.A.901-907. Although the review involves various documentation checks, it should never be considered a 'paperwork exercise'. To refer to it as such would indicate a misunderstanding of its conduct and purpose.

The airworthiness review process verifies the following:

- Airframe, engine, propeller flying hours and cycles have been properly recorded;
- Flight manual and weight & balance are current and reflect the aircraft configuration;
- Maintenance required by the programme (AMP) has been performed and correctly certified;
- Known defects have been corrected or appropriately deferred;
- Airworthiness Directives and other mandatory requirements such as generic requirements have been performed;
- Service life limited parts have not exceeded their life limitation;
- Modifications and repairs are compliant (performed in accordance with approved data);
- The aircraft complies with the latest revision of the type design and TCDS; and
- The aircraft holds a valid Noise Certificate if required.

The above is the documented review. The second element of the review is the physical survey - this checks that:

- All required placards and markings properly installed;
- The aircraft complies with its approved flight manual;
- No evidence of defect can be found that has not been addressed; and
- No inconsistencies can be found between the physical aircraft survey, the aircraft configuration and the documented review.

For aircraft not subject to a CAMO contract, the AMP must be reviewed by the airworthiness review staff as part of the review to ensure that it remains valid and effective.

In some cases, and only for aircraft subject to a CAMO contract, the ARC may be issued a first and second extension, extended on each occasion for 12 months.

Depending on the operational use of the aircraft, the airworthiness review can be performed by either an approved Part-CAMO/CAO/145 organisation or an ICS with a specific Part-ML approval to perform an airworthiness review, issued by the CAA.

The Airworthiness Review

In the case of ICS or a maintenance organisation, the review must be carried out alongside the aircraft's 100 hour or annual inspection. If a Part-CAO or Part-CAMO organisation is used, the review can be conducted at a separate time.

If circumstances reveal a potential safety threat, the CAA must perform the airworthiness review and issue the ARC.

Reference: *ML.A.901, ML.A.902, ML.A.904*

The Regulator

Both the state in which an aircraft is registered and the state of design have an important role to play in overseeing the airworthiness system.

All ICAO contracting states will have an aviation regulator appointed for this purpose. The UK Civil Aviation Authority (UK CAA) is the aviation regulator in the UK.

The activities undertaken by aviation regulators include:

- Approval and oversight of approved organisations;
- Licensing of engineers;
- Certification of new aircraft types and design changes;
- Survey and issue of aircraft certificates.
- Investigating Mandatory Occurrence and whistle blowing reports;
- Issue of Airworthiness / Operational Directives and other mandatory instructions; and
- Review and development of policy and regulations - also known as 'rulemaking'.

Part-ML, Section B sets out the procedures for the CAA overseeing aircraft, personnel and organisations under the Part-ML system.

COMMUNICATIONS

For safety critical information, the CAA uses a separate subscription service. This can be found using the following link: CAA Subscriptions - New Registration.

The CAA also uses the 'Skywise' system to notify aviation stakeholders of information or guidance relevant to their activities. It is available via App, website and as an email notification service. It can be configured by subject, depending on individual preference. More information can be found at skywise.caa.co.uk.

The regulator in the state of design will also issue communications regarding the airworthiness of aircraft or components for which they have responsibility. For example this could be the FAA in the USA or EASA in the case of DAHs residing in an EASA member state.

It is important to identify and subscribe to the relevant airworthiness communication channels from the state of design.

The Mandatory Occurrence Reporting System

THE MOR SCHEME

The requirement for a mandatory occurrence reporting (MOR) system stems from ICAO Annex 13. UK Regulations (EU) 376/2014 and 2015/1018 implement this in the UK.

The objective of the MOR system is:

> "To facilitate collection and exchange of information on actual or potential safety hazards and deficiencies and contribute to the prevention of aircraft accidents"

It is not to attribute blame or liability. Occurrence Reports are treated confidentially to maintain full and free reporting from the aviation community and to protect the identity of the reporter.

The MOR regulation asks pilots flying light aircraft to play an active role in making aviation safer by reporting certain safety occurrences. In the airworthiness context this includes:

- Abnormal severe vibration;
- Fire, explosion, smoke, toxic gas or fumes in the aircraft;
- Any flight which has been performed with an aircraft which was not airworthy;
- Any flight control not functioning correctly or disconnected;
- Any failure or substantial deterioration of the aircraft structure;
- Any loss of a part of the aircraft in flight;
- A failure of an engine, rotor, propeller, fuel system or other essential system; and
- Leakage of any fluid which resulted in a fire hazard or possible hazardous contamination or structure, systems or equipment or risk to occupants.

A full list of reportable occurrences can be found in UK Regulation (EU) 2015/2018, note there are others relating to aircraft operations that are not listed here.

The list applicable to pilots flying on aircraft other than complex-motor powered aircraft can be found in Annex V of the above regulation, only the technical occurrences have been picked out and listed above.

Reports are submitted using the aviation reporting portal. More information and guidance is also available at caa.co.uk/cap382. CAP 1496 contains further details on using the portal. If difficulties are experienced with the submission of a report, the CAA Safety Data team would be pleased to hear from the aviation community and can be contacted at sdd@caa.co.uk.

A key point to remember with reporting is that if the DAH and regulator are not aware of an issue, that lack of reporting may contribute to an incident or accident.

If a responsible person is aware of a safety occurrence and has reason to believe that it has not been reported as it should, the CAA has a whistleblowing policy via which issues may be raised in confidence.

The Mandatory Occurrence Reporting System

PART-ML REQUIREMENTS

ML.A.202 also requires that any person identified as having responsibilities under ML.A.201, shall report any condition of an aircraft or component which endangers flight safety to:

- The CAA;
- The organisation responsible for the type design or supplemental type design (DAH); and
- To the owner or CAMO / CAO, as applicable.

Persons identified in ML.A.201 and required to report the include the owner, operator, lessee, maintenance personnel or pilot in command.

Key info

Pilots and owners should always report any occurrence that is considered relevant to safety. If an occurrence is related to maintenance activity, ask the ICS or maintenance organisation if they have reported the issue.

REPORTING TO THE DAH

It is also important to report relevant occurrences to the DAH. Airworthiness Directives are normally issued when a DAH has reported an unsafe condition to the state of design.

A key part of the DAH identifying an unsafe condition is the feedback given through reporting schemes. This can allow safety interventions to be made before accidents and incidents occur.

DAHs are required to have a system to collect, investigate and analyse failures, malfunctions and defects related to designs for which they have responsibility. This extends to the different types of DAH, such as Type Certificate Holders, STC holders, Design Organisation Approval holders and ETSO holders.

Reference: *UK Regulation (EU) 2015/1018; ML.A.202; CAP 1496]*

Airworthiness System Summary

The DAH achieves type approval of the design and then produces aircraft in accordance with that approval, as reflected in the Type Certificate and associated data sheet. Changes (modifications and repairs) to the aircraft post manufacture must be approved prior to embodiment on the aircraft.

Feedback to the DAH throughout the life cycle of the type drives changes to the type design or the ICA. Mandatory occurrence reporting is a key part of this feedback. Where an unsafe condition applicable to the type is identified, an Airworthiness Directive may be issued mandating inspection or modification activity.

Throughout the life of an individual aircraft, continuing airworthiness management ensures that the aircraft remains airworthy. Maintenance work orders are placed to ensure the required work is performed by appropriately qualified ICS or approved organisations.

In some circumstances pilot-owners are permitted to perform maintenance.

The aircraft is maintained in accordance with the AMP. The data and processes provided by the DAH or manufacturer are used in all maintenance activity. Approved organisations and ICS follow the procedures and requirements of the airworthiness regulations and organisational exposition, as applicable.

The aircraft records are kept complete and are regularly updated from detailed maintenance records and utilisation data such as hours, cycles and landings.

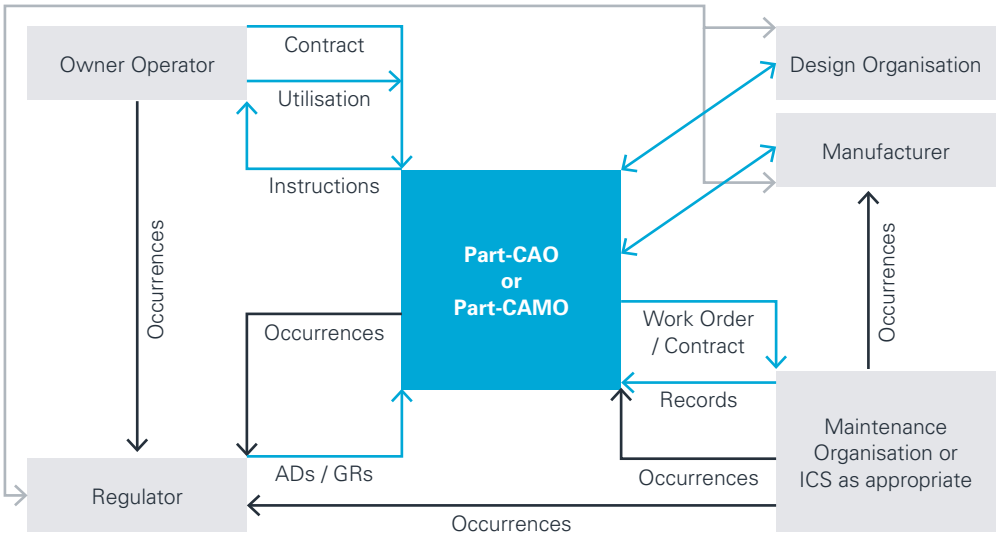
Regular airworthiness reviews ensure that the C of A remains valid.

The aviation regulator performs rulemaking, oversight, certification and investigation functions in support of the aviation system. Regulatory controls applied to the maintenance and continuing airworthiness management are proportionate to the complexity of the aircraft and operational use.

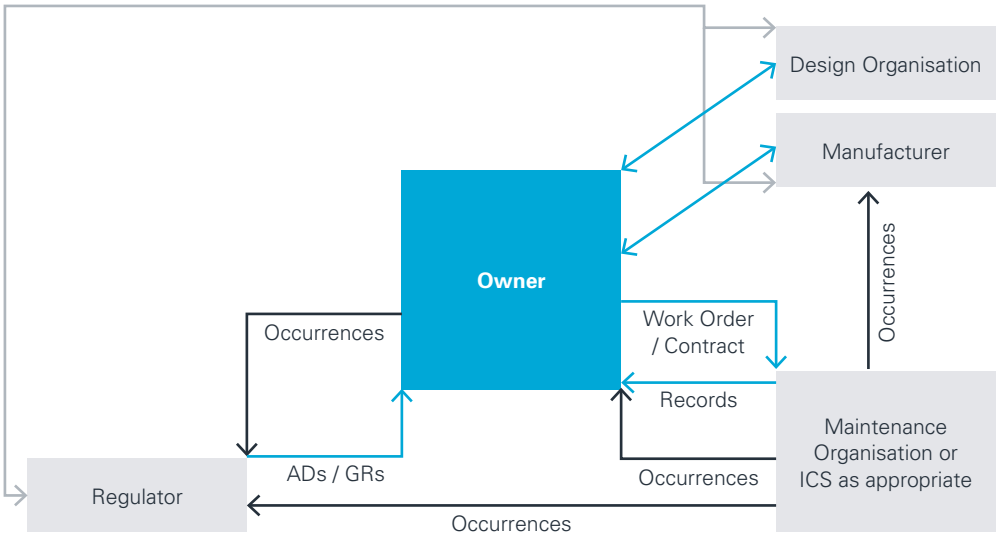
CHAPTER 1: THE AIRWORTHINESS SYSTEM

Airworthiness System Summary

Aircraft managed by an approved organisation



Aircraft managed by the owner



Organisational Approvals and the Airworthiness Codes

Below is a pictorial representation of the codes / structure discussed in the previous pages.

	Part-ML Aircraft Part-NCO and Non Commercial	**Part-ML Aircraft** Non Part-NCO and/or Operated by a commercial ATO / DTO
Continuing Airworthiness	Part-CAMO or Part-CAO (organisation) Owner	
Airworthiness Review	Part-CAMO or Part-CAO (organisation) *Part-145 with airworthiness review privileges *Part-66 ICS with CAA issued Part ML authorisation	
Maintenance	Part-CAO or Part-145 (organisation) Part-66 independent centifying staff Pilot / Owner	

*Only when concident with 100 hour inspection

Note: The above assumes appropriate certicate privileges are held.

AIRWORTHINESS RESPONSIBILITIES OF THE OWNER OR OPERATOR

02.

CHAPTER 2: AIRWORTHINESS RESPONSIBILITIES OF THE OWNER OR OPERATOR

Responsibilities

ML.A.201(a) states that the owner is responsible for the continuing airworthiness of the aircraft and shall ensure that no flight takes place unless the aircraft is:

- maintained in an airworthy condition;
- any operational and emergency equipment fitted is correctly installed and serviceable or marked as unserviceable;
- the airworthiness certificate is valid ; and
- maintenance is performed in accordance with the Part-ML AMP (Maintenance Programme).

Not all aircraft owners will have sufficient knowledge or being willing to manage the airworthiness of the aircraft themselves.

ML.A.201(f) allows the owner to sign a continuing airworthiness management contract (often known as a 'CAMO' contract) with an organisation approved under Part-CAO or Part-CAMO. Doing so essentially delegates the responsibility for the airworthiness of the aircraft to the organisation.

The full requirements and outline of a continuing airworthiness management contract are set out in Appendix I of Part-ML. Note that even when the airworthiness management is contracted, the owner still has obligations such as having a general understanding of the aircraft's AMP and presenting the aircraft for maintenance when directed by the contracted organisation.

Reference: *ML.A.201; Part-ML, Appendix I*

Does a flying school aircraft need to be managed and maintained by an approved organisation?

Under Part-ML, certain operational uses of the aircraft require that the operator of the aircraft enters into a CAMO contract with an organisation approved under Part-CAO or Part-CAMO or are themselves approved as a CAMO organisation:

- Use of the aircraft by a commercial Approved Training Organisation (ATO);
- Use of the aircraft by a commercial Declared Training Organisation (DTO); or
- Use of the aircraft outside of Part-NCO (e.g. Part-SPO).

The contract is required to be between the operator (normally the ATO or DTO) and the Continuing Airworthiness Management Organisation.

Note that when the CAMO requirement applies, it is also required that maintenance tasks on the aircraft are performed by a maintenance organisation approved under Part-CAO, Part-M or Part-145.

'Commercial' ATO or DTO in this context means one run as a business, not necessarily one that provides training for commercial pilot's licences.

Does a flying school aircraft need to be managed and maintained by an approved organisation?

NON-COMMERCIAL FLIGHT TRAINING

There are some circumstances in which flight training can take place, without the need for a CAMO contract covering the aircraft. Guidance on this subject is provided in GM1 to ML.A.201(e).

Note that payment may still be exchanged for the flights, but the activity should normally fall within one of the scenarios below.

Non-commercial ATO or DTO

Flights within an organisation that is an ATO or DTO, created with the aim of promoting aerial sport or leisure aviation and on the conditions that:

- The aircraft is operated by the organisation under ownership or dry lease;
- The ATO/DTO is a non-profit organisation; and
- Whenever non-members of the organisation are involved, such flights represent only a marginal activity of the organisation.

The criteria to be considered non-commercial in this scenario are similar to that for an 'organisation created with the aim of promoting aerial sport or leisure aviation', as set out in article 6(4a) of the UK Air Operations Regulation and associated GM. This includes further guidance on 'non-profit' status and 'marginal activity'. Note that 'non-profit' relates to the legal construct of the organisation, not the financial health of a business.

Pilot-owner training

Aircraft operated under Part-NCO by its owner together with an ATO or a DTO flight instructor for the purpose of training, where the contract between the owner and the training organisation and the procedures of the training organisation allow it. The continuing airworthiness of such aircraft remains under the responsibility of the owner, or of the CAMO or CAO organisation contracted by the owner.

Limited and specific training

Aircraft used for very limited training flights due to the specific configuration of the aircraft and limited need for such flights.

Reference: *ML.A.201(e)*

Does a private aircraft need to be managed and maintained by an approved organisation?

PRIVATE AIRCRAFT UNDER PART-NCO

Private aircraft operated under Part-NCO do not require a CAMO contract. An aircraft could potentially be managed by the owner and maintained by appropriately qualified ICS. With the appropriate authorisation from the CAA, ICS can also perform the airworthiness review and issue the ARC. Certain elements of the maintenance could also be performed by the owner.

Managing the airworthiness of your aircraft may bring an interesting and rewarding dimension to the ownership experience. However, for many aircraft owners the interest in aviation begins and ends with the flying and entering into a CAMO contract with an approved organisation will be the more appropriate option.

Owners considering managing the airworthiness of their aircraft need to be realistic about their interest, capability and time to do so. There are many tasks and considerations, for example:

- Producing and declaring the maintenance programme;
- Organising the maintenance tasks;
- Reviewing and actioning mandatory requirements such as ADs and Generic Requirements;
- Ensuring modifications and repairs are performed using approved data; and
- Updating the aircraft records and logbooks.

Continuing airworthiness management requires skill and attention to detail. This is reflected in the guidance material to ML.A.201(f):

> "If an owner decides not to make a contract with a CAMO or CAO, the owner is fully responsible for the proper accomplishment of the corresponding continuing airworthiness management tasks. As a consequence, it is expected that the owner properly and realistically self-assesses his or her own competence to accomplish those tasks or otherwise seek the necessary expertise".

Owners should be aware of their responsibility, as it is sometimes a conscious decision of approved organisations to perform maintenance tasks on an aircraft, but not to enter a contract that gives them responsibility for the continuing airworthiness.

In the absence of a Part-ML continuing airworthiness management contract, the full responsibility for airworthiness rests with the owner, even if the owner has paid an organisation or engineer to perform some of the continuing airworthiness management work. An aircraft is only managed by an approved organisation if a CAMO contract in accordance with Part-ML, Appendix I is in place.

Does a private aircraft need to be managed and maintained by an approved organisation?

PRIVATE HIRE AND NON-EQUITY GROUPS

Private owners hiring out their aircraft need to consider the airworthiness implications of doing so and have a system for monitoring the use of the aircraft and ensuring defects and damage are reported.

Some aircraft owners establish what is referred to as a 'non-equity' group, whereby they retain ownership of the aircraft but hire it out to a specific group of individuals who may pay a monthly subscription for the privilege of using the aircraft. Legally non-equity groups are no different from private hire.

Whilst private hire does not trigger the CAMO contract requirement, it will add complexity to the airworthiness management task for the owner. The CAA recommends aircraft owners in this situation do consider entering a CAMO contract, particularly if they are hiring out multiple aircraft. Commercial ATOs or DTOs hiring out their aircraft will require a CAMO contract if the aircraft is also used for training.

Pilots hiring an aircraft should also consider and question the airworthiness management and maintenance arrangements. Particularly with owner managed aircraft, there will be variation in the maintenance programmes and the standards applied may not be the same, even if all meet the minimum Part-ML requirements. Pilots may wish to discuss with the owner whether the AMP is appropriate for the aircraft's utilisation profile and whether any non-mandatory maintenance tasks are being omitted.

GROUP OWNERSHIP

Aircraft that are owned by a group of shareholders are still considered private aircraft. Provided the aircraft is operated under Part-NCO, the group may elect to manage the continuing airworthiness of the aircraft. As with a sole owner, the group members need to collectively consider the merits of doing so and whether entering a CAMO contract may be a safer and more realistic option.

If a group does decide to manage the aircraft, responsibilities for this need to be assigned within the group. Particularly in larger groups, one or several co-ordinated individuals need to be given the responsibility for ensuring all the necessary tasks are reviewed and completed. Even with a CAMO contract in place, all groups should have a robust mechanism for monitoring the use of the aircraft and ensuring that any defects or damage are reported and attended to in a timely manner.

CHAPTER 2: AIRWORTHINESS RESPONSIBILITIES OF AN OWNER / OPERATOR

Why does it matter if there is a formal continuing airworthiness management contract?

Part-ML is intended to be proportionate to the complexity of the aircraft and operational use. For example, the owner of a privately operated aircraft is given more scope to manage the airworthiness risks themselves compared to when an aircraft is used in a commercial environment. The diagram below visualises how the requirements are scaled.

THE PART-ML MAINTENANCE PROGRAMME

03.

CHAPTER 3: THE PART-ML MAINTENANCE PROGRAMME

The Part-ML Maintenance Programme (AMP)

INTRODUCTION

In the early days of aviation, engineers and aircraft operators realised that having a regime of inspections and maintenance tasks, rather than simply repairing failures, would improve aircraft safety and reliability. This concept is fundamental to continuing airworthiness and under Part-ML, the regime is known as the 'Aircraft Maintenance Programme' (AMP).

Part-ML also lists the minimum tasks that an AMP must contain and this is known as the 'Minimum Inspection Programme' (MIP). The AMP and MIP requirements are set out in ML.A.302 and the associated AMC and GM.

The Part-ML AMP and MIP concept replace previous arrangements for Part 21 aircraft maintained under the CAA Light Aircraft Maintenance Programme (LAMP). The use of LAMP is no longer permitted. This includes programmes based on LAMP where compliance with either the DAH data or the MIP (as applicable) cannot be demonstrated.

THE AMP TEMPLATE

There is a standard template for the AMP, available in MS Word format from the UK CAA's Part-ML webpage.

This chapter will guide the reader through each section of the AMP template, giving advice on what issues to consider. Text in italics indicates sample entries as a worked example.

Although compiling the AMP requires a review of certain documents, it should never be considered a paperwork exercise. The identification, inclusion and performance of maintenance requirements is what keeps an aircraft airworthy.

Reference: *ML.A.302*

The Part-ML Maintenance Programme (AMP)

SECTION 1 - AIRCRAFT IDENTIFICATION

Aircraft identification			
1	Registration(s): *G-ABCD*	Type: *Piper PA28-140*	Serial No (s): *28-24504*
	Owner: *Johanna Smith*		

The AMP includes details of the owner and the aircraft that are on the programme. It can cover more than one aircraft if any differences in the maintenance requirements are made clear. Logically the boundary for this will be other aircraft of the same type using the same data. The reason for this will become clear as the content of other sections is considered.

The Part-ML Maintenance Programme (AMP)

SECTION 2 - BASIS FOR THE MAINTENANCE PROGRAMME

Basis for the Maintenance Programme			
2	Design Approval Holder (DAH) instructions for continued airworthiness (ICA)	[X]	Minimum Inspection Programme (MIP) as detailed in the latest revision of AMC1 ML.A.302 (d) [ ] Other MIP complying with ML.A.302 (d) [ ] **(List the tasks in Appendix A)**

There are three options for the basis of the maintenance programme:

- Design Approval Holder (DAH) instructions for continued airworthiness;
- Minimum Inspection Programme (MIP) from AMC1 ML.A.302 (d); or
- Other MIP complying with ML.A.302 (d).

When considering which option to select, bear in mind that the MIP is exactly that, it is a regulatory minimum, generic in nature with no consideration of the specific aircraft being operated (customisation of the MIP is covered later on).

A DAH programme is specific to the type, even down to the sub-model and most likely has incorporated numerous service difficulties that have occurred on that type, therefore may carry safety benefits over using the MIP. A useful way of looking at the difference is to compare the MIP against the DAH recommendations, paying particular attention to the aircraft specific tasks that the DAH has included.

If the programme is to be approved by a Part-CAMO or Part-CAO organisation, any deviations from the DAH recommendations need to be identified and justified with a copy of that justification sent to the owner or operator. This is the case even when the MIP is used as the basis of the programme.

The 'other MIP' option allows the development of an alternative MIP compliant with the requirements of ML.A.302 (d). This would need detailed work to achieve and is not covered further in this publication.

There is no MIP for rotorcraft or airships therefore the AMP basis must always be the DAH data.

The Part-ML Maintenance Programme (AMP)

SECTION 3 – DAH INSTRUCTIONS FOR CONTINUED AIRWORTHINESS

If the programme is based on the MIP, Section 3 can be left empty, as the AMP assumes that the latest MIP will be used from AMC1 ML.A.302 (d) or if the 'other MIP' option is used, it will be included in Appendix A. Where based on the MIP, but individual DAH tasks are going to be added as desired, these can be added as detailed in Section 4.

If the AMP is to be based on DAH ICA, the relevant data is listed in this section. It is important to list all the data that is being used to schedule the maintenance. As an example, the TBO for an engine is generally not listed as part of the maintenance documentation, but as part of a Service Instruction, Letter or Bulletin.

Design Approval Holder (DAH) Instructions for Continuing Airworthiness (ICA)			
3	**Equipment manufacturer and type**		**Applicable ICA reference (revision/ date not required assuming the latest revision will always be used)**
For aircraft other than balloons			
3a	Aircraft (other than balloons)	*Piper PA28-140*	*753-586 Service Manual*
3b	Engine (if applicable)	*Lycoming O-320-E3D*	*60297-30 Operators Manual* *60294-7 Overhaul Manual*
3c	Propeller (if applicable)	*Sensenich 74 DM6-0-58*	*Sensenich Service Bulletin R17*
[balloon section omitted]			

It is important to capture all relevant DAH ICA data – this could include data from the DAH of individual parts or appliances (such as avionics or revised safety harness designs) on that aircraft that are subject to STC and/or European Technical Standards Order (ETSO). Individual DAH data should not be assumed to take account of that from other manufactures unless specific cross reference is made.

The Part-ML Maintenance Programme (AMP)

SECTION 4 – ADDITIONAL MAINTENANCE REQUIREMENTS

Section 4 considers and includes additional maintenance requirements. It is this section that is used to customise the programme to reflect the specific aircraft, configuration, operation etc.
Where tasks are applicable, the section is annotated "yes", and the specific tasks are included in Appendix B. In the following example, entries that might be typical of a GA aircraft have been made:

Additional maintenance requirements to DAH's ICA or to the MIP (applicable to all AMPs)			
4	**Indicate if any of the following types of repetitive maintenance are included in the AMP (when replying 'YES', list the specific requirements in Appendix B)**	**Yes**	**No**
	Maintenance due to specific equipment and modifications	*Yes*	
	Maintenance due to repairs		*No*
	Maintenance due to life-limited components (this should be only if the MIP is used. Otherwise, this data is already part of the DAH's data used as a basis for the AMP.)		*No*
	Maintenance due to mandatory continuing airworthiness information (airworthiness limitations (ALIs), certification maintenance requirements (CMRs), specific requirements in the TCDS, etc.)		*No*
	Maintenance recommendations, such as time between overhaul (TBO) intervals, issued through service bulletins, service letter, and other non-mandatory service information	*Yes*	
	Maintenance due to repetitive ADs	*Yes*	
	Maintenance due to specific operational/airspace directives/ requirements (altimeter, compass, transponder, etc.)		*No*
	Maintenance due to type of operation or operational approvals		*No*
	Other		*No*

The Part-ML Maintenance Programme (AMP)

SECTION 4 – ADDITIONAL MAINTENANCE REQUIREMENTS (CONTINUED)

Maintenance due to specific equipment and modifications

Maintenance due to specific modifications are those tasks due to a change from the original type design of the aircraft. ICA may have been issued by the organisation approving or embodying the modification (e.g., CS-STAN), and these should be considered and included as appropriate. Some Avionics manufacturers provide guides for installation in accordance with CS-STAN, which includes a section on ICA. Modern avionics can include items such as back up batteries and routine navigation database software updates therefore the specifics of these systems should be carefully considered.

A good example of maintenance due to specific modifications is vacuum pumps. The original pumps were largely replaced with more modern units in the 80s and 90s. Many of these pumps have inspection ports, inspection schedules and a recommendation to replace on the basis of indicated wear. Given that loss of control is a common cause of accidents in GA, this example illustrates the importance of properly identifying and considering maintenance recommendations.

Maintenance due to repairs

Maintenance due to repairs could be a life limited repair or, repeat inspections that are required by the manufacturers repair scheme when a particular repair has been performed.

Maintenance due to life-limited components (this should be only if the MIP is used. Otherwise, this data is already part of the DAH's data used as a basis for the AMP.)

This entry is generally only needed if the MIP is used because if the AMP is based on the DAH data, the life limited components should already be included in the DAH data. Whether using the MIP or DAH data, check that you have captured any life limited components in products, parts or appliances on the aircraft, particularly if related to modifications.

CHAPTER 3: THE PART-ML MAINTENANCE PROGRAMME

The Part-ML Maintenance Programme (AMP)

SECTION 4 – ADDITIONAL MAINTENANCE REQUIREMENTS (CONTINUED)

Maintenance due to mandatory continuing airworthiness information (airworthiness limitations (ALIs), certification maintenance requirements (CMRs), specific requirements in the TCDS, etc.)

More detail is included in the Managing Continuing Airworthiness section regarding identification of these tasks, but generally they are included in the DAH data and sometimes included as tasks on the type certificate data sheet, as illustrated below:

Life Limitations (see also AMM, chapter 4-00-00 (P/N 761-888)):

The bolt and stack-up that connect the upper drag link to the nose gear trunnion are required to be replaced every 500 hours time in-service. The part numbers are as follows:

1. Piper P/N 400 274 (AN7-35) bolt or Piper P/N 693 215 (NAS6207-50D) bolt;
2. Piper P/N 407 591 (AN960-716L) washer, as applicable;
3. Piper P/N 407 568 (AN 960-716) washer, as applicable;
4. Piper P/N 404 396 (AN 320-7) nut; and
5. Piper P/N 424 085 cotter pin.


EASA
TYPE-CERTIFICATE
DATA SHEET
Piper PA-34

On aircraft of a relatively new design, airworthiness limitations are well distinguished, reflecting their mandatory nature. Depending on the original certification date of the aircraft or product, it may not be obvious which airworthiness items should be considered mandatory for the purposes of the AMP. A variety of terms have been used historically to indicate mandatory requirements:

- Airworthiness limitations or airworthiness limitation items (ALI)
- Certification maintenance requirements (CMR)
- Safe life items or safe life limits or safe life limitations
- Life-limited parts (LLP)
- Time limits
- Retirement life
- Mandatory inspections or mandatory airworthiness inspections
- Fuel airworthiness limitations or fuel tank safety limitations

It may not be possible to ascertain whether the original DAH intended a task to be mandatory or what the consequence of discarding or reducing the frequency of a task may be. Particularly with older aircraft, the absence of a mandatory designation in the ICA is not necessarily an indication that disregarding a task is safe. Aircraft owners compiling their AMP should consult the DAH, a Part-CAO or Part-CAMO organisation knowledgeable of the type or the CAA when making determinations in this area.

The Part-ML Maintenance Programme (AMP)

SECTION 4 – ADDITIONAL MAINTENANCE REQUIREMENTS (CONTINUED)

Maintenance recommendations, such as time between overhaul (TBO) intervals, issued through service bulletins, service letter, and other non-mandatory service information

An example of this may be the engine TBO. Service bulletins are often used to identify an area that needs specific attention, and this information may not always be in the DAH inspection schedule. Service bulletins should therefore be considered an essential source of important airworthiness related type specific information. Although they may not all be mandated by the issue of an AD, they should be considered.

Owners should also consider the economics of decision making. Disregarding a recommended task or performing it less often might eventually lead to the replacement of an expensive part that otherwise might have been subject only to a relatively inexpensive repair. It may also reduce the value of the aircraft.

Maintenance due to repetitive ADs

ADs for GA aircraft are often produced by the regulator in response to an accident or incident but will always be in response to an identified unsafe condition. Often the AD will mandate compliance with a manufacturers service bulletin, be that an inspection or modification. Where a task has already been performed and is a single occurrence with no repeat requirement, it should be listed in the aircraft's records as having been complied with, but does not need to be included in the AMP. Only work that has not been performed and repeat requirements need to be included in the AMP.

Maintenance due to specific operational/airspace directives/ requirements (altimeter, compass, transponder, etc.)

As an example, there may be special maintenance requirements related to IFR flight. If the TCDS shows the aircraft capable of IFR flight, the DAH data should be consulted for more detail (e.g., AFM, service information or maintenance manual). Part-NCO, NCO.IDE (Instruments, Data & Equipment) should be consulted for equipment requirements relevant to the operation or airspace. For example, if an ELT is required to be fitted, the AMP should include the battery life or replacement schedule. For repeat tasks such as updating avionics navigation data, these should be included in the AMP if not already within the DAH ICA being used.

The Part-ML Maintenance Programme (AMP)

SECTION 4 – ADDITIONAL MAINTENANCE REQUIREMENTS (CONTINUED)

Maintenance due to type of operation or operational approvals

This entry may not be relevant for normal Part-NCO operations, but for activities such as glider towing or other specialised operations (NCO.SPEC or Part-SPO), these may bring additional airworthiness considerations not covered elsewhere. The impact of any specific operational approvals should also be included.

Other

This section can be used for any other task the owner or approved organisation wishes to add, that is not covered by the above. Even if the MIP is used as a basis for the AMP, the owner could still elect to add desired DAH tasks using this section. For example, the owner may wish to add more frequent tail wheel maintenance when operating from a bumpy strip or include more corrosion inspections due to the the UK's damp and often saline environment. This section is for the owner to consider what else may be needed to keep the aircraft in an airworthy condition.

The Part-ML Maintenance Programme (AMP)

SECTION 5 – MAINTENANCE TASKS ALTERNATIVE TO THE DAH ICA

If there are any tasks in the AMP that are alternative to the DAH ICA, "yes" must be annotated in Section 5. The individual alternative tasks must then be listed in Appendix C.

	Maintenance tasks alternative to the DAH's ICA (not less restrictive than MIP)		
5	**Indicate if there is any maintenance task alternative to the DAH's ICA (when 'YES', list the specific alternative maintenance tasks in Appendix C)**	*Yes*	~~*No*~~

Key info

If a task is mandatory such as an AD or Airworthiness Limitation, it must always be included in the AMP, without deviation.

Any deviation from a non-mandatory task or interval must also comply with the MIP.

Part-ML allows for deviations from DAH ICA, but only when tasks are not classified as mandatory. Deviations could include escalation of a task (doing a task less often), increasing the frequency of a task, changing the scope of a task or disregarding a task completely. However, the alternative task or frequency of task is not permitted to be less restrictive than the equivalent task in the MIP.

Whilst the potential savings of alternative tasks may look tempting, an owner should consider if they possess the knowledge and aircraft maintenance experience to make decisions related to the proposed alternative task. The DAH has included the task, most likely based on significant operational experience and analysis, which may include knowledge of incidents and accidents.

For example a corrosion inspection task may not be mandatory but in a climate such as the UK, may be highly advisable.

Key info

Before deciding to adopt an alternative or less frequent task to that of the DAH ICA, the owner should consider their liability liable in the event that an incident or accident occurs as a result.

Whilst in the short term some alternatives could save money, an escalation or deletion of a task may lead to a defect not being identified until a point where repair is no longer possible, therefore increasing the long-term cost of ownership.

The Part-ML Maintenance Programme (AMP)

SECTION 5 – MAINTENANCE TASKS ALTERNATIVE TO THE DAH ICA (CONTINUED)

An example of a possible 'false economy' may be operating beyond engine TBO. If the engine is overhauled having exceeded TBO by a considerable margin, you may find that additional parts of the engine have worn beyond specification and need replacement. Whereas an overhaul at TBO may require less replacement of parts. Timely interventions may be economically more efficient over the long term.

It should be noted that manufacturers recommendations are based on adherence to servicing schedules and task frequencies and may be compromised if these schedules are not followed.

The table below gives some examples of when deviations from ICA task intervals are permitted.

ICA task	AMP proposed alternative	MIP task	Alternative acceptable Yes / No
Inspection XX 6 months interval	Inspection XX 12 months interval	Inspection XX 12 months interval	Yes
Inspection XX 12 months interval	Inspection XX 24 months interval	Inspection XX 12 months interval	No
Inspection XX 24 months interval	Inspection XX 36 months interval	Inspection XX 12 months interval	No (24 months to be used)
Functional test system XX	Operational test system XX (same interval) or general visual inspection system XX (same interval)	Functional test system XX (same interval)	No*
Operational test system XX	Functional test system XX (same interval)	Operational test system XX (same interval)	Yes*
Inspection XX 24 months interval	Inspection XX 36 months	None relevant	Yes
Functional test	General visual inspection	None relevant	Yes

*A functional test is more restrictive (more detailed) than an operational test

If the MIP permits a deviation from the DAH ICA recommended task or interval, the owner or CAMO must consider the possible safety impact.

The Part-ML Maintenance Programme (AMP)

SECTION 5 – MAINTENANCE TASKS ALTERNATIVE TO THE DAH ICA (CONTINUED)

The table below lists some factors to consider and indicates scenarios in which deviations from the DAH ICA may represent a higher risk.

Consideration	Possible risk level
OPS approval	**Higher Risk:** commerical operation, commercial flight training **Medium Risk:** flight training by an association, non-commercial specialised operations (SPO) **Lower Risk:** private
Flight rules	**Higher Risk:** instrument flight rules (IFR) **Medium Risk:** visual flight rules (VFR) at night **Lower Risk:** VFR by day
Aircraft weights	**Higher Risk:** Other than ELA1* **Medium Risk:** ELA1 aircraft other than light sport aeroplanes (LSA), very light aircraft (VLA), sailplanes and powered sailplanes **Lower Risk:** LSA, VLA, sailplanes and powered sailplanes
Who manages the airwothiness of the aircraft?	**Higher Risk:** owner **Lower Risk:** CAMO / CAO
Who maintains the aircraft?	**Higher Risk:** pilot-owners **Medium Risk:** independent certifying staff **Lower Risk:** maintenance organisation
Time in service (flight hours, years)	**Higher Risk:** very high number of hours or years **Medium Risk:** medium number of hours or years **Lower Risk:** low number of hours or years
Aircraft utilisation	**Higher Risk:** less than 50 h per year **Medium Risk:** around 200 h per year **Lower Risk:** more than 400 h per year
ACAM findings*	**Higher Risk:** numerous findings in ACAM or ramp inspections **Medium Risk:** few findings in ACAM inspections **Lower Risk:** rare findings in ACAM inspections

The Part-ML Maintenance Programme (AMP)

SECTION 5 – MAINTENANCE TASKS ALTERNATIVE TO THE DAH ICA (CONTINUED)

Consideration	Possible risk level
System redundancy (for components such as engine/propeller)	**Higher Risk:** single-engined aircraft **Lower Risk:** multi-engined aircraft
Supplementary maintenance measures	**Higher Risk:** no supplementary measures **Lower Risk:** supplementary measures (such as oil analysis, engine data monitoring, boroscope inspections, corrosion inspections, etc.)
Risk factor of component failure	**Higher Risk:** engine failure on a helicopter **Medium Risk:** engine failure on an aeroplane **Lower Risk:** sailplane, or powered sailplane

*ACAM refers to Aircraft Continuing Airworthiness Monitoring inspections - these are carried out by the UK CAA or other national aviation authorities. A 'finding' refers to a non-compliance identified during the inspection.

*For aeroplanes, ELA1 includes an aircraft with a Maximum Take-off Mass (MTOM) of 1200 kg or less that is not classified as a "complex motor-powered aircraft".

Where a Part-CAO or Part-CAMO organisation is contracted, in approving the AMP they must identify and justify any deviations from the DAH data (including if they use the MIP). A copy of the deviations and associated justifications must be provided to the owner.

Where the owner is managing the aircraft and declares the AMP, they are not required to justify the deviations, however it may be useful for future reference to document any research and justifications for deviations that have been included.

CAP 747 Generic Requirement 17 (Propellers) and Generic Requirement 24 (Engines) no longer apply to Part 21 aircraft under Part-ML. Deviations from recommended overhaul periods must be considered in accordance with the AMP and MIP framework.

The Part-ML Maintenance Programme (AMP)

SECTION 6 – PILOT-OWNER MAINTENANCE

Where it is intended for pilot-owner maintenance to be performed, the details of the pilot-owner(s) performing the work should be entered into this section. In the event of multiple pilot-owners, the names may be listed separately. See the separate section in this guidance covering pilot-owner maintenance.

Pilot-owner maintenance (only for balloons not operated under Subpart-ADD, or sailplanes not operated under Subpart-DEC, or other aircraft operated under Part-NCO) Remark: pilot-owner maintenance is not allowed for aircraft operated by commercial ATO/DTO				
6	**Does the Pilot-owner perform Pilot-owner maintenance (ref. Part-ML, ML.A.803)?**		*Yes*	~~*No*~~
	If yes, enter the name of the pilot-owner(s) authorised to perform such maintenance:			
	Pilot-owner name:	*Johanna Smith*	Licence Number:	*GBR.FCL.CP.444205J*
	Signature:	*JS*	Date:	*12/08/2022*
	Note: It is possible to refer to a list in the case of jointly owned aircraft.			

Pilot-owner maintenance is only permitted for aircraft not used commercially. A way to think of it is that pilot-owner maintenance cannot be performed on an aircraft where Part-ML requires a CAMO contract.

The Part-ML Maintenance Programme (AMP)

SECTION 7 – APPROVAL / DECLARATION OF THE AMP

Approval/Declaration of the Maintenance Programme (select the appropriate option)				
7	**Declaration by owner:**	[X]	**Approval by contracted CAMO/CAO:**	[ ]
	'I hereby declare that this is the maintenance programme applicable to the aircraft referred to in block 1, and I am fully responsible for its content and, in particular, for any alternatives tasks to the DAH's data.'		Approval Reference No of the CAMO/CAO:	
	Pilot-owner name:	*Johanna Smith*	Name	
	Signature:		Signature:	
	Date:	*12/08/2022*	Date:	

The Part-ML AMP can be either approved or declared and the distinction is simple. If the aircraft is managed by a Part-CAMO or Part-CAO organisation, that organisation must approve the AMP. If the aircraft is not formally managed by a Part-CAMO or Part-CAO organisation, the owner must declare the AMP. The AMP is not valid until it has been declared or approved.

> "I hereby declare that this is the maintenance programme applicable to the aircraft referred to in block 1, and I am fully responsible for its content and, in particular, for any alternatives tasks to the DAH's data."

The organisation or person approving or declaring the AMP must keep it updated.

The Part-ML Maintenance Programme (AMP)

SECTION 8 – THE CERTIFICATION STATEMENT

	Certification statement			
8	**'I will ensure that the aircraft is maintained in accordance with this maintenance programme and that the maintenance programme will be reviewed and updated as required'**			
	Signed by the person/organisation responsible for the continuing airworthiness of the aircraft according to ML.A.201:			
	Owner/Lessee/operator:	X	CAMO/CAO:	☐
	Name of owner/lessee or CAMO/CAO approval number: *Johanna Smith*			
	Address: *6 Privet Drive, Crawley, RH10 1AR*			
	Telephone/fax:			
	E-mail:			
	Signature: JS			
	Date: *12/08/2022*			

The certification statement is confirming that the person or organisation responsible will maintain the aircraft in accordance with the AMP and that it will be reviewed and updated as required.

The Part-ML Maintenance Programme (AMP)

SECTION 9 – APPENDICES

9	**Appendices attached:**	**Yes**	**No**
	Appendix A	☐	☒
	Appendix B	☒	☐
	Appendix C	☒	☐
	Appendix D	☐	☒

This section indicates the appendices that form part of the AMP. For the example given, there will be no appendix A because the AMP is based on the DAH data. Appendix A would only be used if the "other MIP" option was to be used, then the tasks from the "other MIP" would need to be listed. There will be an Appendix B because additional maintenance requirements have been identified. An appendix C is included because there is at least one task alternative to the DAH recommendations.

It is important to remember that the AMP is not a live status report, it is a document that sets out the maintenance to be performed and the frequency it is to be performed at. The frequency or interval for GA aircraft is normally expressed in hours or calendar time. Some tasks may be tracked by landings or airframe cycles, so it is important to know what needs to be tracked. This information should be found in the document used as the basis for the programme. Examples of completed appendices B & C are below.

Appendix D can be used to provide additional information and there are no specific requirements for its content. It could be used to provide a complete list of AMP tasks, or it could be used to list all of the documents reviewed to create the programme. Use of Appendix D is optional.

The Part-ML Maintenance Programme (AMP)

SECTION 9 – APPENDICES (CONTINUED)

Appendix A — Minimum inspection programme (MIP) (only applicable if a MIP different from the one described in AMC1 ML.A.302(d) is used — see Section 2 above)
Detail the tasks and inspections contained in the MIP being used.

Appendix B — Additional maintenance requirements (include only if necessary — see Section 4 above)		
This appendix is supposed to include only the tasks which are included in the AMP, either at the recommended interval or at a different one. (All repetitive maintenance tasks not included here, or the interval differences should be kept by the CAMO/CAO (when contracted) in their files with their corresponding justifications. Appendix D may optionally be used. Nevertheless, the owner/CAMO/CAO is responsible for taking into account all instructions, even if they are not adopted and listed here. The person performing the AR, if reviewing the AMP, is not responsible for the completeness of this appendix, but may do some sampling as part of the investigations and the findings discovered during the physical review).		
Task Description:	**References:**	**Interval:** (tick box if the selected interval differs from that required in the referenced document)
Maintenance due to specific equipment and modifications		
AA211CC Vacuum Pump Life Limit	*Tempest SL-003 (note – unit has no WIP)*	*800H* ☐
Maintenance due to repairs		
		☐
Maintenance due to life-limited components (This should be only if the MIP is used. Otherwise, this data is already part of the DAH's data used as the basis for the AMP.)		
		☐
Maintenance due to Mandatory Continuing Airworthiness Instructions (ALIs, CMRs, specific requirements in the TCDS, etc.)		
		☐

The Part-ML Maintenance Programme (AMP)

SECTION 9 – APPENDICES (CONTINUED)

Appendix B — Additional maintenance requirements (continued)			
Maintenance recommendations, such as time between overhaul (TBO) intervals, issued through service bulletins, service letter, and other non-mandatory service information			
Engine Overhaul	*Lycoming SI 1009 (Notes 11, 15 & 16 apply)*	*2400H*	☐
Propeller Overhaul	*Sensenich SB R17 (Metal Prop TBO)*	*2000H*	☐
Emergency locator transmitters and personal locator beacon — annual testing	*EASA SIB 2019-09*	*1 Year*	☐
(if not using MIP or equivalent ICA task) Transponder test	*EASA SIB 2011-15*	*2 Years*	☐
Maintenance due to repetitive ADs			
Wing Spar Corrosion	*EASA AD 2005-0032*	*7Y*	☐
Oil Cooler Hoses (TSO-C53a Type C fitted)	*FAA AD 2017-14-04*	*8Y / 1000H*	☐
Control Cable Failures	*FAA AD 2013-02-13*	*7Y / 2000H*	☐
Stabilator Balance Tube Cracking	*EASA AD 2005-0034*	*200H*	☐
Maintenance due to specific operational/airspace directives/requirements (altimeter, compass, transponder, etc.)			
			☐
Maintenance due to type of operation or operational approvals			
			☐
Other			
			☐

The Part-ML Maintenance Programme (AMP)

SECTION 9 – APPENDICES (CONTINUED)

Appendix C — Maintenance tasks alternative to the DAH's ICA (not less restrictive than MIP) (include only if necessary — see Sections 5 above)			
Task Description	**Recommended interval**	**Alternative inspection/task**	**Amended interval**
When the DAH's ICA are used as the basis for the AMP, this appendix is supposed to include only the task's alternatives to the DAH's ICA, which are included in the AMP. (When a CAMO/CAO is contracted, all elements justifying the deviations to the DAH's ICA should be kept by the CAMO/CAO and the organisation should provide a copy of these justifications to the owner)			
Engine Overhaul	*12Y (FH limitation has been adopted, unchanged)*	*Addition of conditional inspections at 100H intervals, as detailed in justification form attached.*	*15Y Overhaul* *100H Conditional Inspections.*

Appendix D — Additional information (optional)
This appendix may optionally be used to provide additional information, such as the complete list of AMP tasks or the list of documents (e.g. service bulletins) considered during the development of the AMP.

Review of the AMP

The AMP is required to be reviewed annually. This review cannot be performed by the owner. If the owner manages the aircraft, the review should be considered as an independent check of the content of the AMP. The review is critical for identifying conditions that might adversely impact the airworthiness of the aircraft.

If an aircraft is managed by a Part-CAMO or Part-CAO organisation, the review of the AMP does not necessarily need to be conducted at the same time as the Airworthiness Review of the aircraft.

If an aircraft is not managed by an approved organisation but rather declared by the owner, the review of the AMP must be performed at each Airworthiness Review by the approved organisation or Part-ML authorised ICS who issues the ARC.

The purpose of the review is to assess the effectiveness of the AMP. This is done mainly by looking at issues identified during maintenance for the last 12 months and also reported throughout the year by pilots(s) and assessing if these are related to a deficiency in the maintenance programme. This is generally where a defect has occurred, related to where the owner has elected to disregard a DAH task recommendation (e.g. significant corrosion that would have been detected earlier had the owner performed the specific corrosion inspections recommended by the DAH).

In addition, the review checks the following:

- Revisions to the documents that form the basis of the programme (e.g., MIP or DAH data);
- Changes in the aircraft configuration, and type and specificity of operation;
- Changes in the list of pilot-owners; and
- Applicable mandatory requirements such as Airworthiness Directives, Airworthiness Limitations, Certification Maintenance Requirements and specific maintenance requirements included in the TCDS.

Even maintenance requirements for older aircraft evolve as type experience is gained, so it is important to consider the above points at each review.

If deficiencies are identified, the Part-CAMO, Part-CAO or owner as applicable must amend the AMP. The ARC (Form 15c) cannot be issued until the amendment is made and the aircraft is in compliance with the amended AMP.

When an AMP is not required

ML.A.302 (e) states that declaration by the owner or approval by the Part-CAMO or Part-CAO is not required and an AMP document will not need to be produced when:

- All ICA from the DAH are being followed without deviation;
- All maintenance recommendations such as TBO intervals, issued through Service Bulletins, service letters and other non-mandatory service information are being followed without any deviations; and
- All pilot-owners are authorised to perform pilot-owner maintenance.

Since the AMP must reflect any tasks required due to modifications, repairs or operating considerations, it is unlikely that this option will be applicable for most GA aircraft.

Following all maintenance recommendations would also require applying and evidencing every service bulletin or letter issued for the aircraft. For a common GA type that is perhaps 25 years old or more, this may not be realistic from a time and cost point of view.

The 'no AMP document' option is more likely to be applicable when an aircraft is new or relatively simple. The inclusion of the option was intended primarily for balloons, although it may be used for other aircraft if appropriate.

Notes on the MIP

AMC1 ML.A.302 (d) includes an acceptable MIP for the different categories of aircraft, noting that there is no MIP for rotorcraft or airships, therefore the DAH data must be used as the AMP basis.

When using a MIP, the customisation of the programme, as detailed in the previous sections, is still required. The MIP gives only core tasks which then must be tailored to the specific aircraft and operation.

When using the MIP, it is still a requirement to use the manufacturers maintenance manual to accomplish each task / inspection. As an example, the MIP task for the wheels includes an inspection for cracks, defects, and condition of the bearings. The work would need to be performed in accordance with the procedure included in the manufacturer's manual. This is logical when considering that the manufacturers may have specified areas of interest from service experience and in some cases wear limits beyond which operation is unsafe.

Given the requirement to use DAH data for the actual tasks and inspections, a reasonable question might be "what benefit do we get when using the MIP as opposed to the DAH ICA, most of which will also be on a 100 hour major check cycle?". This is a valid question but remains the responsibility of the Part-CAMO, Part-CAO or owner to answer.

The MIP includes a tolerance of 1 month or 10 hours (to the 10 hour inspection). The next interval is calculated from the time the inspection takes place.

When performing a MIP task, proper operation of backup or secondary systems and components should be performed, whenever a check for improper installation / operation is carried out.

Summary of AMP responsibilities

AMP element	Owner managed	CAMO/CAO managed
Customisation for the aircraft	Required	Required
Development & approval status	AMP declared by the owner.	AMP approved by the CAMO / CAO.
Performance of the AMP review	At airworthiness review by airworthiness review staff. Owner must resolve issues raised by amending and declaring the AMP.	By CAMO / CAO at least every 12 months. CAMO / CAO resolves issues raised by amending and approving the AMP.
Management & responsibility for deviations/ alternate tasks	Shall not be less restrictive then the MIP. No justifications is requred and the owner takes responsibility for the alternate task deviation inclusing any consequences.	Shall not be less restrictive then the MIP. Assessment and justification copy to be sent to owner and held on file. CAMO / CAO takes responsibility for the alternate task deviation including any consequences.

PRACTICAL CONTINUING AIRWORTHINESS

04.

CHAPTER 4: PRACTICAL CONTINUING AIRWORTHINESS

Introduction

Chapter 1 established that the key to continuing airworthiness management was the effective management of the following items:

- Accomplishment of pre-flight inspections;
- Rectification of defects and damage in accordance with approved data;
- Accomplishment of repairs and modifications in accordance with approved data;
- Performing the maintenance as required by the maintenance programme;
- Accomplishment of any applicable mandatory requirement; and
- Performing maintenance check flights.

This chapter explores in more detail how this is achieved, explains some of the key points and terms used and links to other resources that may be helpful to owners when either managing their own aircraft or entering into a continuing airworthiness management contract with a Part-CAMO or Part-CAO organisation.

For group owned aircraft, best practice is to appoint a willing coordinator in the group to manage the aircraft and serve as the single point of contact between the group and the maintainer and/or CAMO organisation. It is important to set group rules for responsibilities and agreement on financial decisions, this will avoid misunderstandings within the group or with the maintainer. It is important that the nominated person within the group has the time and competence to effectively manage the tasks.

Whilst this document is predominantly technical in its nature, financial planning for ongoing maintenance and major costs should also be considered. Good practice could include an engine fund, noting that the engine overhaul or replacement is usually the biggest cost of GA aircraft ownership.

Reference: *ML.A.301*

Pre-flight Check

Foremost in the pre-flight checklist is making sure that the aircraft is airworthy and fit for the intended flight. The pre-flight check is not considered a maintenance check therefore no certificate of release to service is required.

This section deals with the aircraft element of the pre-flight check, it does not address pre-flight planning or operational elements.

The pre-flight check should include a walk around inspection of the aircraft and its equipment for general condition. Guidance for this activity will be found in the AFM, and normally includes checking the following:

- External surfaces are free of ice, snow, sand, dust, and any other surface contaminant;
- Tie downs have been removed and secured;
- Surface locks, tow bars, sensor covers, and aperture blanks have been removed and stowed;
- Engine oil / hydraulic oil content;
- Correct tyre inflation and oleo extension;
- Fuel content, free from contamination and sufficient for the intended flight and any foreseeable diversion;
- Obvious signs of wear, damage, or leakage;
- The correct emergency equipment is present and serviceable;
- Weight and balance calculations, including performance of the aircraft, taking into account the aerodrome(s) being used;
- Any documents required are present and valid; and
- Deferred defects and the impact on the aircraft and its equipment.

Key info

The pre-flight check can become very routine, but it must not be overlooked - it is the last opportunity to identify an unsafe condition that could result in an inflight emergency.

The pre-flight check should never be rushed. Many people involved in GA will recall incidents and accidents involving tow bars, pitot covers, control locks, incorrect weight and balance or insufficient fuel for the flight.

WEIGHT & BALANCE

The accuracy of weight and balance calculations highlights an important relationship between the airworthiness and operation of the aircraft.

It is important that pilots conduct weight and balance calculations before flight, to ensure that the aircraft remains within its certified weight and balance envelope. In order for those calculations to be correct, the basic weight and centre of gravity of the empty aircraft must also be accurate.

If an aircraft has been subject to multiple modifications or paint work, without updates to the weight and balance schedule, there is a risk that the aircraft may fly outside of the certified envelope, even if the calculations may appear correct to the pilot.

> "How confident are you in the basic weight and centre of gravity figures for your aircraft?"

Reference: *ML.A.301*

Managing Defects

If an aircraft is damaged or has a technical defect, it is important to ascertain how it might impact its operation. ML.A.403 states that "any aircraft defect that seriously endangers the flight safety shall be rectified before further flight".

The following defects are permitted to be deferred, if the pilot has determined they do not hazard flight safety:

- Defects affecting non-required aircraft equipment;
- Defects when using the minimum equipment list or configuration deviation list (MEL / CDL); and
- Any other defect where the aircraft is operated under Part-NCO.

> "All other defects may only be deferred by an approved organisation or ICS."

If the aircraft is managed by the owner, the owner must agree to the deferral of a defect. If managed by a Part-CAMO or Part-CAO organisation, that organisation must agree the deferral. An entry must be made in the aircraft records of any deferred defect.

Another consideration is the deferral of defects that might impact the performance of the aircraft or its equipment. It should always be apparent to the pilot what the serviceability status is of the aircraft they are flying, including any performance limitations.

Part-NCO Subpart D, Instruments, Data and Equipment (NCO-IDE) should also be considered as it specifies equipment required for flight including instruments, aircraft equipment, safety equipment. Even if the pilot considers it safe, it may not be legal to operate an aircraft with deficiencies in required instruments, data, and equipment.

The Minimum Equipment List (MEL) provides for the operation of an aircraft with specified equipment inoperative. It also specifies any conditions that must be met when operating in that condition. Normally an MEL is produced by an aircraft operator and based on the Master Minimum Equipment List provided by the DAH.

The Configuration Deviation List (CDL) is a list established by the DAH which identifies external parts of an aircraft that may be missing at commencement of a flight (e.g., missing doors or panels). It also specifies any conditions (e.g., performance reductions) that must be considered when operating. A CDL is produced by an aircraft operator based on the CDL provided by the DAH.

Most aircraft subject to Part-ML will not have an MEL or CDL provided by the DAH, although where they do exist, they must be used.

RECTIFICATION

In most cases the desired outcome is to rectify the defect and restore the serviceability of the aircraft. It is essential that the work is performed as detailed by the DAH data. In practical terms this means following the aircraft maintenance manual, using the appropriate tools and using the parts specified in the relevant illustrated parts catalogue.

Defect deferrals cannot be indefinite in their duration. Part-ML requires that any defect that does not seriously hazard flight safety is rectified as soon as practicable from the date on which the defect was first identified and within the limits specified in the maintenance data. This is logical when considering that any defect is an erosion of the type design standard.

Reference: *Part-ML, ML.A.301, ML.A.401, ML.A.403; UK Regulation (EU) 965/2012, Part-NCO*

Managing Repairs

The initial damage assessment performed by the repairer must establish the approved repair data to be used. The purpose of the repair is to restore the aircraft to an airworthy condition. Repair data will be either approved by the CAA, a design organisation approved under Part 21 or via Standard Change or Repair (CS-STAN). The following are common examples of repair data:

- Maintenance Manual, Repair Manual or other repair data approved and issued by the DAH;
- Part 21 Approved Data (Design Organisation); or
- Standard Repair (CS-STAN). This may also allow the use of FAA Advisory Circular AC 43.13 – 1B, although this should be checked in CS-STAN before use.

An owner managing their own aircraft is responsible for ensuring that the repair is performed in accordance with approved data.

Although repairs restore the aircraft to a safe condition, unless they are repaired by replacement of all affected components with those equivalent to original manufacture, the aircraft may not fully meet its original production standard. Some repairs, particularly major repairs may include an ongoing repeat inspection to assess the condition of the repair throughout the remaining life of the aircraft.

Any previous repairs that may require repeat inspection should be considered in the context of the AMP customisation. Some major repairs may require the aircraft to be reweighed to establish the new basic weight.

Good records of repairs are essential as without them, it may not be possible to issue an Airworthiness Review Certificate. Loss of these records may also devalue the aircraft, make it difficult to sell and in some cases require the repair to be removed and a new approved repair performed.

Reference: *Part-ML, ML.A.301, ML.A.304, ML.A.401; Part 21, Subpart M*

CHAPTER 4: PRACTICAL CONTINUING AIRWORTHINESS

Managing Modifications

Modifications can increase the value and change the reliability, performance or aesthetics of an aircraft. Some modifications may be mandatory for particular airspace or operations (e.g., transponder or 8.33khz radio installations). Modifications to the aircraft must always be approved. The approval signifies that the modification meets the applicable design standards or certification specifications.

Modification data will be either approved by the CAA, a design organisation approved under Part 21 or be a Standard Change in accordance with CS-STAN. The following are more common examples of modification data:

- Service Bulletin Issued by the DAH
- Part 21 Approved Modification
- Standard Change (CS-STAN)
- CAA Supplemental Type Certificate (STC)
- FAA/EASA STC – see notes in the table

Some modifications introduce new ICA. This may well require an update to the AMP and relevant data will need to be shared with whoever is undertaking the applicable maintenance tasks. Some modifications introduce new operational equipment or impact the performance of the aircraft, often requiring a flight manual supplement to be included in the AFM. Some modifications may require a new calculation of the basic aircraft weight, including a new weight and centre of gravity schedule or may require a physical reweigh of the aircraft.

STCs

FAA STCs are not automatically approved for UK Part 21 aircraft, however many existing FAA STCs have been approved or validated by the CAA or EASA. Depending on when the original validation was issued, it may or may not be necessary for the FAA STC to be further validated by the CAA before use.

Period of original STC approval or validation	Approval Basis
Pre-EASA (before 28th Sept 2003)	FAA STCs validated by an EU Member State prior to EASA are considered to hold a "Grandfathered" approval. "Grandfathering" is a term used by the EU Regulations and allows EASA acceptance of approvals granted under the pre-EASA certification regimes of EASA Member States. Prior to EASA, the CAA would have validated foreign STCs via the issue of an Airworthiness Approval Notice (AAN).
During UK membership of EASA	Validation of the FAA STC by EASA, and EASA STC issued.
Post UK membership of EASA (since 1st January 2021)	STC validation required by the CAA. This includes any changes made after 31st December 2020 to previously validated FAA STCs.

Managing Modifications

EASA STCs are not all automatically approved for UK Part 21 aircraft. In general, an applicable EASA STC may be considered as accepted under the following circumstances:

Period of STC approval or validation	Approval Basis
During UK membership of EASA	STC approved by EASA with the issue of an EASA STC. STC continues to be accepted by the CAA.
Post UK membership of EASA (since 1st January 2021)	A new EASA STC has to be validated by the CAA, if it is classified as "significant" (Part 21,21.A.101). For all "non-significant" STCs and changes to STCs that do not require a CAA STC certificate change, these are accepted based on the EASA approval.

The table relates to when the version of the EASA STC being embodied was approved. For example, an STC approved during the UK membership of EASA remains approved and can be used for new installations, as long as it has not changed since the UK ceased its EASA membership. In the case of a new STC or change to an existing STC after the 31st December 2020, a direct CAA validation of that change may be needed.

Complete records of modifications, including the approved data (e.g., STC) are essential as without them, it may not be possible to issue an Airworthiness Review Certificate. Loss of these records may also devalue the aircraft or make it difficult to sell.

Reference: *Part 21, Subpart D, Subpart E*

CHAPTER 4: PRACTICAL CONTINUING AIRWORTHINESS

Use of CS-STAN

Normally a modification or repair to an aircraft needs specific approval by either the DAH or another approved design organisation. This is not the case for a modification or repair contained in CS-STAN. The latest UK version of CS-STAN is available via the CAA website.

The term 'CS-STAN' is essentially an abbreviation for 'Certification Specification - Standard' and covers both 'Standard Changes' (SC) and 'Standard Repairs' (SR).

When conducting a standard change or repair, the ICS or approved organisation must follow the applicable scope and procedure set out in CS-STAN. The ICS or organisation takes full responsibility for the change or repair being compliant.

In some limited cases a pilot-owner may conduct a standard change or repair. The individual change or repair procedures will state whether pilot-owner release to service is acceptable.

A Standard Change or Repair cannot be embodied when that change or repair conflicts with the applicable DAH data.

Standard Repairs cannot normally be used if an appropriate DAH repair already exists. The conditions of use for a Standard Change or Repair should be carefully reviewed.

CS-STAN has been developed over several years and now contains over fifty changes and repairs including:

- Exchange of conventional lights for LED lights
- Battery Exchanges
- Installation of FLARM equipment
- Exchange of avionics equipment
- Installation of carbon monoxide detectors
- Camera installation
- Exchange of interior material
- Temporary repair of canopy cracks
- Aircraft repair in accordance with FAA AC 43.13-1B

The individual Changes or Repairs are set out in a standard format:

Purpose – High level description of what the SC or SR can or cannot be used for.

Aircraft eligibility – Covers the aircraft that the SC or SR can be embodied on, with any associated limitations (e.g., airspeed), class (e.g., rotorcraft / balloons / fixed wing) or complexity.

Acceptable methods, techniques and practices – The technical detail of the SC or SR (e.g., equipment specification, conditions for the use of the SC or SR, testing, other applicable airworthiness standards).

Limitations – Any limitations that are applied to the SC or SR (e.g., technical and or operational limitations).

Manuals – Details relating to the aircraft manuals (e.g., requirement to update to flight manual, requirement to update the ICA).

Release to Service – Defines the level of the release to service, usually indicating if the SC or SR is suitable for pilot-owner release or not.

Reference: *Part 21, 21.A.90B, 21.A.431B; UK CS-STAN; Part-ML, ML.A.304*

Use of CS-STAN

RESPONSIBILITIES

In a normal repair or modification, the designer is responsible for compliance of the design with applicable CS and the installer is responsible for the embodiment of the modification or repair. In the case of CS-STAN, the installer is responsible for full compliance with the CS-STAN SC or SR as well as physical embodiment of the repair or modification, including identifying any conflict with the existing aircraft configuration and modification status.

The normal requirements under Part-ML for acceptance of parts used in changes and repairs still apply to those made under CS-STAN.

The person responsible for the embodiment of a change or a repair should compile details of the work accomplished. In the case of SCs/SRs, this would typically include items such as:

- Parts list and documents (e.g., CAA Form 1)
- Drawings
- Test reports / results
- Instructions for continued airworthiness (ICA) and flight manual supplements
- Any other relevant documentation
- Work record

Some manufacturers, particularly in the avionics discipline provide specific CS-STAN installation guides for certain equipment.

RECORD KEEPING

The CAA Form 123 should be used to record the SC/SR embodied, including any data used. The aircraft logbook should contain an entry referring to the Form 123. Both the Form 123 and the release to service required after the embodiment of the SC/SR should be signed by the same person. It should also be signed in the final block by the owner, signifying that they have received all relevant documentation and most importantly any additional ICA or updates to the AFM.

Complete records of modifications are essential as without them, it may not be possible to issue an Airworthiness Review Certificate. Loss of these records may also devalue the aircraft or make it difficult to sell.

Reference: *ML.A.305, ML.A.801*

Accomplishment of Maintenance in Accordance with the AMP

MONITORING UTILISATION

Once the AMP has been established, the next challenge is to manage the associated maintenance tasks and ensure they are performed at the correct time. This is dependent on the pilots(s) of the aircraft properly recording and the owner / Part-CAMO or Part-CAO summing the flight time / landings / cycles, as applicable. If this is not correct, neither will be the timing of maintenance tasks.

When considering tasks defined by a utilisation time, the definition used by the DAH in the ICA must be understood. For example, the DAH assumption for maintenance, particularly for engines, may be based on the engine running time, not flight time. This should be checked throughout the aircraft and engine DAH data and reflected when compiling the AMP and managing the maintenance.

When considering what needs to be monitored and managed, it will essentially consist of scheduled checks, components and a collection of what can be referred to as single running tasks. The CAA logbook system "CAP 543 Time Limited Task, Additional Inspections and Component Change Record" can be used to control these tasks, and the logbook pink pages can be used (CAP 398, 399 & 400) to control the repeat Airworthiness Directives.

Other solutions include spreadsheet use or where multiple aircraft are managed, commercially available software. It is important that the system used is consistently updated, well understood, reliable and ensures the timely highlighting of maintenance tasks before they become overdue.

Rotorcraft typically include more life limited parts therefore the volume of items to be tracked should be considered where selecting a system.

WORK ORDERS

For the owner managing their own aircraft, it is important that maintenance task requirements are clearly communicated to the organisation or ICS who will conduct the work.

A Part-CAO or Part-145 organisation is required to receive a written work order for any work undertaken. An example of a clear work order is below may be stated in an email:

> *To ABCD engineering,*
>
> *As discussed, please perform the following tasks on G-ABCD as detailed in the attached AMP.*
>
> *100H Inspection*
>
> *EASA AD 2005-0032 Wing Spar Corrosion*
>
> *FAA AD 2017-10-04 Oil Cooler Hoses (Inspection)*
>
> *Kind regards,*

Note also that a maintainer is not required to hold the current applicable maintenance data, apart from when the maintenance is being performed. Most maintainers have a subscription service to the DAH data but for rare types, the owner may need to provide the current applicable data to enable the maintenance to be performed. This should be discussed with the selected organisation or ICS.

Reference: *ML.A.301, ML.A.302*

CHAPTER 4: PRACTICAL CONTINUING AIRWORTHINESS

Managing Mandatory Requirements

Mandatory requirements include:

- Airworthiness Directives (ADs)
- Operational directives with a continuing airworthiness impact
- Continuing Airworthiness requirement established by the CAA (e.g., Generic Requirements)
- Measures required by the CAA as an immediate reaction to a safety problem

ADs for GA aircraft are often produced by the regulator in response to an accident or incident but will always be in response to an identified unsafe condition. Most often the AD will mandate compliance with a manufacturer's service bulletin, be that an inspection or modification.

An Operational Directive or measure required by the CAA as an immediate reaction to a safety problem will most likely be issued as a Safety Directive.

Other continuing airworthiness requirements established by the CAA are contained within CAP 747, Mandatory Requirements for Airworthiness. Section 2, Part 4 of CAP 747 contains Generic Requirements, some of which are applicable to Part 21 aircraft.

It is important that the owner is aware of mandatory airworthiness information. This is by subscription to the relevant airworthiness authorities safety information. The most common links are as follows, but there may be others depending on the state of design for the aircraft, engine, propeller and equipment:

UK CAA: Subscriptions | UK Civil Aviation Authority (caa.co.uk)

US FAA: U.S. Federal Aviation Administration Regulatory and Guidance Library (govdelivery.com)

EASA: EASA information hub (europa.eu)

Reference will need to be made to CAP 747 to establish the applicable ADs for the particular aircraft, engine, propeller and equipment. There are some tables that identify the applicable ADs dependent on status of the aircraft.

Airworthiness Directives may be issued at any time, so monitoring needs to be continuous. This is usually by using email subscriptions available from the CAA and the applicable state of design for the aircraft, engine, components and equipment.

Emergency ADs are sometimes issued and these could require immediate action. Some ADs and if this is the case it will be stated in the AD. If an aircraft is managed by a Part-CAMO or Part-CAO organisation, the organisation should be consulted, and should have identified the requirement as part of their own approved processes.

Managing Mandatory Requirements

Depending on the urgency or nature of the AD, different actions may be required:

AD Action Required	Action
AD – Immediate or very short notice compliance required, or the AD will be due before the next maintenance opportunity.	AD planned and accomplished according to AD requirements.
AD – Due date after the next maintenance opportunity.	AD added to the work order for the next maintenance opportunity. AD planned and accomplished according to AD requirements.
AD with a repeat requirement.	AMP amended with appropriate details to ensure capture of the repeat requirements.

A similar process would need to be followed in the event of an applicable Generic Requirement or Operational Directive being issued.

Reference: *Part-ML, ML.A.301, ML.A.303; Part 21, 21.A.3B*

CHAPTER 4: PRACTICAL CONTINUING AIRWORTHINESS

Managing Mandatory Requirements

GENERIC REQUIREMENTS

Although only rarely amended, Generic Requirements (GRs) are also contained within CAP 747 and should be reviewed for applicability to Part 21 aircraft. The current GRs are included below for information only and reference should be made to CAP 747 for more detail.

GR No.	Title	Applicability		*Basis of Applicability
		Part 21 Aircraft	Non-Part 21 Aircraft	
4	Electrical Generation Systems – Aircraft Not Exceeding 5,700 kg Maximum Authorised Weight	Yes	Yes	1 and 2
6	Electrical Generation Systems – Bus-Bar Low Voltage Warning Single-Engined Aircraft With a UK Certificate of Airworthiness	Yes	Yes	1 and 2
8	Cotton, Linen and Synthetic Fabric-Covered Aircraft	Yes	Yes	3
9	Helicopter Emergency Escape Facilities	Yes	Yes	3
10	Painting of Aircraft	Yes	Yes	3
11	Maintenance of Cockpit and Cabin Combustion Heaters and their associated Exhaust Systems	Yes	Yes	3
15	Light Aircraft Maintenance Schedule (Non-EASA Aircraft – Annex I)	No	Yes	2
16	Tyre Bursts In Flight – Inflation Media	Yes	Yes	3
17	Maintenance Requirements for Variable Pitch Propellers Installed on Aircraft Holding a UK Certificate of Airworthiness	No	Yes	2
18	Electrical Power Supplies for Aircraft Radio Systems	No	Yes	2
19	Emergency Power Supply for Electrically Operated Gyroscopic Bank and Pitch Indicators (Artificial Horizons)	No	Yes	2
23	Maintenance Personnel Certification for Non-Destructive Testing of Aircraft, Engines, Components and Materials	Yes	Yes	3
24	Light Aircraft Piston Engine Overhaul Periods	No	Yes	2
25	Aerobatic Smoke Systems	No	Yes	3

CHAPTER 4: PRACTICAL CONTINUING AIRWORTHINESS

Managing Maintenance Check Flights (MCFs)

The definition and requirements for MCFs are set out in UK Regulation (EU) 965/2012 - the UK Air Operations Regulation. MCFs are carried out under the control and responsibility of the aircraft operator. For MCFs conducted under Part-NCO, please see NCO.SPEC, Section 6. The CAA has also issued CAP 1038, the Check Flight Handbook which gives detailed and practical information about the need, planning and conduct of these flights, including a section dedicated to light aircraft.

For certain MCFs, the performance information obtained or verified in flight by the crew will be necessary for assessment or consideration after the flight by the maintenance personnel or organisation, prior to issuing the maintenance release. The maintenance staff should appoint and brief the crew to ensure that the scope of the check flight and any process or information required is understood.

Some different scenarios follow that indicate if the aircraft can fly under its C of A or if a temporary permit to fly is required:

Example 1: The aircraft maintenance manual (AMM), or any other maintenance data issued by the DAH, requires that an MCF be performed before completion of the maintenance ordered. In this scenario, a certificate after incomplete maintenance, when in compliance with ML.A.801(f) or 145.A.50(e), should be issued and the aircraft can be flown for this purpose under its C of A. Due to incomplete maintenance, it is advisable to open a new entry in the aircraft logbook, that identifies the need for an MCF. This new entry should contain or refer to, as necessary, data relevant to perform the MCF, such as aircraft limitations and any potential effect on operational and emergency equipment due to incomplete maintenance, maintenance data reference and maintenance actions to be performed after the flight. After a successful MCF, the maintenance records should be completed, the remaining maintenance actions finalised and a certificate of release to service (CRS) issued.

Example 2: For reliability considerations and/or quality assurance, an operator, owner, CAO or CAMO organisation may wish to perform an MCF after the aircraft has undergone maintenance, even if not required by the applicable maintenance data. In this case the CRS should be issued before the flight and the flight is conducted under the aircraft's C of A.

Example 3: After troubleshooting of a system on the ground, an MCF is proposed by the maintenance personnel or organisation as confirmation that the solution applied has restored the normal system operation. During the maintenance performed, the maintenance instructions are followed for the complete restoration of the system and therefore a CRS is issued before the flight. The airworthiness certificate is valid for the flight. An open entry requesting this flight may be recorded in the aircraft logbook.

Example 4: An aircraft system has failed and flight without the system is not permitted by operational or maintenance data. However, maintenance data does not provide for troubleshooting or diagnosis on the ground. Since the failure would normally prohibit flight, the aircraft may not fly under its C of A and a temporary permit to fly is required. After the flight and the corresponding maintenance work, the aircraft can be released to service and continue to operate under its C of A.

Reference: *Part-ML, ML.A.301; Part-NCO, NCO.SPEC*

Aircraft Records

Correct records demonstrate where the aircraft is in the maintenance cycle, repairs, modifications, component replacements, mandatory requirements etc and assist maintainers or management organisations. If the aircraft passes from one maintainer or management organisation to another, it is vital that complete records are transferred with the aircraft. Missing or incomplete records can have a significant impact on the value of the aircraft may require that maintenance or repairs are repeated.

All entries are required to be clear and accurate, with any corrections made in a manner that clearly shows the original entry. The person or organisation managing the aircraft are responsible for maintaining the required records.

PART-ML REQUIREMENTS

ML.A.303 details the records to be kept:

- Aircraft, Engine & Propeller Logbook, containing the aircraft type, registration, date, total flight time, cycles and landings. Any maintenance CRS must be entered into the records system as soon as possible but not later than 30 days after completion of the maintenance.
- Current status of mandatory items (ADs, GRs, Operational Directives):

This is sometimes referred to as an AD status list. It may be permissible to split the completed ADs from the repeat ADs, but the person reviewing the records should be able to determine the AD status from the information available, therefore individual and separate AD logbook entries would not constitute a "current status". ADs applicable to an aircraft type or component may not always be applicable to a specific airframe of that type. In this case the AD status should still be recorded in the AD status list, accompanied by the reason the AD does not apply.

Where an AD has been previously complied with, the AD status should give the details, not simply state 'PCW' (Previously Complied With).

- Current status of service life limited components:

This should include the CAA Form 1 or equivalent and a logbook / log card containing the component identification, aircraft / engine / propeller details to which the component is fitted, installation and removal details, accumulated flight time, landings, cycles and calendar time as applicable to the component and the current status of compliance with mandatory requirements (e.g., ADs).

- Current status of modifications and repair
- Current status of compliance with the AMP
- Current list of deferred maintenance

ML.A.305 specifies retention periods for the above records. When records are only kept electronically, the IT system used should have at least one backup system and should contain safeguards against unauthorised altering of the information.

If an aircraft is managed by an approved organisation, a good question for the owner to ask that organisation is "how, and in what conditions will the logbooks and aircraft records be stored?". The insurance status of the organisation may be another consideration.

Reference: ML.A.305

Records when changing Part-CAMO or Part-CAO Organisation

For various reasons owners and operators may wish to change their contracted CAMO. Part-ML acknowledges this and there exists a requirement in ML.A.307 that relates to the transfer of records.

The transition of airworthiness records between owners and organisations will be is significantly easier if relations remain cordial. To prevent unpleasant negotiations or litigation, the CAA recommends that every effort is made to maintain good terms in all relationships.

When a CAMO contract with a Part-CAO organisation is terminated, CAO.A.090 requires that the organisation transfer the records required by Part-ML to the new organisation or person. This is a regulatory requirement and owners may wish to add this to the continuing airworthiness management contract if applicable.

Reference: *ML.A.305, ML.A.307*

Selecting a maintainer

When selecting a maintenance organisation, or authorised ICS, several factors need to be considered. There are the usual things such as location, convenience, reputation, quality of work and price but from the perspective of managing the airworthiness of the aircraft, there are other things to consider.

In order to maintain an aircraft, independent certifying staff must be appropriately licensed, and type rated for the aircraft, and approved organisations such as a Part 145 or Part-CAO must have the aircraft type or group listed on the approval certificate and in the company exposition.

As with placing any business, discussing options and experience with other owners might be useful, as would asking the maintainer about their specific experience with the aircraft type concerned, especially where the aircraft is niche or has different construction methods such as wood, fabric or composite.

Selecting a maintainer

The extent of the work required may also determine the options for where it is carried out. Part-ML removed the restriction on ICS carrying out complex tasks, however in the absence of a dedicated maintenance hangar, it may not be possible to perform the depth of work required and an approved organisation may be more appropriate. These are all judgments to be made and sensible areas to investigate and question.

Another consideration is the way the work is approached. Whilst all organisations should meet the minimum standards required by the regulations, there may be different approaches between maintainers. A visit to the organisation would be beneficial prior to placing the work, to meet the staff that will be working on the aircraft and get a sense of how they operate. When delivering the aircraft for maintenance, it is a good idea to conduct a walk around of the aircraft with one of the maintenance personnel. This will ensure a better common understanding of the work required.

When placing work with a Maintenance Organisation or ICS, consider the following:

- Ensure their ethos is compatible with yours. Are you comfortable with the organisation and people performing the work, experience on type and general knowledge of the aircraft. Consider recommendations from other owners;
- Confirm who provides the maintenance manuals, to ensure that work is correctly completed;
- Ensure that the organisation is approved to perform the work (or ICS is appropriately licensed to perform the work);
- Agree a date for the work to be performed, a time frame for the work and deliver the aircraft in person to the maintainer's premises. Walk around the aircraft with the ICS or organisation staff after arriving;
- Agree a work scope in writing, ensuring any additional work is accurately defined and quotation for performing the work is clear, with method and time of payment defined and agreed;
- Agree the workshop where major parts are being sent (e.g., factory overhaul, overhaul), Consider reputation of workshop for the specific component;
- Agree cost limits for additional work, so where desired, authorisation is granted by the customer before the work is commenced or parts ordered;
- Agree if used parts need to be retained for the owner to view or can be disposed of;
- Confirm arrangements for insurance of the aircraft during maintenance and liability for the work performed;
- Agree where the supplied records (e.g., logbooks) are going to be kept while the aircraft is with them;
- Agree the level of maintenance record that will be provided to the owner. Whilst the CRS, log statement and a copy of component Form 1s could be considered as normal, it is not unusual for a maintainer to retain the detailed work pack and not provide a copy to the owner. The record to be provided should be agreed when negotiating the work; and
- Consider and record how disputes and disagreements might need to be resolved.

Pilot-owner Maintenance

Key info

The pilot-owner must hold the appropriate level of competence to perform the task and be familiar with both the maintenance procedures and the aircraft's AMP.

The pilot-owner can only perform simple visual inspections or operations to check the airframe, engines, systems and component for general condition, obvious damage and normal operation.

Appendix II of Part-ML contains a full list of possible pilot-owner tasks for the different types of aircraft, including more detailed guidance on the requirements and limitations.

The pilot-owner is responsible for any maintenance that they perform and must limit themselves to those tasks for which they are competent.

A pilot-owner can only perform and release maintenance if they hold a pilot licence issued or validated by the CAA which includes the relevant type or class rating for the aircraft. They must own the aircraft as a sole or joint owner and be named on the aircraft registration (for group ownership this could be the trustee grid form CA04). The pilot-owner performing and releasing the work must be named in the AMP.

A pilot-owner can only release work that the pilot-owner has performed themselves and must have access and use the DAH maintenance data when performing the task. They are not able to supervise and release work performed by others and there are limits to what can be performed.

INSPECTION FOR DEFECTS

Whilst performing pilot-owner maintenance, good practice is to identify defects (such as corrosion patches) for rectification at the next maintenance visit and make a record of them so that they don't get missed. If unsure about a possible defect, a qualified ICS or approved organisation should be consulted before further operation.

CORROSION

It is worth noting that corrosion is a defect and is never an acceptable ongoing condition. Identification and treatment of corrosion on metal aircraft needs constant vigilance. Even apparently superficial surface corrosion must not be ignored since it may progress to structural implications and put the aircraft beyond economic repair. Corrosion on the aircraft skin may already have progressed to hidden extensive (and expensive) damage behind that skin on other parts of the aircraft structure. The CAA have produced CAP 1570, Corrosion and Inspection of General Aviation Aircraft, a document that contains extensive information on the subject.

Pilot-owner Maintenance

PROHIBITED TASKS

Tasks involving any of the following cannot be performed by a pilot-owner:

- A critical maintenance task;
- Requires the removal of major components or a major assembly;
- Is carried out in compliance with an AD or an airworthiness limitation item (ALI) unless specifically allowed in the AD or the ALI;
- Requires the use of special tools or calibrated tools (except for torque wrench and crimping tool);
- Requires the use of test equipment or special testing (e.g., non-destructive testing, system tests or operational checks for avionics equipment);
- Is composed of any unscheduled special inspections (e.g., heavy-landing check);
- It affects systems essential for the instrumental flight rules (IFR) operations;
- A complex maintenance task in accordance with Appendix III of Part-ML, or it is a component maintenance task in accordance with point (a) or (b) of point ML.A.502; and
- Is part of the 100-h/annual check.

Aircraft not operated in accordance with Part-NCO or aircraft operated by a commercial ATO/DTO are not eligible for pilot-owner maintenance. Any pilot performing maintenance of commercially operated aircraft must be appropriately authorised by a Part-145 or Part-CAO maintenance organisation.

CERTIFICATE OF RELEASE TO SERVICE

Once complete, the work needs to be released with a Certificate of Release to Service. The CRS should be written or fixed in the logbook and include details of the work performed and the maintenance data used. The requirement is that at the end of the work, the owner should have a clear and legible record of the work performed. The release should include the name of the pilot-owner and be signed with the pilot-owners normal signature, including the pilot's licence number. The wording is slightly different from a standard CRS:

> "certifies that the limited pilot-owner maintenance specified, except as otherwise specified, was carried out in accordance with Part-ML, and in respect to that work, the aircraft is considered ready for release to service."

It should be remembered that this release to service is stating that the work was carried out in accordance with Part-ML. The release must be issued prior to further operation of the aircraft.

If the aircraft is managed by a Part-CAMO or Part-CAO organisation, a copy of the documentation and the CRS must be forwarded to that organisation within 30 days of the pilot-owner maintenance task being performed.

Key info

Appendix III of Part-ML gives a list of complex tasks that can only be certified by independent certifying staff or approved organisations. It may be possible for the pilot / owner to work under the supervision of a suitably qualified person or organisation.

Reference: *Part-ML, ML.A.402, ML.A.801, ML.A.803, Appendix II & III*

Aircraft Exterior Repainting and Interior Trim Work

Aircraft painting and interior refurbishment are maintenance tasks. Most organisations that offer these services are not themselves approved or licensed to release maintenance tasks on an aircraft. Work by such organisations therefore needs to be supervised and released by either an authorised ICS or approved maintenance organisation.

INTERIOR WORK

Interior work would normally is outside of the scope of pilot-owner maintenance discussed in Part-ML Appendix II. Interior work should be discussed with an ICS or approved organisation before any disassembly of the aircraft is undertaken. If an owner removes the interior and sends it to an unapproved organisation, without prior consultation, it may not be possible to certify the reinstallation. If a new interior is installed without approval, the ARC may be refused at the next Airworthiness Review.

For interior work on GA aircraft, the ICS or approved organisation will need to supervise the work to the extent necessary to ensure it has been performed correctly and can be released on completion. This may need to be under a sub-contract arrangement between the approved organisation and the organisation doing the interior work. Some work, especially when not a like for like change, may need to use CS-STAN or have a bespoke modification created.

While interior trim work may appear to be largely cosmetic, it does raise issues around flammability and the functioning of seat adjustment mechanisms, both of which can be safety critical. For this reason it is considered a maintenance task requiring supervision by ICS or approved organisations.

PAINTING

Painting is subject to a mandatory requirement in the UK, Generic Requirement (GR) 10, and can be found in CAP 747. There are also standard changes relating to paint and decorative finishes in CS-STAN.

In general terms, GR10 requires consideration / action relating to:

- Manufacturer's requirements, impact on airworthiness of the paint task;
- Issue of a CRS on completion; and
- Responsibility and control by ICS or an approved organisation as appropriate.

Note that for painting, the ICS involvement is limited to ELA1 aircraft. In all other cases the work must be overseen by an approved organisation.

For aeroplanes, ELA1 includes an aircraft with a Maximum Take-off Mass (MTOM) of 1200 kg or less that is not classified as a "complex motor-powered aircraft".

Many aircraft under Part-ML will fall outside of the ELA1 definition so would require an approved organisation to oversee the work.

Aircraft Exterior Repainting and Interior Trim Work

PAINTING (CONTINUED)

Painting is considered to be major work and if not carried out correctly will compromise the airworthiness of the aircraft. Some potential issues include:

- Reduction in fastener heads caused by uncontrolled use of power tools;
- Surface scratching;
- Use of incorrect tools to remove paint and aerodynamic sealant;
- Degrading of plastics and transparencies;
- Aluminium surface contamination by steel wool;
- Use of incorrect paint stripper, or poor application control leading to airframe contamination (sometimes observed after paint has been applied by the stripper leaching from between skin joints);
- Blockage of probes, vents, and other openings or failing to remove masking material from them;
- Failure to replace mandatory markings or registration marks;
- Water ingress through the use of power washing (e.g., fuel contamination);
- Uncontrolled variation of the aircraft basic weight;
- Loss of correct mass balance moments on flight control surfaces;
- Variation to the surface profile and smoothness by uncontrolled use of aerodynamic fillers;
- Aggressive removal of paint applied to fabric. Not considering the aircraft and fabric system manufacturers instructions;
- Jamming of flight control and / or landing gear mechanisms; and
- Impact of paint coatings on non-destructive testing (NDT) methods.

Note that a complete paint job on an aircraft will normally require the aircraft to be reweighed and an updated weight and balance schedule produced.

Critical tasks and the need to perform independent inspections should be considered where tasks which may affect the aircraft flight path and attitude have been performed, such as the balancing, installation, rigging and adjustment of flight controls.

Full details relating to the painting of aircraft can be found in Generic Requirement (GR) 10, as contained in CAP 747 Mandatory Requirements for Airworthiness. Reference should also be made to CS-STAN where applicable.

Reference: *Part-ML, ML.A.301, ML.A.801; CAP 747; UK CS-STAN*

Purchasing a used aircraft

Key info

The applicable airworthiness regulations represent a minimum standard only.

The scope Part-ML allows for deviations from DAH recommendations and the delegation of airworthiness decisions to owners, will inevitably lead to different levels of maintenance being applied to individual aircraft. A large proportion of the UK GA fleet are also considered to be aging aircraft; bringing additional considerations for their ongoing airworthiness.

BUYER BEWARE

To give an example, owner 1 maintains the aircraft to the manufacturers data, with no exceptions. Every service bulletin, service letter, or optional modification is performed. The manufacturers corrosion inspection programme is complied with. The engine is factory overhauled and never exceeds TBO. The aircraft is kept in a heated hangar. Replacement parts are new. The aircraft operates on a well-kept airfield with a hard runway and is generally used for flights of one hour or more.

Owner 2 has the same aircraft type, maintains the aircraft to the MIP, deviates from multiple DAH recommendations, including the manufacturers corrosion inspection programme, and is running the engine and propeller beyond the recommended TBO.The aircraft is kept outside, not covered and rarely flown. Most flights are for local sightseeing and last for around thirty minutes.

The aircraft has some recorded defects for rectification when it goes in for the next 100H check, none of which are adversely impacting safety but will be expensive to rectify.

In both scenarios 1 & 2, the aircraft are compliant with Part-ML and have a valid C of A and ARC, but they are two very different aircraft.

It will often be cost effective to spend more money on an aircraft in better condition than buy a cheaper one that will have significant defect rectification costs.

Potential buyers need to approach aircraft ownership with caution and not be overcome by the excitement of the purchase. Unfortunately aircraft are often sold with undisclosed faults that render them unairworthy - missing such issues will be very costly when they inevitably emerge later.

Whilst the CAA has an interest in these issues, they are often raised with the CAA a significant period after the sale which makes proving an unairworthy condition existed at the point of sale very difficult or impossible.

Purchasing a used aircraft

PRE-PURCHASE INSPECTION

The best way to establish the status of the aircraft is to have a type experienced and independent engineer or organisation perform a thorough pre-purchase survey of the aircraft and its records. The type experience is important, especially on niche aircraft that are less common.

An ICS or organisation familiar with the type should be able to advise on the availability and cost of spare parts and maintenance. Not all aircraft are well supported so ongoing costs between types can vary significantly. Some individuals and organisations specialise in aircraft of specific construction such as wood, fabric and metal tube or composite.

It is preferable for the individual or organisation conducting the inspection to be a disinterested party who is not involved in the maintenance or continuing airworthiness of the aircraft. The inspection should take the form of an aircraft survey and go beyond a general walk around. Performing a flight in the aircraft is also advisable.

Even an aircraft advertised with a "fresh annual" should be approached with caution and be appropriately surveyed prior to purchase. There will likely be a reason for an unusually low price, and sometimes that reason will mean the purchase is not advisable.

The status of the documentation that accompanies the aircraft should be carefully scrutinised. Without complete and accurate records an aircraft is not complete, and the value will be diminished. If you are having a survey conducted on the aircraft, include a review of the documentation and records.

Time, effort and money spent at pre-purchase survey could prevent an expensive and often unpleasant negotiation or litigation after the purchase. Identification of a defect does not necessarily mean a purchase should not proceed, but the prospective buyer should consider how it affects any offer they plan to make on the aircraft. It may also be possible to negotiate the rectification of defects prior to the sale.

CHAPTER 4: PRACTICAL CONTINUING AIRWORTHINESS

Certificate of Airworthiness Applications (including aircraft import)

All Part 21 aircraft types that qualify for a Certificate of Airworthiness (C of A) are issued with a non-expiring C of A, validated annually with an Airworthiness Review Certificate (ARC, Form 15c). This annual validation will be either the issue of a new ARC or an extension of the validity of the current ARC.

All applications for a C of A are made using the online form which can be found on the CAA Part 21 Aircraft, C of A Webpage.

The CAA has determined that some aircraft types are required to meet Additional Requirements for Importation before a C of A can be issued. These additional requirements are defined in CAP 747 and may include UK Airworthiness Directives and applicable Generic Requirements. As part of the application, the supporting Part-ML authorised person or approved organisation should check for compliance with the latest version of CAP 747.

Transfer documentation is normally one of the following documents:

- Form 52 Statement of Conformity to Type Design (new aircraft manufactured in the UK or the EASA Member states). The aircraft must be declared as being compliant with the UK approved version of the Type Certificate Data Sheet;
- Export Certificate of Airworthiness (new aircraft from outside of the UK or EU). The aircraft must be declared as being compliant with the UK approved version of the Type Certificate Data Sheet; or
- Export Certificate of Airworthiness (used aircraft). The aircraft must be declared as being compliant with the UK approved version of the Type Certificate Data Sheet.

CAA Type Certificate Data Sheets can be found on the UK CAA website. For used aircraft where the exporting organisation are unable to declare compliance with the CAA approved Type Certificate Data Sheet, the CAA should be contacted for further guidance.

Key info

Note that transfer documentation for used aircraft must have been issued within the 60 days preceding receipt of the application by the CAA.

Noise certificates are required for some GA aircraft and this element should be researched prior to making the application for the C of A. No separate application is required. In practice this means providing the noise record number applicable to the aircraft configuration from the CAA approved noise certification levels database. There are often multiple noise record numbers for the same aircraft type, since noise characteristics will vary depending on the exact engine, propeller and exhaust configuration. Care is needed to select the correct record.

Applications must be supported by an approved person (ICS with a Part-ML authorisation) or organisation (e.g., Part-CAO or Part-CAMO). An airworthiness review will need to be performed and an ARC (Form 15c) issued by the supporting person or organisation as part of the process.

Certificate of Airworthiness Applications (including aircraft import)

AIRCRAFT SURVEY

A newly manufactured aircraft does not necessarily need a physical survey by the CAA before the issue of a UK C of A, unless it is a type new to the UK register. The CAA may chose to survey any aircraft as part of the application, but often for a new aircraft, the C of A is issued after a desktop review by the CAA's Shared Services Centre (SSC) Technical Team in Gatwick.

Used aircraft requiring a C of A will be subject to a physical survey by the CAA.

If a survey is required, the CAA will allocate an airworthiness surveyor to attend the aircraft. To prepare for this:

- Collate all relevant aircraft records in a logical order, ensure they are up to date and available at the location of the survey;
- Ensure that the current status of modifications, repairs, mandatory requirements, maintenance and components is up to date and available at point of survey, along with any supporting documents;
- Ensure that any original documents from the exporting state are available (e.g., Export C of A), or if communicated digitally, the supporting email dialogue;
- Ensure that the aircraft is in a condition for survey and any maintenance has been completed and released to service; and
- Ensure that the location for the survey allows for good access to the aircraft and records and ideally protected from inclement weather.

Good preparation is key for the surveyor visit. If there are no adverse findings, the certificates will usually be issued on site before the surveyor leaves or by email shortly thereafter.

For used aircraft, a check flight is required to support the C of A issue. See CAP 1038 for more detail. Permit to fly applications can be made as part of the C of A application process and if required should be made at the point of initial C of A application, so as to avoid any unnecessary delay in the process. Owners should also consider performing an airworthiness check flight while the aircraft is still on the register of the existing state, immediately prior to deregistration. This potentially avoids needing a permit to fly for the check flight prior to acceptance on the UK register.

Other items for the owner to consider includes, but is not limited to:

- VHF Radio with 8.33Khz spacing
- Transponder Mode S Code & Verification
- Aircraft Registration Markings (and exemption for military markings if applicable)
- Fireproof registration plate
- ELT

Reference: *Part 21, Subpart H; Part-ML, ML.A.906*

CHAPTER 4: PRACTICAL CONTINUING AIRWORTHINESS

Ownership of Aircraft operating on an enduring Part 21 Permit to Fly

A permit of fly is issued when an aircraft cannot meet the requirements for the issue of a C of A. A permit to fly can either be temporary, for example when maintenance is not up to date, or permanent (enduring) where the aircraft has not been shown to meet certification requirements. Where an enduring permit to fly is issued, the use of the aircraft is limited to non-commercial flying activity and additional permissions may be needed when flying outside of the UK.

The permit to fly is issued to an individual aircraft serial number and is supported by a CAA Form 18b (known as "Flight Conditions"). The Form 18b references an Aircraft Data Sheet (similar to a TCDS), AFM and Aircraft Maintenance Manual (AMM). The Form 18b also lists any conditions and limitations essential for safe operation and specifies how maintenance must be certified. The Form 18b is signed by the owner and approved by the CAA.

Although each Form 18b is individual to the specified aircraft, examples of conditions and restrictions contained in Section 8 of the form are as follows:

- The use of the aircraft is limited to non-commercial flying activity;
- The aircraft must be maintained in accordance with the AMM defined in the aircraft data sheet. This includes safe component lives and other airworthiness limitations;
- The Airworthiness Review must be performed as detailed in ML.A.903 but an ARC / Form 15c is not issued. An entry must be made in the logbook describing the review and its outcome and supplied on request to the CAA;
- New parts are required to have a CAA Form 1 or equivalent; and
- Any modification, repair or configuration change that affects the datasheet must be appropriately approved (either by the manufacturer, another design organisation or the CAA).

The Form 18b is specific to each aircraft and owner because the owner is taking responsibility for the airworthiness of the aircraft including the datasheet, manuals, maintenance programme and any modifications. Importantly the owner is responsible for ensuring any published continued airworthiness information (such as Airworthiness Directives) is followed.

The maintenance of these aircraft in the UK is not usually performed and certified by an approved organisation (e.g., Part-CAO), but by a Permit Maintenance Release (PMR) which is signed by an individual authorised by the CAA. The certification is made in accordance with UK national requirements for permit to fly aircraft contained in BCAR A3-7 – see CAP 553 for more details.

Owners should ensure prior to permit renewal that the aircraft is compliant with the Form 18b Flight Conditions and that all supporting records are available. Where the flight conditions need amendment, the owner should correspond with the DAH, as the responsibility to present those conditions to the CAA for approval is with the owner, in most cases supported by the DAH.

Potential owners of enduring permit to fly aircraft should consider the relative complexity of this type of aircraft management. As with any task, familiarity with the process of management and permit application and survey makes that task easier, but it should be recognised as different to the Part-ML aircraft.

Reference: *Part 21, Subpart P; CAP 553, BCAR Section A*

Abbreviations

AC
FAA Advisory Circular

AD
Airworthiness Directive

AFM
Aircraft Flight Manual

ALI
Airworthiness Limitation Item

AMC
Acceptable Means of Compliance

AMP
Aircraft Maintenance Programme

AOC
Air Operators Certificate

ARC
Airworthiness Review Certificate

ATO
Approved Training Organisation

BCAR
British Civil Airworthiness Requirement

CAA
UK Civil Aviation Authority

CAE
Combined Airworthiness Exposition

CAMO
Continuing Airworthiness Management Organisation

CAO
Combined Airworthiness Organisation

C of A
Certificate of Airworthiness

CDL
Configuration Deviation List

CS
Certification Specification

CMR
Certification Maintenance Requirement

CRS
Certificate of Release to Service

CS-STAN
Certification Specification for standard changes and repairs

DAH
Design Approval Holder

DTO
Declared Training Organisation

EASA
European Aviation Safety Agency

ELA
European Light Aircraft

ELT
Emergency Locator Transmitter

ETSO
European Technical Standard Order

EU
European Union

FAA
Federal Aviation Administration

FLARM
Traffic Awareness and Collision Avoidance technology

GA
General Aviation

GAU
UK CAA General Aviation Unit

GM
Guidance Material

GR
Generic Requirement

ICA
Instructions for Continued Airworthiness

ICAO
International Civil Aviation Organisation

ICS
Independent Certifying Staff

IFR
Instrument Flight Rules

LAE
Licensed Aircraft Engineer (See also ICS)

LAMP
Light Aircraft Maintenance Programme (CAA LAMP – now withdrawn)

LED
Light Emitting Diode

LLP
Life Limited Part

MCF
Maintenance Check Flight

MEL
Minimum Equipment List

MMEL
Master Minimum Equipment List

MIP
Minimum Inspection Programme

Abbreviations

MOR
Mandatory Occurrence Report

MTOM
Maximum Takeoff Mass

MTOW
Maximum Takeoff Weight

NCO
Non-commercial operations with other than complex motor-powered aircraft

NCO-IDE
Part-NCO – Instruments, Data & Equipment

NDT
Non-Destructive Test (e.g., Ultrasonic / Eddy Current)

POH
Pilots Operating Handbook

SAS
Specific Airworthiness Specification

SB
Service Bulletin

SC
Standard Change (CS-STAN)

SI
Service Instruction

SL
Service Letter

SPO
Specialised Operations

SR
Standard Repair (CS-STAN)

SSC
UK CAA Shared Service Centre

STC
Supplemental Type Certificate

TBO
Time Between Overhauls

TCDS
Type Certificate Data Sheet

TSO
Technical Standard Order

VFR
Visual Flight Rules