



# ADVISORY CIRCULAR

## AC 21-08 v2.1

### Approval of modification and repair designs under Subpart 21.M

Date December 2022  
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Advisory circulars are intended to provide advice and guidance to illustrate a means, but not necessarily the only means, of complying with the Regulations, or to explain certain regulatory requirements by providing informative, interpretative and explanatory material.

**Advisory circulars should always be read in conjunction with the relevant regulations.**

## Audience

This advisory circular (AC) applies to:

- approved design organisations
- authorised persons for Subpart 21.M
- holders of modification/repair design approvals for aircraft, aircraft engines, propellers and appliances
- approved maintenance organisations
- applicants for approval of modifications or repairs.

## Purpose

This AC provides information and guidance on the application, assessment and approval of designs of modifications and repairs under Subpart 21.M.

## For further information

For further information, contact CASA's Airworthiness and Engineering Branch (telephone 131 757).

Unless specified otherwise, all subregulations, regulations, divisions, subparts and parts referenced in this AC are references to the *Civil Aviation Safety Regulations 1998 (CASR)*.

## Status

This version of the AC is approved by the Branch Manager, Airworthiness and Engineering.

**Note:** Changes made in the current version are not annotated. The document should be read in full.

Version	Date	Details
v2.1	December 2022	Administrative review only.
v2.0	June 2020	Inclusion of information about mounting small cameras and similar devices in aircraft. Deletion of reference to AC 21-23 - Technical data, until that AC is published.
v1.0	February 2015	Initial issue of this AC.

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# 1 Reference material

## 1.1 Acronyms

The acronyms and abbreviations used in this AC are listed in the table below.

<b>Acronym</b>	<b>Description</b>
AC	Advisory Circular
ADO	Approved design organisation
AFM	Aircraft flight manual
ALI	Airworthiness limitation item
ALS	Airworthiness limitations section
AMO	Approved maintenance organisation
APMA	Australian Parts Manufacturing Approval
ARC	Authorised Release Certificate
ASETPA	Approved single engine turbine powered aircraft
ATSO	Australian Technical Standard Order
CAR	<i>Civil Aviation Regulations 1988</i>
CASA	Civil Aviation Safety Authority
CASR	<i>Civil Aviation Safety Regulations 1998</i>
CDCCL	Critical design configuration control limitations
CMR	Certification maintenance requirement
COTS	Commercial off-the-shelf
CPMP	COTS parts management plan
DA	Design advice
DAR	Designated Airworthiness Representative (FAA)
DER	Designated Engineering Representative (FAA)
DOA	Design Organisation Approval (EASA)
EASA	European Aviation Safety Agency
EDTO	Extended diversion time operations
EUROCAE	European Organisation for Civil Aviation Equipment
FAA	Federal Aviation Administration of the USA
FITCOM	Fabrication in the course of maintenance
FMS	Flight manual supplement
ICA	Instructions for continuing airworthiness

Acronym	Description
IEC	International Electrotechnical Commission
MEL	Minimum equipment list
MITCOM	Manufacture in the course of maintenance
NAA	National Aviation Authority
ODA	Organization Designation Authorization (FAA)
RTCA	Radio Technical Commission for Aeronautics
SB	Service bulletin
STC	Supplemental type certificate
TC	Type certificate

## 1.2 Definitions

Terms that have specific meaning within this AC are defined in the table below.

Term	Definition
Aeronautical product	Any part or material that is, or is intended by its manufacturer to be, a part of or used in an aircraft, unless excluded by the regulations. <sup>1</sup>
Aircraft component	<ul style="list-style-type: none"> <li>a. any part or equipment for an aircraft that, when fitted to, or provided in an aircraft may, if it is not sound or functioning correctly, affect the safety of the aircraft, its occupants or its cargo or cause the aircraft to become a danger to person or property</li> <li>b. flotation equipment, evacuation equipment, ration packs, portable breathing apparatus, fire-fighting equipment, or any other equipment or apparatus, fitted to, or provided in, an aircraft for use in an emergency.<sup>2</sup></li> </ul>
Airworthiness requirements	The comprehensive and detailed requirements established, adopted or accepted under the regulations for the airworthiness of the aircraft or aeronautical product. The airworthiness requirements include the applicable airworthiness standards and additional airworthiness requirements such as airworthiness directives (AD), Part 90 requirements and airworthiness requirements associated with operational approvals such as extended diversion time operations (EDTO) and approved single engine turbine powered aircraft (ASETPA).
Airworthiness standards	The design standards applicable to the aircraft or aeronautical product for approval or certification under Part 21. Airworthiness standards for type certificated aircraft, aircraft engines and propellers are set out in Parts 22 to 35.
Airworthy	An aircraft or aeronautical product is airworthy if it is in a state that conforms with its approved design and is in a condition for safe operation.
Appliance	Any instrument, mechanism, equipment, part, apparatus, appurtenance, or

<sup>1</sup> See section 3 of the *Civil Aviation Act 1988*.

<sup>2</sup> See regulation 2 of CAR.

Term	Definition
	accessory, including communication equipment, that is used or intended to be used in operating or controlling an aircraft in flight, is installed in or attached to the aircraft, and is not part of an airframe, engine or propeller.
Approved design	<p>Approved design means:</p> <ol style="list-style-type: none"> <li>a. for a type certificated aircraft, aircraft engine or propeller: <ol style="list-style-type: none"> <li>i the type design for the aircraft, engine or propeller; and</li> <li>ii any changes to the type design made in accordance with an approval under Part 21</li> </ol> </li> <li>b. for an aeronautical product, other than an aircraft engine or propeller, that is approved in a manner mentioned in regulation 21.305 or 21.305A: <ol style="list-style-type: none"> <li>i the design specifications for the product; and</li> <li>ii any changes to the design specifications made in accordance with an approval under Part 21</li> </ol> </li> <li>c. for an aircraft or aeronautical product not mentioned in (a) or (b): <ol style="list-style-type: none"> <li>i the design that applied to the original certification (however described) of the aircraft or aeronautical product; and</li> <li>ii any changes to the design made in accordance with an approval under Part 21.</li> </ol> </li> </ol>
Approved design organisation (ADO)	A design organisation approved under Subpart 21.J to carry out design activities under Part 21. An ADO's scope of approval may include approval and certification activities for modification/repair designs under Subpart 21.M.
Certification activity	A process wherein an application for a design approval has been made to CASA, CASA authorises an ADO to assess the design for compliance with the applicable airworthiness requirements, the ADO provides a certificate to CASA in relation to the compliance of the design, and CASA may approve the design based on the certificate from the ADO. <sup>3</sup>
Certification basis	<p>Certification basis means:</p> <ol style="list-style-type: none"> <li>a. for an aircraft, aircraft engine or propeller for which there is a type certificate or type acceptance certificate—the type certification basis for the aircraft, aircraft engine or propeller; and</li> <li>b. for an aeronautical product, other than an aircraft engine or propeller, that is approved in a manner mentioned in regulation 21.305 or 21.305A—the airworthiness standards that applied for certification of the product; and</li> <li>c. for an aircraft or aeronautical product not mentioned in (a) or (b) above—the airworthiness standards that applied for certification of the aircraft or aeronautical product (however described).</li> </ol>
Certification plan	<p>A document that identifies:</p> <ol style="list-style-type: none"> <li>a. a brief description of the intended modification/repair design</li> <li>b. the applicable airworthiness standards</li> <li>c. the compliance plan – the means and methods by which an aircraft or aeronautical product will be shown to comply with the applicable airworthiness requirements</li> <li>d. the certification activities (ADO) or agreed level of delegation or authorisation granted to the applicant for each applicable requirement</li> </ol>

<sup>3</sup> See AC 21.J-01 for more information on certification activities.



Term	Definition
	<ul style="list-style-type: none"> <li>e. the agreed level of involvement of certification team members (CASA specialists and ADO/authorised persons) for each applicable requirement</li> <li>f. communication plan, describing communication and coordination responsibilities between applicant, CASA, ADO, authorised persons and suppliers, as applicable</li> <li>g. project schedule, including major milestones and deliverables.</li> </ul>
Commercial off-the shelf (COTS) part	<p>A part that is to be used in an aircraft but:</p> <ul style="list-style-type: none"> <li>a. the product design has not been approved under Part 21;</li> <li>b. was not produced under a Part 21 production approval; and</li> <li>c. is not a standard part.</li> </ul>
Compliance summary	A report that describes the airworthiness requirements that are applicable to the design and how compliance with those requirements was shown. It is used to ensure, systematically and comprehensively, that a design complies with all applicable airworthiness requirements. A compliance summary is also called a compliance check list.
Equivalent Level of Safety	A finding where literal compliance with an applicable airworthiness standard cannot be demonstrated but compensating factors exist in the design that can be shown to provide a level of safety equivalent to that intended by the standard.
Modification	A change to the design of an aircraft or aeronautical product which is not a repair.
Modification/repair design approval	An approval granted under regulation 21.435 or 21.437.
Person	An individual or body corporate.
Repair	<p>The restoration of an aircraft or aeronautical product to an airworthy condition. This AC deals with repairs that involve a design change.</p> <p><b>Note:</b> Repairs specified in instructions for continuing airworthiness (ICA) or other data approved under the type certificate do not require subsequent approval under Subpart 21.M.</p>
Special Conditions	The technical requirements added to the certification basis because of novel or unusual design feature(s) that exists in a type design and the absence or inadequacy of the applicable airworthiness standards to provide a basis for the certification of such features.
Supplemental type certificate (STC)	An approval issued by CASA under Subpart 21.E of a major modification or repair of a type certificated aircraft, engine or propeller.
Technical data	The data that describes and shows compliance of a design. <sup>4</sup>
Type acceptance certificate (TAC)	A document issued by CASA to accept the design of a type of aircraft, aircraft engine or propeller approved via a foreign type certificate.
Type certificate (TC)	A document issued by CASA to define the design of a type of aircraft, aircraft engine or propeller and to certify that the design meets the applicable airworthiness requirements.
Type certificate data	A document that forms part of the type certificate providing the technical

<sup>4</sup> See regulation 21.008 for more information on technical data.

<b>Term</b>	<b>Definition</b>
sheet	details and limitations of the aircraft, aircraft engine or propeller.
Type certification basis	The airworthiness standards and any special conditions or other conditions with which the aircraft, aircraft engine or propeller must comply for the issue of a type certificate.
Type design	The basic design of a type certificated aircraft, aircraft engine or propeller.

## 1.3 References

### Legislation

Legislation is available on the Federal Register of Legislation website <https://www.legislation.gov.au/>

<b>Document</b>	<b>Title</b>
Part 21 of CASR	Certification and airworthiness requirements for aircraft and parts
CASR Dictionary	
Air Navigation (Aircraft Noise) Regulations 1984	
CAO 20.16.2	Air service operations - Loading - General

### Advisory material

CASA's advisory materials are available at <https://www.casa.gov.au/publications-and-resources/guidance-materials>

<b>Document</b>	<b>Title</b>
AC 21.J-01	Approved design organisations
AC 21-09	Special flight permits
AC 21.6	Restricted category aircraft – certification
AC 21-12	Classification of design changes
AC 21-14	Production certificates
AC 21-15	Supplemental type certificates
AC 21.16	Approval of Materials, Parts, Processes and Appliances
AC 21.27	Manufacturing approval — overview
AC 21-28	Permissible unserviceabilities - unrepaired defects (r.21.007)
AC 21-34	Aircraft flight manuals
AC 21-46	Airworthiness approval of avionics equipment
AC 21-601	Australian Technical Standard Order Authorisation
AWB 02-047	Manufacturing Aeronautical Products During Maintenance
CAAP 30-4	Certificate of Approval — Maintenance Organisation

Document	Title
Part 145 AMC/GM	CASR Part 145 Approved Maintenance Organisation Requirements

### International agreements

International agreements are available at [http://www.casa.gov.au/scripts/nc.dll?WCMS:STANDARD::pc=PC\\_90820](http://www.casa.gov.au/scripts/nc.dll?WCMS:STANDARD::pc=PC_90820)

### Other documents

Document	Title
Airservices Australia aircraft noise certification information	Airservices Australia documents are available at <a href="http://www.airservicesaustralia.com/">http://www.airservicesaustralia.com/</a>
European Aviation Safety Agency (EASA) CM - SWCEH – 001	EASA documents are available at <a href="http://easa.europa.eu/">http://easa.europa.eu/</a>
EASA CS-25 AMC 25.1309	
European Organisation for Civil Aviation Equipment (EUROCAE) ED-80	EUROCAE documents are available at <a href="https://www.eurocae.net/">https://www.eurocae.net/</a>
Federal Aviation Administration (FAA) AC 23.1309-1	FAA documents are available at <a href="http://www.faa.gov/">http://www.faa.gov/</a>
FAA AC 25.1309-1	
FAA AC 27.1309 (found in FAA AC 27-1)	
FAA AC 29.1309 (found in FAA AC 29-2)	
International Electrotechnical Commission (IEC) TS 62239	IEC documents are available at <a href="http://www.iec.ch/">http://www.iec.ch/</a>
Radio Technical Commission for Aeronautics (RTCA) DO-178	RTCA documents are available at <a href="http://www.rtca.org/">http://www.rtca.org/</a>
RTCA/DO-254	
RTCA/DO-313	
SAE International ARP4754	SAE International documents are available at <a href="http://www.sae.org/">http://www.sae.org/</a>
SAE International	

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<b>Document</b>	<b>Title</b>
ARP4761	
MIL-STD-882	USA Department of Defense documents are available from various standards suppliers

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## 1.4 Forms

CASA's forms are available at <http://www.casa.gov.au/forms>

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<b>Form number</b>	<b>Title</b>
CASA Form 655	Design Advice
CASA Form 979	Statement of Compliance

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## 2 Background

### 2.1 Introduction

- 2.1.1 Design changes to Australian aircraft must be approved under Part 21 (excluding certain aircraft that are exempt from the regulations).<sup>5</sup> Design changes may be modifications or repairs for reasons such as to rectify defects, change or improve parts or equipment, comply with enhanced safety requirements, provide for different aircraft utilisation or address operators' commercial requirements.
- 2.1.2 Subpart 21.D provides for approval of design changes to type certificated aircraft, aircraft engines and propellers as a change in type design. The provisions of Subpart 21.D are for design changes proposed by the type certificate holder.
- 2.1.3 Subpart 21.E provides for approval of major design changes to type certificated aircraft, aircraft engines and propellers under an STC. See AC 21-15 for more information on STCs.
- 2.1.4 Subpart 21.M provides the general requirements for approval of modification and repair designs for aircraft, aircraft engines, propellers and appliances. The requirements of Subpart 21.M for assessment and approval of a repair are the same as for a modification.
- 2.1.5 A flowchart showing the Subpart 21.M design approval process is provided in 5.24.2Appendix A.

**Note:** Approvals under Subpart 21.M are for changes to the design of an aircraft, aircraft engine, propeller or appliance, including changes to the ICA that are part of an approved design. If a proposed change is not part of the approved design then an approval under Subpart 21.M would not be necessary or appropriate (e.g. ground support equipment not covered by the approved design or associated ICA).

#### 2.1.6 Repairs

- 2.1.6.1 A repair, in the context of this AC, is a design change to an aircraft or aeronautical product intended to restore it to an airworthy condition after it has suffered a defect.
- 2.1.6.2 A repair may be permanent or temporary.

**Note:** A defect cannot be approved as a permissible unserviceability under Subpart 21.M. See AC 21-28 for more information on approval of permissible unserviceabilities under regulation 21.007.

#### 2.1.7 Modifications

- 2.1.7.1 A modification is a change to the design of an aircraft or aeronautical product which is not a repair.
- 2.1.7.2 A modification may be any one or a combination of a physical design change, or a change to an operating envelope, performance, operating characteristics, limitations or ICA. The change can be a single change or a collection of changes.
- 2.1.7.3 Approval of an aeronautical product (including materials) as an alternative to an aeronautical product specified in the approved design of an aircraft or another

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<sup>5</sup> See regulation 42.125 and regulation 42U of CAR.

aeronautical product may also be approved as a modification under Subpart 21.M. See subsection 4.4 for more information on approval of alternative products.

- 2.1.7.4 A modification/repair design may provide for the use of COTS parts. However, the showing of compliance approved under regulation 21.009 for the design must include the part(s). See subsection 4.3 for more information on COTS.

## **3 Other information relevant to modification/repair design approvals**

### **3.1 Responsibilities of associated parties**

#### **3.1.1 Applicant's responsibilities**

- 3.1.1.1 The applicant is responsible for showing that the proposed modification/repair design complies with the applicable airworthiness standards. This involves providing all the data and documents for the design to the approver and carrying out the necessary tests.

#### **3.1.2 Approver's responsibilities**

- 3.1.2.1 The approver of the modification/repair design is responsible for determining whether the proposed airworthiness standards provide an appropriate level of safety, determining additional airworthiness standards if necessary, the finding of compliance for the design with the applicable airworthiness standards, and determining that no feature or characteristic of the design makes the relevant aircraft, aircraft engine, propeller or appliance unsafe for its intended use. If the approver finds that the proposed design does not comply with the applicable airworthiness standards (or equivalent level of safety determination) or would make the aircraft or product unsafe, then they cannot approve the design.

#### **3.1.3 Design approval holder's responsibilities**

- 3.1.3.1 The holder of the modification/repair design approval is responsible for controlling the distribution of the approval and associated documents, and for the ongoing administration of the approval, including reporting failures, malfunctions, and defects associated with the approval and addressing any such issues.

#### **3.1.4 Maintainer's responsibility**

- 3.1.4.1 The maintainer (i.e. the person who carries out the modification/repair design) is responsible for ensuring that the modification/repair design has been approved, is carried out in accordance with the associated maintenance data, and for updating the maintenance records for the aircraft or aeronautical product. If the maintainer becomes aware that the modification/repair would make the aircraft unsafe or the product unfit for use, then the maintainer cannot certify for the maintenance.

#### **3.1.5 Owner/operator's responsibilities**

- 3.1.5.1 The owner/operator of the affected aircraft or product is ultimately responsible for the airworthiness of the aircraft or product. This includes ensuring that any modification/repair designs have been approved and are compatible with the configuration of the aircraft, that the conditions of any approvals have been complied with, that the continuing airworthiness records for the aircraft or product are up to date, and for reporting major defects associated with the design.

## 3.2 Design advice

### 3.2.1 Design advice purpose and policy

3.2.1.1 CASA Form 655 – Design Advice, is the primary means of obtaining advice or a determination from CASA in relation to design activities. A design advice (DA) may be submitted if an ADO or authorised person requires advice from CASA in relation to any matter associated with a modification/repair design. The following primary reasons for a DA in relation to a modification/repair design are outlined in the following paragraphs:

- a. major alteration (repair or modification)
- b. major/minor determination by CASA
- c. application for design standard
- d. application for equivalent safety determination [CASR 21.437(6)]
- e. determination of inappropriate design requirement [CASR 21.416]
- f. other.

### 3.2.2 Major alteration

- 3.2.2.1 A DA may be submitted when the ADO or authorised person has classified the proposed modification/repair design as major and requires advice as to whether the design should be processed under Subpart 21.M or as an STC.
- 3.2.2.2 The ADO or authorised person must include with the DA application, a brief description of the proposed modification/repair design and a copy of the compliance plan.
- 3.2.2.3 CASA will consider the DA application and determine whether the design should be processed as a modification/repair design under Subpart 21.M or an STC under Subpart 21.E. The determination will be based on the design and the qualifications, experience and knowledge of the ADO or authorised person. See AC 21-15 for more information on STCs and AC 21-12 for information on classification of design changes.
- 3.2.2.4 If CASA is satisfied that the design is appropriate for assessment and approval by the ADO or authorised person under Subpart 21.M, then CASA will carry out a technical review of the proposed airworthiness standards for the design and the compliance plan. If CASA is satisfied that the proposed airworthiness standards and the compliance plan are acceptable, then CASA will provide the applicant with a DA response that authorises the ADO or authorised person to approve the design under Subpart 21.M, subject to any conditions specified by CASA in the response. If CASA is not satisfied that the proposed airworthiness standards or the compliance plan are acceptable, then the DA response will outline the reasons.

### 3.2.3 Major/minor determination by CASA

- 3.2.3.1 A DA may be submitted if the ADO or authorised person requires advice from CASA in relation to making a major/minor determination for a proposed modification/repair design.
- 3.2.3.2 The ADO or authorised person must provide with the DA application, a brief description of the proposed modification/repair design, a draft determination and an outline of the reasons why there is uncertainty in making the determination.



- 3.2.3.3 CASA will consider the DA application and determine whether the proposed modification/repair design should be classified major or minor and advise the applicant accordingly in the DA response.
- 3.2.3.4 If the classification is major then the applicant may submit an application for an STC under Subpart 21.E or may submit a DA application for approval to process the design under Subpart 21.M (see subsection 3.2.2).

### **3.2.4 Application for design standard**

- 3.2.4.1 A DA may be submitted if the ADO or authorised person requires advice from CASA to determine the applicable airworthiness standards for a proposed modification/repair design.
- 3.2.4.2 The ADO or authorised person should provide with the DA application a brief description of the proposed modification/repair design, the proposed airworthiness standards and outline the reasons why there is uncertainty with regard to the applicability of the standards.
- 3.2.4.3 CASA will consider the DA application and determine the applicable airworthiness standards and advise the applicant accordingly in the DA response.

### **3.2.5 Application for equivalent safety determination**

- 3.2.5.1 A DA should be submitted if the ADO or authorised person requires CASA to make or agree with an equivalent level of safety determination under regulation 21.436 for a proposed modification/repair design.
- 3.2.5.2 The ADO or authorised person should provide with the DA application a brief description of the proposed modification/repair design, details of the applicable airworthiness standards with which the design does not comply and an equivalent level of safety proposal that clearly shows how the non-compliance is compensated for. See subsection 5.12.5 for the information required for an equivalent level of safety determination.
- 3.2.5.3 CASA will consider the DA application and make a determination or decision on the proposed equivalent level of safety and advise the applicant accordingly in the DA response.

### **3.2.6 Determination of inappropriate design requirement**

- 3.2.6.1 A DA should be submitted if the ADO or authorised person requires CASA to either:
- a. make a determination under regulation 21.416 that an airworthiness standard does not apply to a proposed modification/repair design
  - b. approve under regulation 21.418 a determination made by an ADO or authorised person that an airworthiness standard does not apply to a proposed modification/repair design.
- 3.2.6.2 The ADO or authorised person should provide with the DA application a brief description of the proposed modification/repair design, details of the airworthiness

standards that do not apply to the design and the reasons why the airworthiness standards do not apply.

- 3.2.6.3 CASA will consider the DA application and make a determination or decision on the proposed non-application of the standards and advise the applicant accordingly in the DA response.

### **3.2.7 Other**

- 3.2.7.1 A DA should be submitted if an ADO or authorised person requires advice from CASA in relation to any other matter not covered by the other reasons.

## **3.3 Use of service experience in the design and approval process**

- 3.3.1 Service experience may be used to support qualitative analyses, assumptions and engineering judgements that may be necessary for the design and approval of modification/repairs under Subpart 21.M. However, for service history to be acceptable, the data must be both sufficient and pertinent. The essentials of the process involve:

- a. a clear understanding of the relevant airworthiness requirements and standards, their purpose and the hazards addressed
- b. a detailed knowledge of the design
- c. the availability of pertinent and sufficient service experience data
- d. a comprehensive review of that service experience data.

- 3.3.2 The applicant should:

- a. provide data for the design pertinent to the requirement
- b. provide service experience from such data sources as the following:
  - i. accident reports
  - ii. incident reports
  - iii. service bulletins
  - iv. ADs
  - v. repairs
  - vi. modifications
  - vii. flight hours/cycles for fleet leader and total fleet
  - viii. world airline accident summary data
  - ix. service difficulty reports
  - x. transport safety agency reports
  - xi. warranty, repair and parts usage data
  - xii. aircraft/engine/product reliability and engine trend monitoring reports
  - xiii. scheduled and unscheduled maintenance finding reports
  - xiv. relevant data pertaining to aircraft or products of similar design and construction may be included.
- c. show that the data presented represent all relevant service experience for the product, including the results of any operator surveys, and is comprehensive enough to be representative

- d. show that the service experience is relevant to the design/requirement/standard/hazard
- e. provide documentation to support identification and evaluation of each of the main areas of concern with regard to:
  - i. recurring and/or common failure modes
  - ii. cause
  - iii. probability, by qualitative reasoning
  - iv. measures already taken and their effects
- f. provide documentation to support evaluation of failure modes and consequences through analytical processes. The analytical processes should be supported by:
  - i. a review of previous test results;
  - ii. additional detailed testing as required; or
  - iii. a review of aircraft functional hazard assessments (FHA) and any applicable system safety assessments (SSA) as required
- g. provide documentation adequate to support a conclusion that draws together the data and the rationale.

**Note:** These guidelines are not limiting, either in setting required minimum elements or in precluding alternative methods. Each case may be different, based on the particulars of the design/system being examined and the requirement to be addressed.

### Example

- 3.3.3 Engine reliability and trend monitoring data can be used to support an engine modification approval process. However, in order to use this data to support showing compliance with the requirements of regulations related to endurance tests, a clear and without any doubt relationship must be established between any part of the data and every part of the endurance test. It may be difficult to find relevant data for parts of the test that include engine runs at 105% or 108% (in which case specific tests may be necessary).

## 3.4 Unsafe feature or characteristic analysis

- 3.4.1 This is a separate condition from compliance with the applicable airworthiness standards because in some cases an unsafe condition may exist even though the design complies with the applicable airworthiness standards. The design standards against which designs are approved are intended to address the vast majority of unsafe situations. These standards develop over time to cover previously unforeseen unsafe conditions, new materials and innovative technologies. Hence, design standards always lag behind technology and it cannot be assumed that the design standards are comprehensive.
- 3.4.2 The unsafe feature or characteristic analysis is of particular significance when a modification/repair design is for (or incorporates) an aircraft or aeronautical product to be used in a way which was not envisaged by the original designer.
- 3.4.3 An unsafe feature or characteristic includes:
- a. a feature or characteristic that may lead to an event that would:

- i. result in fatalities, usually with the loss of the aircraft; or
- ii. reduce the capability of the aircraft or the ability of the crew to cope with adverse operating conditions to the extent that there would be:
  - A. a large reduction in safety margins or functional capabilities;
  - B. physical distress or excessive workload such that the flight crew cannot be relied upon to perform their tasks accurately or completely; or
  - C. serious or fatal injury to one or more occupants;

unless it is shown that the probability of such an event is within the limit defined by the applicable airworthiness standards;

- b. a feature or characteristic that too frequently (i.e. significantly beyond the applicable safety objectives) leads to events having less severe immediate consequences than those listed above but:
  - i. could eventually lead to one of the consequences listed above in specific operating environments; or
  - ii. may reduce the capability of the aircraft or the ability of the crew to cope with adverse operating conditions to the extent that there would be, for example:
    - A. a significant reduction in safety margins or functional capabilities;
    - B. a significant increase in crew workload, or in conditions impairing crew efficiency; or
  - iii. discomfort to occupants, possibly including injuries;
- c. a feature or characteristic with which there is an unacceptable risk of serious or fatal injury to persons other than occupants; or
- d. design features intended to minimise the effects of survivable accidents not performing their intended function.

3.4.4 The analysis may be qualitative or quantitative. In cases where formal and quantitative safety analyses are not available, as will be the case for the majority of modification/repair designs, the level of analysis should be consistent with that required by the applicable airworthiness standards and may be based on engineering judgement supported by service experience data. The analysis may assume the following:

- a. that the crew has the skill to apply the necessary procedures correctly, but without requiring exceptional piloting skill, alertness or strength
- b. that the aircraft is maintained in accordance with the applicable maintenance program and ICA
- c. that the aircraft has been modified in accordance with the applicable instructions.

3.4.5 If an ADO or authorised person concludes that an unsafe situation might exist then the design may not be approved until the unsafe feature or characteristic has been adequately addressed, for example by modification of the design or additional procedures, personnel, training or documentation.

## **3.5 Modification/repair design approvals for foreign or state aircraft**

3.5.1 The regulations do not prevent the issue of an approval under regulations 21.009 or 21.437 to a foreign or state aircraft, aircraft engine, propeller or appliance.

- 3.5.2 This is because the registration status of an aircraft has no bearing from a safety perspective on the question of whether the approval should be granted. It also reflects the reality that design approvals may be sought at a time before the aircraft to which they will apply are registered at all.
- 3.5.3 However, the ADO or authorised person must comply with any conditions specified in their exposition and design assurance system manual, or instrument of appointment, as applicable.
- 3.5.4 Furthermore, an approval granted under Australian civil legislation may be of no effect under the legislative regime which applies to the particular foreign or state aircraft, aircraft engine, propeller or appliance (it is the responsibility of the applicant, owner or operator, not the approver, to make this determination). An approval granted for a foreign or state aircraft, aircraft engine, propeller or appliance should include the following statement (or similar): 'This approval is granted under Subpart 21.M of the Australian CASR. It is the responsibility of the owner/operator to determine whether this approval requires additional approval under their relevant regulations.'

### 3.6 Noise certification

- 3.6.1 Noise certification for individual aircraft is required in Australia before the aircraft can legally operate in Australian territory.
- 3.6.2 Noise certification, or lack of such certification, has no legal impact on the modification/repair design approval. However, if an individual aircraft does not meet the Australian noise requirements, then it is illegal for that aircraft to operate in Australian territory, even though the aircraft may have a valid certificate of airworthiness.
- 3.6.3 If a modification/repair design would affect the existing noise certification, then noise certification will be required.
- 3.6.4 Aircraft noise is regulated by Airservices Australia under the *Air Navigation (Aircraft Noise) Regulations 1984*, introduced under the *Air Navigation Act 1920*.
- 3.6.5 Further information regarding noise certification is available on the Airservices Australia website.

### 3.7 Installation of small cameras and similar devices inside aircraft

**Note:** This section is only applicable to mounting small devices inside an aircraft. It is not applicable to mounting devices on external surfaces – the regulations and safety considerations are different in those scenarios.

- 3.7.1 From time to time CASA receives enquiries about the rules and requirements for mounting small cameras and similar devices inside aircraft, in particular about whether the airworthiness regulations are applicable and a Part 21 modification design approval is required.
- 3.7.2 The airworthiness regulations are primarily about certifying the approved design of aircraft and required operational equipment, manufacturing those products and thereafter ensuring they remain airworthy. The continuing airworthiness and maintenance regulations are framed in relation to the approved design and the terms aircraft components (CAR) and aeronautical products (CASR). Aircraft components and

aeronautical products include parts of aircraft as specified in the Part 21 approved design of the aircraft, and equipment required by the regulations for operation of the aircraft.

- 3.7.3 A small camera, or similar device, is not an aircraft component or an aeronautical product if it is:
- a. not included in the approved design of the aircraft; and
  - b. mounted in a way that does not affect the approved design of the aircraft; and
  - c. not required equipment for the operation of the aircraft.
- 3.7.4 Mounting a small camera, or similar device, in accordance with the above criteria is not a change to the approved design of the aircraft and is not maintenance of the aircraft. A Part 21 modification design approval is not required in those circumstances.
- 3.7.5 The approved design of the aircraft would be affected by physical changes to a part of the aircraft, such as drilling holes. The approved design of the aircraft would not be affected by mounting means such as a suction cup.
- 3.7.6 Under CAO 20.16.2, a small camera, or similar device, that meets the above criteria is cargo. It is therefore the operator and pilot in command's responsibility to ensure that the device is used, restrained and stowed in compliance with CAO 20.16.2 and such that the safety of the aircraft is not adversely affected for the particular operation. A formal approval from CASA or an ADO or authorised person is not required in these circumstances.
- 3.7.7 The assessment by the operator and pilot in command will necessarily be on a case by case basis considering the device, the mounting means, the mounting location inside the aircraft and the operation. The physical size of the device is a relevant consideration for mounting and safe operation, in particular, the mass and dimensions of the device are relevant for determining the suitability of the mounting means and the mounting location.

## 4 Approval and production of parts for a modification/repair design

### 4.1 General

- 4.1.1 A modification/repair design approval is approval of a design or a design change for the purposes of incorporation/installation on an aircraft, aircraft engine, propeller or appliance.
- 4.1.2 A modification/repair design approval does not constitute approval for the purposes of approval of required instruments or equipment under the operational regulations (e.g. regulation 207 of CAR).
- 4.1.3 A modification/repair design approval does not constitute an approval to produce/fabricate/manufacture the parts associated with the design.
- 4.1.4 Parts that are aeronautical products<sup>6</sup> or aircraft components<sup>7</sup> are subject to the normal requirements for production and installation—they may only be made by a production or maintenance organisation that holds the necessary approvals and must be installed in accordance with regulation 42.420 or regulation 42W of CAR.

### 4.2 Production of parts

- 4.2.1 Parts for a modification/repair design may be produced by the following means, or a combination thereof (see AC 21.27 for more information on manufacturing approvals):
- Production certificate
  - FITCOM/MITCOM
  - Australian Parts Manufacturing Approval (APMA) – see AC 21.16
  - Australian Technical Standard Order authorisation (ATSOA) – see AC 21-601.

#### 4.2.2 Production certificates

- 4.2.2.1 Production certificates under Subpart 21.G may be obtained for production of parts included in a modification/repair design.
- 4.2.2.2 A one-off production certificate may be granted in cases where the application is limited, but the parts are not within the scope of FITCOM/MITCOM. For example, a major repair that includes a Class II product.
- 4.2.2.3 See AC 21-14 for more information on production certificates.

#### 4.2.3 FITCOM/MITCOM

- 4.2.3.1 Certain kinds of parts may be fabricated or manufactured in the course of maintenance (FITCOM/MITCOM) by a maintenance organisation. FITCOM applies for Part 42 aircraft and Part 145 approved maintenance organisations (AMO); MITCOM applies to

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<sup>6</sup> See section 3 of the *Civil Aviation Act 1988* and clause 1 of Part 2 of the CASR Dictionary.

<sup>7</sup> See regulation 2 of CAR.

maintenance organisations holding an approval under regulation 30 of CAR and aircraft subject to Part 4A of CAR.

- 4.2.3.2 FITCOM/MITCOM is for simple Class III products that are to be used on an aircraft on which the maintenance organisation is carrying out maintenance (e.g. hoses, brackets, cables) – parts made under FITCOM/MITCOM cannot be issued an authorised release certificate (ARC) and cannot be onsold.
- 4.2.3.3 See the Part 145 AMC/GM, CAAP 30-4 and AWB 02-047 for more information on FITCOM and MITCOM.

### 4.3 Commercial off-the-shelf parts

- 4.3.1 COTS parts are parts that:
  - a. the product design has not been approved under Part 21;
  - b. have not been produced under a Part 21 production approval; and
  - c. are not standard parts.
- 4.3.2 A modification/repair design may include COTS parts; however, the requirements for approval of the design apply to the whole design, including the COTS part.
- 4.3.3 Consideration must also be given to continuing airworthiness and maintenance requirements; in particular, ICA and the need for an ARC for installation of aeronautical products<sup>8</sup> and aircraft components<sup>9</sup>.
- 4.3.4 See 5.24.2Appendix C for more information on COTS parts.

#### Example – COTS camera

- 4.3.5 A modification design may provide for installation of a COTS camera on an aircraft. The applicant must show that the aircraft with the design incorporated (i.e. with the camera and any attaching hardware installed) would comply with the applicable airworthiness standards. For example: if the camera is mounted internally then flammability requirements must be considered; and if the camera is mounted externally then aerodynamic effects must be considered.

### 4.4 Approval of alternative parts and materials

- 4.4.1 A modification/repair design approval may be used to approve an aeronautical product (including parts and materials and software) as an alternative to an aeronautical product specified in the approved design of an aircraft, aircraft engine, propeller or appliance.
- 4.4.2 Such approvals are granted as a modification of the aircraft, aircraft engine, propeller or appliance on which the alternative product may be fitted or used, and therefore, under paragraph 21.440(c), the approval must specify the aircraft, aircraft engine(s), propeller(s), or appliance(s) on which the alternative product may be fitted or used.

**Note** Approval under Subpart 21.M does not constitute approval for the purposes of approval of required instruments or equipment under the operational regulations (e.g. regulation 207 of CAR).

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<sup>8</sup> See Division 42.E.2.

<sup>9</sup> See regulation 42W of CAR.



## **4.5 Approval of alternative instructions for continuing airworthiness**

- 4.5.1 A modification/repair design approval may be used to approve alternative ICA for an aircraft, aircraft engine, propeller or appliance. This may be in the form of new ICA (if there are no existing ICA), or a variation of existing ICA.
- 4.5.2 Such approvals are granted as a modification of the aircraft, aircraft engine, propeller or appliance on which the alternative ICA may be used, and therefore, under paragraph 21.440(c), the approval must specify the aircraft, aircraft engine(s), propeller(s), or appliance(s) for which the alternative ICA is applicable.
- 4.5.3 See 5.24.2 Appendix B for more information on approving alternative ICA.

## 5 Advisory material for Subpart 21.M and associated regulations

### 5.1 Regulation 21.003 – Reporting failures, malfunctions, and defects

- 5.1.1 Subregulation 21.003(2A) requires the holder of a modification/repair design approval to report to CASA any failure, malfunction or defect related to the approval. CASA's service difficulty reporting (SDR) system is the appropriate means for reporting these defects, failures or malfunctions.

### 5.2 Regulation 21.006A – Approval of changes to aircraft flight manuals

- 5.2.1 Regulation 21.006A sets out who may apply for the approval of a change to an aircraft flight manual (AFM) and provides for CASA, an ADO or an authorised person to approve a change to an AFM or a change to an AFM supplement (FMS).
- 5.2.2 If a modification/repair design necessitates a change to the AFM for the applicable aircraft, then the AFM change must be approved under this regulation.<sup>10</sup>
- 5.2.3 The applicant for the modification/repair design approval or the registered operator of the aircraft may apply (in writing) for a change to the AFM.

**Note:** If the person to whom the modification/repair design application has been submitted is also permitted to approve changes to an AFM, then it should generally not be necessary to submit an additional application to them for approval of a change to the AFM associated with the modification/repair design.

- 5.2.4 In order for the change to be approved, the applicant must satisfy CASA, the ADO or authorised person (as applicable) that the manual, as changed, would comply with the applicable airworthiness standards. For type certificated aircraft this should include 23.1581, 25.1581, 27.1581 or 29.1581 (or similar, as applicable).
- 5.2.5 The showing of compliance for a change to an AFM should be covered in the technical data approved under regulation 21.009 for the modification/repair design.
- 5.2.6 The AFM amendment or supplement should be in the same format and structure as the existing AFM, and should clearly specify the modification/repair design to which the amendment or supplement relates.
- 5.2.7 If the aircraft does not have an AFM and a modification/repair design affects the information that would normally be contained in an AFM, then an AFM supplement may be approved under this regulation. However, if the information that would normally be provided in an AFM is provided by placards in the aircraft, and a modification/repair design necessitates a physical change to the placards, then that change should be approved as part of the modification/repair design under regulation 21.435 or 21.437.

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<sup>10</sup> See also subregulation 21.420(2).

5.2.8 See AC 21-34 for more detailed information on AFMs.

**Notes:**

1. An authorisation to approve a modification/repair design does not imply an authorisation to approve a change to an AFM. The authorisation to approve a change to an AFM under this regulation must be specifically granted by CASA, either under an ADO approval certificate or an instrument of appointment.
2. It is the responsibility of the holder of the modification/repair design approval to ensure that any subsequent required changes to the AFM (e.g. as a result of defects or changes to the design) are approved under this regulation and provided to the registered operator of the aircraft.<sup>11</sup>

### 5.2.9 When a change to a flight manual is required for a modification/repair design

5.2.9.1 A change to a flight manual must be developed and approved under this regulation for designs for which information is necessary for safe operation because of design, operating, or handling characteristics, such as:

- a. designs that result in a change to limitations, procedures, performance, or loading information specified in the current AFM, pilot's operating handbook (POH) or placards
- b. designs that include new equipment, modify equipment or change the crew/aircraft interface or the aircraft configuration and for which the pilot would need additional information for the safe operation of the equipment or the aircraft.

5.2.9.2 Designs that do not result in a change to limitations, procedures, performance, or loading information may not require a supplement or the supplemental information may consist of system operating instructions only. In this case the equipment manufacturer's operating manual containing detailed instructions may be incorporated by reference into an AFM supplement.

5.2.9.3 If **ALL** of the following conditions are met, then an AFM supplement is not required:

- a. the design does not change limitations, procedures, performance, or loading information, specified in the current AFM, POH or placards; **and**
- b. the design does not restrict, displace, or limit the use of required equipment; **and**
- c. all new limitations can be addressed via placards; **and**
- d. the aircraft performance is not negatively affected; **and**
- e. a placard is not required by the TC or STC; **and**
- f. the aircraft or the affected equipment is for VFR use only; **and**
- g. the design affects/involves only non-required equipment.

5.2.9.4 See AC 21-34 for more detailed information on when an AFM supplement would be required.

#### **Example – design for installation of alternative non-required avionics equipment**

5.2.9.5 In the case of a modification/repair design that covers the installation of an item of avionics equipment as an alternative to the equipment that is currently installed on the aircraft and the equipment is not required either for compliance with the certification basis of the aircraft or by the applicable operational regulations, and the new equipment

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<sup>11</sup> See regulation 21.460.

does not change any limitations, procedures, performance, loading information or affect the use of any required equipment:

- a. If there is already mention of the original equipment in the current AFM, then a supplement would be required to amend that information.
- b. If the current AFM does not mention the original equipment, and the design does not affect the information in the current AFM and does not change the pilot-machine interface, then an AFM supplement would not be required. If the equipment is installed in the cockpit and it requires the pilot's use or input and, therefore, it changes the pilot-machine interface, an AFM supplement would be required.

### 5.3 Regulation 21.009 – Approval of technical data

- 5.3.1 The technical data for a modification/repair design must include all the data that:
  - a. describes the design; and
  - b. shows that the design complies with the applicable airworthiness standards.<sup>12</sup>
- 5.3.2 The following paragraphs provide an overview of technical data for modification/repair design approvals.
- 5.3.3 Under regulation 21.420, the applicant for a modification/repair design approval must provide all the technical data for the design for approval under regulation 21.009.
- 5.3.4 Regulations 21.435 and 21.437 require the technical data for the design to have been approved under regulation 21.009 in order for the modification/repair design to be approved. The technical data for a modification/repair design must be of a standard that is appropriate for the scope, complexity and criticality of the design.
- 5.3.5 Technical data must cover all the design changes to be approved as a part of the modification/repair design and all the compliance requirements for each of those changes, including the major/minor classification, limitations, changes to the AFM, production data and the instructions for continuing airworthiness (ICA) for the design.
- 5.3.6 Technical data must be approved by an individual who holds the necessary authorisation in the relevant engineering speciality.<sup>13</sup>
- 5.3.7 The technical data package for a design may be provided as a set of multiple approvals (for example, if the design involves multiple specialities).
- 5.3.8 The technical data for a modification/repair design may be approved by the same individual who approves the modification/repair design under regulation 21.435 or 21.437, or a different individual. If the same individual is to approve both the technical data and the modification/repair design then both approvals may be granted at the same time; however, the approval of the technical data under regulation 21.009 is a distinct approval under the regulations and this must be evident on the approval document (e.g. a single signature on the design approval package may be used to approve both the technical data under 21.009 and the modification/repair design under

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<sup>12</sup> See regulation 21.008 for the meaning of technical data.

<sup>13</sup> See AC 21.J-01 for more information on engineering specialities.

21.437, provided the document clearly states that the approval is for both the technical data under 21.009 and the modification/repair design under 21.437).

- 5.3.9 A technical data approval covers only what is specified in the approval document – this may or may not be the complete technical data for a modification/repair design. Therefore, a technical data approval document must clearly specify what the approval covers.
- 5.3.10 It is the responsibility of the person granting the modification/repair design approval under regulation 21.435 or 21.437 to ensure that the technical data package for the particular modification/repair design covers all the relevant requirements and has the necessary approvals.

## **5.4 Regulation 21.010 – References to modifications and repairs in Part**

- 5.4.1 Regulation 21.010 provides that a reference to a modification of, or repair to, an aircraft, aircraft engine, propeller or appliance includes a reference to a modification of, or repair to, an aeronautical product for the aircraft, aircraft engine, propeller or appliance; regardless of whether, at the time of the modification or repair, the aeronautical product was fitted to the aircraft, aircraft engine, propeller or appliance.

### **Example**

- 5.4.2 In some cases a product must be removed in order for a modification or repair to be incorporated, for example, a modification/repair design for an aircraft flap—the flap does not have to be fitted to the aircraft when the modification or repair is approved and incorporated on the flap.

## **5.5 Regulation 21.402 – Definition of proposed airworthiness standards for Subpart 21.M**

- 5.5.1 Under regulation 21.405, the applicant for an approval of a modification/repair design must specify the proposed airworthiness standards for the design in the application.
- 5.5.2 Regulation 21.402 provides the definition of proposed airworthiness standards that applies for Subpart 21.M. This definition should be read in conjunction with subregulations 21.405(3) and (4), which provide additional requirements in relation to what the proposed airworthiness standards must be for a particular modification/repair design (see subsection 5.7.3).

## **5.6 Regulation 21.403 – Definition of applicable airworthiness standards for Subpart 21.M**

- 5.6.1 Regulation 21.403 provides the definition of applicable airworthiness standards that applies for Subpart 21.M. This definition should be read in conjunction with the definition of proposed airworthiness standards in regulation 21.402 and also subregulations 21.405(3) and (4), which provide additional requirements in relation to what the

proposed airworthiness standards must be for a particular modification/repair design (see subsection 5.7.3).

- 5.6.1.1 The definition also provides for the following determinations:
- a. a determination under regulation 21.414 that additional standards apply to the design (see subsection 5.9)
  - b. a determination under regulation 21.416 or 21.418 that certain standards do not apply to the design (see subsections 5.10 and 5.11).

## **5.7 Regulation 21.405 – Applications for modification/repair design approvals**

### **5.7.1 Who may be the applicant?**

- 5.7.1.1 Any person (individual or body corporate) may be the applicant for a modification/repair design approval.
- 5.7.1.2 If the modification/repair design is approved, then the applicant becomes the holder of the modification/repair design approval.
- 5.7.1.3 There is no restriction on the relationship between the applicant and the ADO or authorised person who approves the application (i.e. the applicant and the approver may be the same person or different parts of the same organisation).

### **5.7.2 Form of application**

- 5.7.2.1 An application for a modification/repair design must:
- a. be in writing, which includes in an electronic form
  - b. be in the approved form – an application submitted to CASA should be made on Form 442. An ADO or an authorised person may develop their own form for applicants to use, provided all the required information is covered
  - c. include all the information required by the regulations:
    - i. the applicant's name and contact details
    - ii. the make, model and serial number of each aircraft, aircraft engine, propeller or appliance to which the design relates
      - A. an application may be for a single item or multiple types, models or serial numbers
      - B. if an application is for more than one aircraft or aeronautical product then the application need not state each particular registration or serial number individually, but must include a statement that enables accurate identification of the aircraft, aircraft engines, propellers or appliances to which the application applies
    - iii. a description of the modification or repair
    - iv. the proposed airworthiness standards for the design
    - v. an outline of the means for demonstrating compliance with the proposed airworthiness standards

- d. be accompanied by every document required by the regulations – this includes all the technical data for the design.

### **5.7.3 Subregulation 21.405(3) and (4) – proposed airworthiness standards**

- 5.7.3.1 For an aircraft, aircraft engine or propeller for which there is a TC, TAC or foreign type certificate, the proposed airworthiness standards for the design must be:
  - a. either:
    - i. the airworthiness standards that applied to the issue of the TC, TAC or foreign type certificate, or
    - ii. a specified later version of those standards; and
  - b. any other standards that the applicant considers to be directly related to those standards.
- 5.7.3.2 For an aircraft, aircraft engine or propeller for which there is no TC, TAC or foreign type certificate, or an appliance, the proposed airworthiness standards for the design must be:
  - a. either:
    - i. the airworthiness standards that applied to the original certification (however described) of the aircraft, aircraft engine, propeller or appliance; or
    - ii. a specified later version of those standards; and
  - b. any other standards that the applicant considers to be directly related to those standards.
- 5.7.3.3 Under regulation 21.010, the proposed airworthiness standards for an appliance for a type certificated aircraft, aircraft engine or propeller must include the applicable type certification standards.

## **5.8 Regulation 21.410 – Refusal to grant approval if design constitutes major change in type design**

- 5.8.1 CASA, the ADO or authorised person may refuse to grant approval for the design under Subpart 21.M without further consideration if the design would constitute a major change in a type design. However, CASA, the ADO or authorised person must provide the applicant the reasons for the decision.<sup>14</sup>
- 5.8.2 A major change in type design should generally be processed as an STC. However, certain major changes that are not significant or substantial changes may be approved under Subpart 21.M by an ADO or authorised person in the following circumstances:
  - a. An ADO or authorised person may apply on a one-off basis to CASA via a DA for authorisation to approve a major design change under Subpart 21.M (see subsection 3.2 for more information about a DA). Such authorisations will be limited to a single aircraft, aircraft engine or propeller.

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<sup>14</sup> See regulation 11.060.

- b. An ADO may apply to CASA, either as part of their initial application or a subsequent change to their scope of approval, for authorisation to approve major design changes of a particular kind under Subpart 21.M. Such an application must include specific procedures, documented in the ADO's exposition and design assurance system manual, for approving major design changes of the relevant kind. See AC 21.J-01 for more information about ADOs.

5.8.2.1 General examples of design changes that should be processed as an STC include:

- a. the design introduces a significant change to the data or limitations mentioned in the TC or type acceptance certificate for the aircraft, aircraft engine or propeller
- b. the design changes airworthiness limitations or certification maintenance requirements (CMR) for the aircraft, aircraft engine or propeller
- c. the design is a major change for more than one aircraft, aircraft engine or propeller serial number
- d. the parts to be manufactured for the design are complex, exceeding what would be appropriate for FITCOM/MITCOM or a one-off production certificate.

### 5.8.3 Major/minor classification of designs

5.8.3.1 A minor change is one that has no appreciable effect on the weight, balance, structural strength, reliability, operational characteristics, or other characteristics affecting the airworthiness of an aircraft, aircraft engine or propeller.<sup>15</sup> The following items should be considered for the classification:

- a. Structural performance. Structural performance includes static strength, fatigue, damage tolerance, flutter and stiffness characteristics. Changes to any element of the structure should be assessed for their effect upon the structural performance.
- b. Weight and balance. The weight of the change may have a greater effect upon smaller aircraft as opposed to larger aircraft. The effects to be considered are related to overall aircraft centre of gravity and aircraft load distribution. Control surfaces are particularly sensitive to the changes due to the effect upon the stiffness, mass distribution and surface profile which may have an effect upon flutter characteristics and controllability.
- c. Systems. Changes to any elements of a system should be assessed for the effect intended on the operation of the complete system and for the effect on system redundancy and reliability. The consequence of a structural change on an adjacent or remote system should also be considered as above, (for example: airframe change in area of a static port).
- d. Operational characteristics, including:
  - i. stall characteristics
  - ii. handling
  - iii. performance and drag
  - iv. vibration.
- e. Other characteristics, including:

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<sup>15</sup> See regulation 21.093 for the meaning of minor change.



- i. changes to load path and load sharing
- ii. change to noise and emissions
- iii. fire protection / resistance.

**Note:** Considerations for classifying design changes 'major/minor' should not be limited to those listed above – the classification must thoroughly consider all the effects of the design, including any unique or novel features or characteristics.

- 5.8.3.2 If it cannot be shown that the modification/repair design has no appreciable effect on the above then it should be classified major.
- 5.8.3.3 Changes that require a re-assessment and re-evaluation of the original certification substantiation data to ensure that the aircraft still complies with all the relevant requirements are to be classified major.
- 5.8.3.4 All previous related design changes and the amendment level of the certification basis for these changes should also be considered for the classification.
- 5.8.3.5 It is understood that in many cases not all the certification substantiation data will be available to the ADO or authorised person classifying a design change. In cases where the certification substantiation data is not available a qualitative engineering judgement, supported by service experience where possible, of the effects of the design will be acceptable for the initial classification. However, if it is subsequently found that any of these judgements are no longer valid, then the classification must be reviewed and reclassified if necessary.
- 5.8.3.6 See AC 21-12 for more detailed information on classification of design changes.

## **5.9 Regulation 21.414 – Determination of additional airworthiness standards—special conditions**

- 5.9.1 If CASA, the ADO or authorised person is not satisfied that the proposed airworthiness standards for the design provide an adequate safety standard for the design in a particular respect then they may determine additional airworthiness standards for the design.
- 5.9.2 The additional airworthiness standards may be either, or a combination, of the following:
  - a. later versions of the proposed airworthiness standards
  - b. special conditions.
- 5.9.3 The additional airworthiness standards must be appropriate to provide a level of safety for the aircraft, aircraft engine, propeller or appliance equivalent to the level of safety required by the regulations for a comparable aircraft, aircraft engine, propeller or appliance. The objective is to achieve a level of safety consistent with that provided for:
  - a. other areas, systems, components, equipment, or appliances affected by the change, by the other requirements of the proposed airworthiness standards; or
  - b. another aircraft, engine or propeller or appliance certified to the same airworthiness standards (at the same version).

- 5.9.4 In any case, the overall level of safety should not be reduced relative to the proposed airworthiness standards (see regulation 21.405 for the requirements for the proposed airworthiness standards).
- 5.9.5 CASA, the ADO or authorised person must notify the applicant, in writing, of any additional airworthiness standards that are determined to apply to the design.

### **5.9.6 Later versions of the proposed airworthiness standards**

- 5.9.6.1 If additional airworthiness standards are required for the design, then the ADO or authorised person should first consider later versions of the proposed airworthiness standards, beginning with the proposed airworthiness standards and progressing to the most appropriate later amendment level for the design.
- 5.9.6.2 If there are no airworthiness standards at any version that adequately address the design then special conditions will be required.

### **5.9.7 Special conditions**

- 5.9.7.1 Special conditions may be required if there are no airworthiness standards at any version that adequately address the particular features or characteristics of the design. This may occur in situations such as:
- a. the design contains novel or unusual features
  - b. the design is for an unconventional use of the aircraft or product
  - c. service experience from other aircraft or products that have similar design features has shown that unsafe conditions may develop.

### **5.9.8 Airworthiness directives**

- 5.9.8.1 A check of current ADs, including exclusions or alternative means of compliance, should be carried out to ensure that the proposed modification or repair does not impact on the requirements of any applicable ADs. If the modification/repair design conflicts with the requirements of an AD, then it will be necessary to include additional airworthiness standards or special conditions, alter the proposed modification/repair design so that it is not in conflict with the AD, or apply to CASA for an exclusion or alternative means of compliance for the AD.

### **5.9.9 Part 90—Additional airworthiness requirements**

- 5.9.9.1 A check of Part 90 additional airworthiness requirements should be carried out to ensure that the proposed modification or repair does not impact on any applicable requirements. If the modification/repair design conflicts with a Part 90 requirement, then it will be necessary to include additional airworthiness standards or special conditions, alter the proposed modification/repair design so that it is not in conflict with the requirement, or apply to CASA for an exclusion from the requirement.

### **5.9.10 Additional requirements associated with operational approvals**

- 5.9.10.1 A check of the requirements associated with any operational approvals, such as instrument flight rules (IFR) operations, extended diversion time operations (EDTO),

approved single engine turbine powered aeroplane (ASETPA) operations, reduced vertical separation minimum (RVSM), required navigation performance (RNP) or night vision goggle operations, should be carried out to ensure that the proposed modification or repair does not impact on any applicable requirements. If the modification/repair design conflicts with a requirement, then it will be necessary to include additional airworthiness standards or special conditions, alter the proposed modification/repair design so that it is not in conflict with the requirement, or impose operational conditions on the approval.

## **5.10 Regulation 21.416 – Determination of non-application of airworthiness standards—application to CASA**

- 5.10.1 This regulation only applies to applications that have been made to CASA for approval of a modification/repair design for:
- a. a restricted category aircraft
  - b. an aircraft subject to an application for a special certificate of airworthiness in the restricted category under subregulation 21.185(3B).
- 5.10.2 This regulation provides for CASA to make a determination that a proposed airworthiness standard does not apply for a particular modification/repair design. It provides for a modification/repair design to be subject to similar requirements that apply for type certification of a restricted category aircraft under regulation 21.025.
- 5.10.3 The process of establishing the applicable airworthiness standards for restricted category and special purpose aircraft is in principle the same as for aircraft with a standard certificate of airworthiness. The requirements of subregulation 21.405(3) for the proposed airworthiness standards are applicable to all type certificated aircraft, including restricted category aircraft.
- 5.10.4 However, CASA may exclude certain requirements of the airworthiness standards that CASA considers are inappropriate for the special purpose for which the aircraft is to be used. The exclusion of certain requirements may require CASA to specify additional airworthiness standards that provide an acceptable level of safety for the special purpose or conditions limiting the use of the aircraft.
- 5.10.5 The applicant should include with their application, a certification plan that clearly sets out the following:
- a. the intended special purpose(s)
  - b. details of the design
  - c. proposed airworthiness standards for the design
  - d. the airworthiness standards that they believe are inappropriate for the design
  - e. the features or characteristics of the design that are related to those standards
  - f. the reasons why those airworthiness standards are inappropriate – the application must demonstrate a clear understanding of the relevant airworthiness standards, their purpose and the hazards addressed
  - g. the proposed means of ensuring a level of safety appropriate for the aircraft's intended use, which may include:

- i. modified requirements of the airworthiness standards
- ii. additional/alternative airworthiness standards
- iii. operating limitations.

5.10.6 See AC 21-06 for further information on certification of restricted category aircraft.

## **5.11 Regulation 21.418 – Determination of non-application of airworthiness standards—application to authorised person or approved design organisation**

5.11.1 This regulation only applies to applications that have been made to an ADO or authorised person for approval of a modification/repair design for:

- a. a restricted category aircraft
- b. an aircraft subject to an application for a special certificate of airworthiness in the restricted category under 21.185(3B).

5.11.2 This regulation is similar to regulation 21.416, except that it is for applications that have been made to an ADO or authorised person.

5.11.3 This regulation provides for the ADO or authorised person to make a determination that a proposed airworthiness standard does not apply for a particular modification/repair design. However, the ADO or authorised person must notify CASA of the determination and the determination may not be applied to the design unless CASA provides written notification of agreement with the determination.

5.11.4 The notification to CASA should be made on a DA (see subsection 3.2.6). The ADO or authorised person should include with their notification to CASA, the applicant's certification plan that clearly sets out the following:

- a. the intended special purpose(s)
- b. details of the design
- c. proposed airworthiness standards for the design
- d. the airworthiness standards that they believe are inappropriate for the design
- e. the features or characteristics of the design that are related to those standards
- f. the reasons why those airworthiness standards are inappropriate – the application must demonstrate a clear understanding of the relevant airworthiness standards, their purpose and the hazards addressed
- g. the proposed means of ensuring a level of safety appropriate for the aircraft's intended use, which may include:
  - i. modified requirements of the airworthiness standards
  - ii. additional/alternative airworthiness standards
  - iii. operating limitations
- h. any additional information used by the ADO or authorised person to make the determination.

5.11.5 See regulation 21.216 guidance above and AC 21-06 for further information on certification of restricted category aircraft.

## **5.12 Regulation 21.420 – Applicants must show compliance with applicable airworthiness standards, submit technical data and provide documents**

5.12.1 It is the applicant's responsibility to demonstrate that the design complies with the applicable airworthiness standards. However, the applicant may be assisted by other parties, including the ADO or authorised person to whom the application has been made, with any aspect of the process, including development of the design, the certification plan, carrying out the necessary tests, the compliance summary and obtaining the required approvals.

### **5.12.2 Technical data**

5.12.2.1 It is the applicant's responsibility to provide all the technical data for the design for approval under regulation 21.009. See subsection 5.3 for more information on technical data.

### **5.12.3 Instructions for continuing airworthiness (ICA)**

5.12.3.1 It is the applicant's responsibility to provide the ICA for the modification/repair design. ICA must be prepared in accordance with the airworthiness standard for ICA that applies to the aircraft or aeronautical product (e.g. 23.1529, 25.1529, 27.1529, 29.1529, CS-E 25, FAR 33.4, CS-P 40, FAR 33-4).

5.12.3.2 If a modification/repair design affects the existing ICA (e.g. the modification/repair design alters a part of an aircraft that is subject to a maintenance task in the ICA from the type certificate holder), then a part of showing compliance with the applicable ICA standard will be to assess the effect the modification/repair design has on the existing ICA and, if necessary, provide alternative ICA that will ensure the aircraft or aeronautical product remains airworthy throughout its lifetime.

5.12.3.3 If the assessment shows that the existing ICA are adequate for the modified aircraft or aeronautical product then a statement to that effect should be made under the ICA section of the technical data and modification/repair design approval.

5.12.3.4 The ICA for the modification/repair design should be included in the technical data package for approval under regulation 21.009. See subsection 5.3 for more information on technical data and 5.24.2 Appendix B for more information on ICA.

**Note:** A design that changes the airworthiness limitations or certificated life limits of an aircraft or aeronautical product should be classified as major.

### **5.12.4 Aircraft flight manual (AFM)**

5.12.4.1 If a modification/repair design requires the information in the AFM to be changed, then it is the applicant's responsibility to obtain approval of the necessary changes, either as an amendment to the AFM or as an AFM supplement, and provide those approved changes to the person who is to approve the modification/repair design. See subsection 5.2 for more information on approval of changes to an AFM.

### 5.12.5 Equivalent level of safety information

- 5.12.5.1 If literal compliance with an applicable airworthiness standard cannot be demonstrated, but compensating factors exist in the design that can be shown to provide a level of safety equivalent to that intended by the standard, then the applicant may request an equivalent level of safety determination under subregulation 21.435(3) or regulation 21.436.
- 5.12.5.2 The applicant must provide all the necessary data required to make the finding of equivalent safety, including:
- a. an introduction of the background information including an explanation of the need for the equivalent level of safety determination
  - b. a listing of the relevant applicable airworthiness standards
  - c. a description of the features of the design or other program elements that require the equivalent level of safety finding
  - d. a description of compensating design features or alternative methods of compliance which allow the granting of the equivalent level of safety determination (including design changes, limitations or equipment need for equivalency)
  - e. an explanation of how design features or alternative methods of compliance provide an equivalent level of safety to the level of safety intended by the standard – the application must demonstrate a clear understanding of the relevant airworthiness standards, their purpose and the hazards addressed.

### 5.12.6 Certification activity

- 5.12.6.1 Subregulations 21.420(3), (4) and (5) apply if an application for a modification/repair design approval has been made to CASA and CASA has authorised an ADO to carry out a certification activity in relation to the design.
- 5.12.6.2 The applicant is taken to have shown CASA that the design complies with the applicable airworthiness requirements if an ADO has carried out a certification activity and has provided CASA with a certificate to the effect that the design complies with the applicable airworthiness requirements.
- 5.12.6.3 However, the applicant remains responsible for showing compliance in relation to any applicable airworthiness requirements not covered by the certification activity.
- 5.12.6.4 Furthermore, if CASA is not satisfied that the certificate is complete and accurate then CASA may ask the applicant or the ADO that carried out the certification activity to provide more information. CASA may reject the certificate if the necessary information cannot be provided.<sup>16</sup>
- 5.12.6.5 See AC 21.J-01 for more information on certification activities.

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<sup>16</sup> See Subparts 11.B and 11.BA.

## 5.13 Regulation 21.425 – Applicants to carry out necessary inspections and tests

- 5.13.1 The applicant is responsible for carrying out all inspections and tests necessary to show that the design complies with the applicable airworthiness standards for the design. However, the applicant may enlist the assistance of other parties, such as an ADO, authorised person, maintenance organisation or production organisation, as necessary, to ensure the inspections and tests are carried out to the required standards.
- 5.13.2 Test results from, but not limited to, component, ground, and flight testing, may be required. If flight testing is necessary for the purposes of research and development or showing compliance with the applicable airworthiness standards then those flights should be carried out under an experimental certificate.<sup>17</sup>
- 5.13.3 Testing must be consistent with that required by the applicable airworthiness standards.
- 5.13.4 The test plans and test reports (if required) must be documented and approved under regulation 21.009 as part of the technical data for the design (see subsection 5.3 for more information on technical data).
- 5.13.5 Prototype parts that are to be tested must comply with the technical data that is relevant to the test. Where consistent with the applicable airworthiness standards, the test plan that is approved as part of the technical data may include specific data (i.e. specifications, drawings, manufacturing processes) for test articles that are representative of the 'as installed' configuration. The test articles must be sufficiently representative to ensure the test data is valid and sufficient to demonstrate that the design meets the applicable airworthiness standards.
- Note:** Subregulation 21.425(2) deals with prototype parts for the purposes of showing compliance. It does not restrict the manufacture and testing of test and development parts throughout the design development process.
- 5.13.6 If the test parts are not to be used in service then it is not necessary for them to be made by an AMO or a production organisation, provided the applicant can demonstrate that they comply with the relevant technical data.
- 5.13.7 If tests or inspections are considered necessary to show compliance then the applicant should submit the compliance and test plans to the person who is to approve the technical data and the modification/repair design in advance of carrying out the tests or inspections. This allows the person to provide advice in relation to the tests and inspections that may be required and for the person to observe those tests or inspections necessary to provide the approvals. It should also avoid any tests or inspections having to be repeated for the purposes of regulation 21.430.

## 5.14 Regulation 21.430 – CASA, authorised person or approved design organisation may carry out or observe certain tests

- 5.14.1 The person to whom the application for approval of the modification/repair design has been made (i.e. CASA, ADO or authorised person), may require the applicant to allow them to carry out or observe any inspection or test that is necessary to satisfy them that

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<sup>17</sup> See AC 21-10 for more information on experimental certificates.

the design complies with the applicable airworthiness standards. The applicant must be notified in writing.

- 5.14.2 If flight testing is required under this regulation for the purposes of research and development or showing compliance with the applicable airworthiness standards then the applicant is responsible for obtaining an experimental certificate for the flight.<sup>18</sup>
- 5.14.3 See subsection 5.13 for further information on inspections and tests.

## **5.15 Regulation 21.435 – Grant of modification/repair design approvals—grant by CASA**

- 5.15.1 Regulation 21.435 provides for CASA to grant a modification/repair design approval.

### **5.15.2 Granting approval**

- 5.15.2.1 CASA must grant the approval if CASA is satisfied that the applicant has shown, via the technical data for the design, that:

- a. the design complies with the applicable airworthiness standards for the design, which also includes:
  - i. inspections and tests under regulation 21.425 and 21.430
  - ii. the ICA for the design
  - iii. any AFM amendments or supplements; and
- b. no feature or characteristic of the design makes the relevant aircraft, aircraft engine, propeller or appliance unsafe for its intended use (see subsection 3.4 for more information on unsafe feature or characteristic analysis).

### **5.15.3 Conditions**

- 5.15.3.1 Under regulations 11.055 and 11.056, CASA may make the approval subject to any condition that is necessary in the interests of the safety of air navigation. For example, operational limitations, or if the technical data for the design is only sufficient to satisfy CASA that the design will comply with the applicable airworthiness standards for a limited period then CASA may specify a limit at which the approval ceases.
- 5.15.3.2 If the condition was not sought by the applicant then CASA must provide the applicant the reasons for the decision.<sup>19</sup>

### **5.15.4 Certification activity**

- 5.15.4.1 Subregulation 21.435(2A) applies if an ADO has carried out a certification activity for a modification/repair design. See subsection 5.12.6 and AC 21.J-01 for more information on certification activities.

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<sup>18</sup> See AC 21-10 for more information on experimental certificates.

<sup>19</sup> See regulation 11.060.



### **5.15.5 Equivalent level of safety determination**

5.15.5.1 Paragraph 21.435(3)(c) provides for CASA to make an equivalent level of safety determination in cases where the application for the modification/repair design approval was made to CASA (see regulation 21.436 for cases where the application was made to an ADO or authorised person). If an equivalent level of safety determination is sought by the applicant, the applicant must provide all the necessary information for CASA to make the determination. See subsection 5.12.5 for the information required for an equivalent level of safety determination.

### **5.15.6 Refusal to grant approval**

5.15.6.1 If CASA decides to refuse to grant the modification/repair design approval then CASA must provide the applicant with the reasons for the decision.<sup>20</sup>

## **5.16 Regulation 21.436 – Application to authorised person or approved design organisation—non-compliance with applicable airworthiness standards: determination of equivalent level of safety**

5.16.1 Regulation 21.436 provides for an equivalent level of safety determination to be made when the application for the modification/repair design approval was made to an ADO or an authorised person (see regulation 21.435 for cases where the application was made to CASA).

5.16.2 An ADO or authorised person must be specifically approved to make an equivalent level of safety determination – an authorisation to approve modification/repair designs under regulation 21.437 does not imply an approval to make an equivalent level of safety determination.

### **5.16.3 Equivalent level of safety determination by CASA**

5.16.3.1 If the ADO or authorised person has not been approved to make equivalent level of safety determinations then they must apply to CASA for the determination via a DA (see subsection 3.1 for more information about a DA). The ADO or authorised person must provide CASA the following:

- a. the relevant technical data for the design; and
- b. the information mentioned in paragraph 5.12.5.2.

5.16.3.2 See subsection 5.12.5 for the information required for an equivalent level of safety determination.

### **5.16.4 Equivalent level of safety determination by an ADO or authorised person**

5.16.4.1 If the ADO or authorised person has been approved to make equivalent level of safety determinations then they may make a determination; however, the determination must be agreed by CASA in writing before it may be applied. If an ADO or authorised person

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<sup>20</sup> See regulation 11.060.

has made an equivalent level of safety determination then they must provide CASA, in the form of a DA (see subsection 3.1 for more information about a DA), a notice in relation to the determination that includes the following:

- c. a statement that:
  - i. the design does not comply with the standard; and
  - ii. the non-compliance is compensated for by factors that provide an equivalent level of safety; and
- d. details of how the non-compliance is compensated for, including:
  - i. the relevant technical data for the design; and
  - ii. the information mentioned in paragraph 5.12.5.2.

5.16.4.2 If CASA agrees with the notice and the equivalent level of safety determination is applied to the modification/repair design, then the notice to CASA from the ADO must be retained with the documents for the modification/repair design approval.

## **5.17 Regulation 21.437 – Grant of modification/repair design approvals — grant by authorised person**

5.17.1 Regulation 21.437 provides for an ADO or an authorised person to grant a modification/repair design approval.

### **5.17.2 Granting approval**

5.17.2.1 The ADO or authorised person must grant the approval if they are satisfied that the applicant has shown, via the technical data for the design, that:

- a. the design complies with the applicable airworthiness standards for the design, which includes:
  - i. any determinations under regulations 21.414, 21.416 or 21.418 in relation to the applicable airworthiness standards for the design
  - ii. inspections and tests under regulation 21.425 and 21.430
  - iii. the ICA for the design
  - iv. any AFM amendments or supplements; and
- b. no feature or characteristic of the design makes the relevant aircraft, aircraft engine, propeller or appliance unsafe for its intended use (see subsection 3.4 for more information on unsafe feature or characteristic analysis).

### **5.17.3 Technical data**

5.17.3.1 The technical data for the design must be approved under regulation 21.009.

5.17.3.2 The ADO or authorised person that will approve the modification/repair design must ensure that the technical data package covers all the relevant requirements and has the necessary approvals. This should be clearly shown in the compliance summary.

5.17.3.3 See subsection 5.3 for more information on technical data.

#### **5.17.4 Equivalent level of safety determination**

5.17.4.1 If the ADO or authorised person is not satisfied that the design complies with an applicable airworthiness standard then an equivalent level of safety determination under regulation 21.436 may be applied.

#### **5.17.5 Conditions**

5.17.5.1 Under regulations 11.055 and 11.056, the ADO or authorised person may make the approval subject to any condition that is necessary in the interests of the safety of air navigation. For example, operational limitations, or if the technical data for the design is only sufficient to satisfy the ADO or authorised person that the design will comply with the applicable airworthiness standards for a limited period then the ADO or authorised person may specify a limit at which the approval ceases.

5.17.5.2 If the condition was not sought by the applicant then the ADO or authorised person must provide the applicant the reasons for the decision.<sup>21</sup>

#### **5.17.6 Coordinated approvals**

5.17.6.1 If an ADO or authorised person (the first ADO/AP) receives an application for a modification/repair design approval that requires coordination of multiple specialities, some of which are not covered under the first ADO/AP's scope of approval, then the parts of the activity that are not covered under the first ADO/AP's approval certificate must be carried out by another ADO or authorised person (the second ADO/AP) whose scope of approval includes the relevant specialities.

5.17.6.2 A coordinated approval must be clearly documented in the certification plan, including:

- a. the agreed responsibilities of each ADO or authorised person for each applicable requirement
- b. the communication plan, describing communication and coordination responsibilities between the ADOs or authorised persons
- c. the project schedule, including major milestones and deliverables.

5.17.6.3 The first ADO/AP issues the final approval under regulation 21.437 based on the complete technical data for the design, which must be approved under regulation 21.009 by the first ADO/AP and the second ADO/AP in accordance with the agreed compliance plan.

5.17.6.4 The second ADO/AP carries out its technical data approvals under its own approval certificate or instrument of appointment. This technical data must cover and clearly document:

- a. the scope of the design activities carried out by the second ADO/AP
- b. all the applicable airworthiness standards that are applicable to the relevant approvals
- c. any findings of compliance that are partial or incomplete in relation to the final approval

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<sup>21</sup> See regulation 11.060.

- d. any interface issues that must be considered by the first ADO/AP for granting the final approval
- e. any conditions, limitations or restrictions necessary for the design.

### **5.17.7 Refusal to grant approval**

5.17.7.1 If the ADO or authorised person decides to refuse to grant the modification/repair design approval then they must provide the applicant with the reasons for the decision.<sup>22</sup>

## **5.18 Regulation 21.440 – Form of modification/repair design approvals**

5.18.1 A modification/repair design approval must be issued in writing (including electronic form) and must contain at least the following information:

- a. The name of the person to whom it is granted. This must be the name of the holder of the modification/repair design approval. It may be an individual or a body corporate. It is recommended to include contact details as well.
- b. Describe or otherwise identify the modification or repair. This must include a reference to the technical data for the design, including any ICA and AFM amendments, and must contain sufficient detailed information to allow the modification or repair to be carried out on the aircraft or aeronautical product.
- c. Specify, by reference to manufacturer, model and serial number, each aircraft, aircraft engine, propeller or appliance to which the design of the modification or repair relates.
  - i. If the approval is for an aeronautical product, then consideration should be given to the aircraft on which the product may be installed – the approval must either cover compliance with the applicable airworthiness standards for the aircraft or clearly specify any limitations associated with the approval.
  - ii. If an approval is for more than one aircraft or aeronautical product then the approval need not state each particular registration or serial number individually, but must include a statement that enables accurate identification of the aircraft, aircraft engines, propellers or appliances to which the approval applies (e.g. an approval may specify the applicable types and models of aircraft, aircraft engines or propellers or the part numbers of the applicable appliances, and the range(s) of applicable serial numbers).
  - iii. For approvals that apply to aircraft engines, propellers or appliances and for which compliance with the applicable airworthiness standards can be shown for all serial numbers of a particular part number, an approval may specify the part number and use the statement 'all serial numbers'. Such approvals are primarily applicable in component workshop applications, such as approval of a generic minor repair or approval of an alternative material (e.g. if a particular

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<sup>22</sup> See regulation 11.060.

material specified in a component maintenance manual is no longer available then an alternative material may be approved). The following must also be applied for such approvals:

- A. the approval must be limited to the particular part number(s) for which compliance with the applicable airworthiness standards can be established; and
  - B. the airworthiness compliance assessment must take into account all aircraft types and models for which the aircraft engine, propeller or appliance is included in the type design, and must establish that in all cases the modification/repair design complies with the applicable airworthiness standards and no feature or characteristic of the design makes the relevant aircraft, aircraft engine, propeller or appliance unsafe for its intended use.
- d. The date on which the approval was granted. This is the date that the approval comes into effect, unless otherwise stated on the approval – the approval may state a different date on which the approval comes into effect; however, the date must not be before the approval was granted.<sup>23</sup>
  - e. If applicable, the limit at which the approval ceases. This may be specified in any appropriate manner (e.g. calendar time, flight time, flight cycles).
  - f. Any conditions associated with the approval.
  - g. The name of the person granting the approval. If the approval is granted by an ADO then the name of the individual granting the approval on behalf of the ADO must also be included.
  - h. The regulation under which the approval is granted:
    - i. if the approval is granted by CASA – regulation 21.435
    - ii. if the approval is granted by an ADO or authorised person – regulation 21.437.

## 5.19 Regulation 21.445 – Variation of modification/repair design approvals

- 5.19.1 The same requirements apply for a variation of a modification/repair design approval as for a modification/repair design approval, except that it is not necessary for the applicant to resubmit the technical data that CASA, the ADO or authorised person (as applicable) already holds. In particular:
- a. the holder must apply for a variation, carry out any necessary inspections and tests and provide all the new or varied technical data in accordance with the relevant provisions of Subpart 21.M
  - b. the technical data for the variation must be approved under regulation 21.009
  - c. the variation of the modification/repair design approval must be approved under:
    - i. regulation 21.435 – by CASA
    - ii. regulation 21.437 – by an ADO or authorised person.

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<sup>23</sup> See regulations 11.060 and 11.065.

**Note:** Under regulation 11.067, CASA, the ADO or authorised person who granted a modification/repair design approval may impose or vary a condition of a previously approved modification/repair design if necessary in the interests of aviation safety. In that case an application is not required; however, any technical data for the variation must still be approved, and the holder of the modification/repair design approval must be given the reasons for the variation.

## **5.20 Regulation 21.450 – Transfer of modification/repair design approvals and approvals granted in accordance with alternative method**

- 5.20.1 The holder of a modification/repair design approval or an approval granted in accordance with a method specified in a legislative instrument issued under regulation 21.475 may transfer the approval to another person, with the written agreement of the other person.
- 5.20.2 If an approval is transferred to another person then a copy of the records required to be kept under regulation 21.455 must be provided to the new holder. The new holder becomes responsible for the records.
- 5.20.3 The new holder also becomes responsible for all the other ongoing obligations associated with the approval, including defect reporting under regulation 21.003 and providing up to date ICA and AFM amendments under regulation 21.460.
- 5.20.4 This regulation does not apply to other kinds of design approvals, such as foreign design approvals that are taken to be approved under regulation 21.470.

## **5.21 Regulation 21.455 – Record keeping and making records available to CASA**

- 5.21.1 The holder of a modification/repair design approval or an approval granted in accordance with a method specified in a legislative instrument issued under regulation 21.475 must keep the documents and records for the approval for at least 12 months after the approval ceases to be in force. This includes:
- a. the approval document
  - b. all the technical data for the design, including:
    - i. test and inspection reports
    - ii. ICA
    - iii. AFM amendments or supplements
  - c. any determinations made in relation to the applicable airworthiness standards under regulations 21.414, 21.416 21.418 or 21.436.
- 5.21.2 If the approval is transferred to another person then a copy of the records required to be kept under this regulation must also be provided to the new holder.<sup>24</sup> The new holder becomes responsible for the records.
- 5.21.3 CASA may require, by written notice, that the holder of an approval make the documents and records available for inspection by CASA.

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<sup>24</sup> See regulation 21.450.

- 5.21.4 The requirements to retain the records and provide them to CASA continue to apply if an approval is suspended.

## **5.22 Regulation 21.460 – Instructions for continued airworthiness and flight manual supplement to be made available**

- 5.22.1 The holder of a modification/repair design approval or an approval granted in accordance with a method specified in a legislative instrument issued under regulation 21.475 is required to provide the current version of any ICA and AFM amendments or supplement for the design to any person who is required to comply with them, such as the registered operator of the aircraft on which the approved design is installed. The documents may be in electronic form.
- 5.22.2 The ICA is approved as part of the modification/repair design approval; therefore, if a variation of the existing ICA or new ICA is necessary then it must be approved as a variation of the modification/repair design approval. This includes approval of the varied or new ICA as technical data under 21.009, and approval of the variation of the modification/repair design approval under regulation 21.435 or 21.437. See regulation 21.445 for more information about variations of modification/repair design approvals.
- 5.22.3 See 5.24.2 Appendix B for more information on ICA.

## **5.23 Regulation 21.470 – Foreign modification/repair designs**

- 5.23.1 This regulation provides for automatic acceptance of certain foreign modification/repair designs. Such an approval must clearly identify the applicable aircraft, aircraft engine(s), propeller(s) or appliance(s) – this regulation does not apply to guidance or advisory material that only provides generally applicable instructions on how to carry out maintenance.
- 5.23.2 An approval that is taken to have been approved under this regulation does not need further approval under Subpart 21.M. It is the responsibility of the registered operator of the aircraft and the person who carries out the modification/repair to ensure that the approval meets the requirements of the regulations and the approval documents are included in the continuing airworthiness records for the aircraft or aeronautical product. If the approval documents cannot be obtained or have been lost then a new approval may need to be obtained, for example from a relevant ADO or authorised person.

### **5.23.3 Paragraph 21.470(a) – Approval by the NAA of a recognised country**

- 5.23.3.1 Recognised countries are defined in regulation 21.010B. Under regulation 21.010A, any modification/repair design approval issued by EASA is taken to have been issued by the NAA of a recognised country.
- 5.23.3.2 For the purposes of paragraph 21.470(a), the NAA need not be the NAA of the TC holder or State of Design of the aircraft or aeronautical product.
- 5.23.3.3 Approved by the NAA of a recognised country means approved on behalf of the NAA by an officer or a delegate of the NAA. It does not include an approval granted by an

individual or organisation that has been authorised to approve designs on their own behalf by the NAA of a recognised country.

- 5.23.3.4 For approvals from the FAA to be accepted under paragraph 21.470(a), the approval must be granted by the FAA, an FAA Organization Designation Authorization (ODA) holder or an FAA Designated Engineering Representative (DER). For a design to be installed on an aircraft under an FAA Form 337 approval by an FAA Designated Airworthiness Representative (DAR), the design must be accompanied by the Form 337 and a DER approval for each relevant engineering speciality (Form 8110-3).
- 5.23.3.5 Approvals by the holder of an EASA Subpart J Design Organisation Approval (DOA) are not acceptable under this provision.

#### **5.23.4 Paragraph 21.470(b) – TC holder – system approved by the NAA of a recognised country**

- 5.23.4.1 Published or issued by the foreign TC holder of the aircraft, aircraft engine or propeller under a system approved by the NAA of that (recognised) country means approved by, or on behalf of, the individual or organisation that the NAA of the recognised country recognises as the holder of the applicable TC. The document issued by the TC holder should have an approval statement that shows that the modification/repair design has the necessary approval (e.g. approved under the regulations of the relevant recognised country or the NAA).
- 5.23.4.2 A design for an appliance for an aircraft, aircraft engine, or propeller may also be covered by this provision, including a design issued by a subcontractor or supplier to a TC holder that is referenced in a design issued by the TC holder (e.g. a service bulletin (SB) for an aeronautical product that is specified in an aircraft SB).
- 5.23.4.3 If the document issued by the TC holder states or makes clear that no approval has been given then the modification/repair design is not taken to be approved. However, the data may be used, as appropriate, to substantiate an approval under regulation 21.437.

#### **Examples**

- 5.23.4.4 A document issued by the holder of an FAA TC that approves minor repair data that is acceptable to the FAA under the FARs is taken to be approved; however, a document stating only 'no technical objection' (or another similar term indicating something other than approval of the data), is not taken to be approved.
- 5.23.4.5 A document approved by the FAA DER or ODA of an FAA TC holder, for aircraft covered by the TC, is automatically accepted under this provision. Similarly, a document approved by the EASA Subpart J DOA of an EASA TC holder, for aircraft covered by the TC, is automatically accepted under this provision.

#### **5.23.5 Paragraph 21.470(c) – Appliance – system approved by the NAA of a recognised country**

- 5.23.5.1 This provision only applies to an appliance designed in a recognised country. However, for the purposes of this regulation, designed in a recognised country includes an



appliance that was designed under a system approved by the NAA of a recognised country (e.g. the design was approved in conjunction with a type certification program of a recognised country), regardless of the physical location of the various facilities associated with the manufacturer of the appliance.

- 5.23.5.2 The NAA that approved the system of approval for the modification/repair design and the NAA of the country in which the appliance was designed must be the same.
- 5.23.5.3 The document issued by the manufacturer should have an approval statement that shows that the modification/repair design has the necessary approval (e.g. approved under the regulations of the relevant recognised country or the NAA).
- 5.23.5.4 If the document issued by the manufacturer states or makes clear that no approval has been given then the modification/repair design cannot be taken to be approved under this provision. However, the data may be used, as appropriate, to substantiate an approval under regulation 21.437.
- 5.23.5.5 See paragraph 5.23.4.2 for designs referenced in a modification/repair design issued by a TC holder.

#### **5.23.6 Paragraph 21.470(d) – Accepted under an agreement between CASA and foreign NAA**

- 5.23.6.1 CASA and the Australian Government may make agreements with other NAAs or countries that recognise certain kinds of approvals. This includes countries that are not on the list of recognised countries.
- 5.23.6.2 If an arrangement provides for acceptance of modification/repair design approvals, which may include approvals granted by the NAA and approvals granted by other individuals or organisations authorised by the NAA, then those approvals are taken to be approved, subject to any conditions mentioned in the arrangement.
- 5.23.6.3 These agreements and arrangements are published on the CASA website.

#### **5.24 Regulation 21.475 – CASA may issue instruments specifying alternative methods of approval of modifications and repairs**

- 5.24.1 This regulation provides for CASA to approve a method of approval for a modification or repair to an aircraft, aircraft engine, propeller or appliance that may be used as an alternative to approval under the other provisions of Subpart 21.M.
- 5.24.2 Such an approval must be issued as a legislative instrument, and therefore must be registered on the federal register of legislative instruments and will be published on the CASA or FRLI/ComLaw website.

## Appendix A

### Subpart 21.M design approval flowchart

**Note:** This appendix provides a simplified flowchart of the Subpart 21.M modification/repair design approval process. It should be read in conjunction with the information in the main body of this AC.

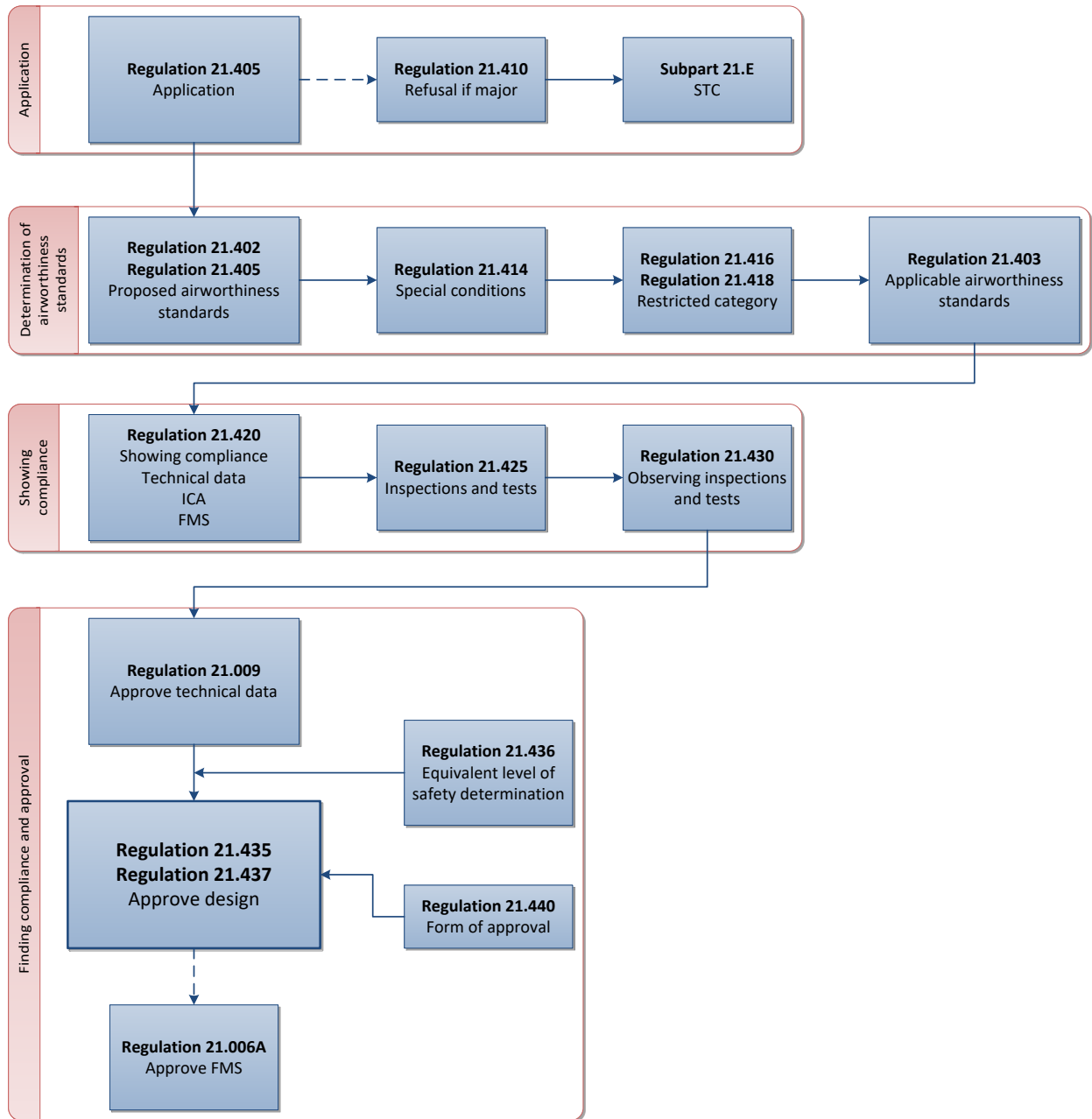


Figure 1: Subpart 21.M design approval flowchart

## Appendix B

### Instructions for continuing airworthiness

**Note:** This appendix provides specific information on ICA for a modification/repair design and approval of alternative ICA as a modification/repair design. It should be read in conjunction with the general information in the main body of this AC.

## B.1 General

- B.1.1 The ICA for an aircraft or aeronautical product are written instructions that specify requirements, procedures and standards for the continuing airworthiness of the aircraft or aeronautical product. An item is airworthy when it meets the following two conditions:
- The item conforms with its approved design – an item conforms with its approved design when its configuration is consistent with its approved design (for example, a type certificated aircraft conforms with its approved design when its configuration is consistent with its type design and any changes to the type design made in accordance with a Part 21 approval).
  - The item is in a condition for safe operation – an item is in a condition for safe operation when factors such as defects, wear, damage, and deterioration do not prevent the item from demonstrating compliance with those certification requirements that relate to the safe operation of the item and do not result in an unsafe condition to the aircraft (for example, a propeller in a condition for safe operation should still comply with the centrifugal load requirements (FAR 35.35 or CS-P 350)).
- B.1.2 ICA specifies:
- what maintenance is to be carried out
  - when that maintenance is to be carried out
  - how that maintenance is to be carried out.
- B.1.3 A modification/repair design approval must include the ICA that are necessary to ensure that the modified aircraft, aircraft engine, propeller or appliance remains safe throughout its lifetime.
- B.1.4 A modification/repair design may be used to approve alternative ICA for an aircraft or aeronautical product.

**Note:** Subpart 21.M approvals are for changes to the design of an aircraft, aircraft engine, propeller or appliance. This includes changes to the instructions for continuing airworthiness that are part of an approved design, but if the subject (e.g. procedure or material) is not part of the approved design then an approval under Subpart 21.M would not be necessary or appropriate. In that case a maintenance data approval under the continuing airworthiness legislation should be sought (e.g. regulation 2A of CAR, section 1.12 of the Part 42 MOS, or section 145.A.45 of the Part 145 MOS).

## B.2 ICA for a modification/repair design

- B.2.1 The ICA must comply with the applicable airworthiness standards for the item (e.g. 23.1529, 25.1529, 27.1529, 29.1529, CS-E 25, FAR 33.4, CS-P 40, FAR 33-4).
- B.2.2 Each affected part should be addressed either individually or as part of a group or system. The applicant should consider airworthiness limitations, safety assessments, classification of parts, and compliance requirements when determining the need for instructions for parts, sub-assemblies, assemblies, or modules.
- B.2.3 The ICA should include information describing the order and method of removing and installing the parts and accessories, including warnings, cautions and notes.

- B.2.4 If the design includes electrical/electronic parts, then the ICA should include system wiring diagrams (if appropriate, these may be the design wiring diagrams). They must include wire routing information detailed enough to enable maintenance personnel to troubleshoot, repair, and service the electrical system. These diagrams must also include a method of determining connector type, wire type, and wire size.
- B.2.5 The ICA should provide a means to ensure accurate configuration control (e.g. an illustrated parts catalogue) that complies with the approved design for all affected parts, components, and combinations of parts or components, and allows proper identification of the configuration during assembly or replacement.
- B.2.6 Scheduling information should be provided to the extent that the lack of specific scheduling information on any part would not adversely affect the continued airworthiness of the part or the aircraft. The substantiation for scheduling information should be derived from certification testing, development testing, analyses, service experience of the same or similar item, or a combination of these.
- B.2.7 The ICA should include adequate inspection and test criteria to enable the appropriate inspection and test of each part, sub-assembly, assembly, and module, as well as systems and components. The ICA should identify the serviceability limits and required action at each level, such as part replacement, repair, or further detailed inspection/test.
- Note:** While these inspection and test criteria may be identified as limits, they are not considered airworthiness limitations unless specifically described as such in the design approval conditions. However, if these limits are exceeded, the item may not be airworthy.
- B.2.8 The accuracy and reliability of inspection techniques should be consistent with the criticality of the part and the types of defects for which the part is being inspected. The ICA should identify parts and key features or areas for which special emphasis or a higher awareness is needed to assure continued airworthiness.
- B.2.9 Cleaning could have a significant effect on the inspection, as improper cleaning could result in missing potentially hazardous defects. Therefore, the ICA should emphasize the proper cleaning methods, with the appropriate cautions when improper cleaning could impede inspection.
- B.2.10 Repairs specified in the ICA should be complete and may include personnel training requirements. When the repair is accomplished in accordance with the ICA, the part should conform to its approved design and, if safe for operation, should constitute an airworthy part.
- B.2.11 The ICA may include troubleshooting information describing probable malfunctions, how to recognise and correct them, and precautions.
- B.2.12 The ICA should provide a list of special tools needed to accomplish recommended maintenance and calibration requirements (frequency, accuracy, and standard/protocol to be used) for all testing and measurement equipment used to carry out the ICA.
- B.2.13 The ICA should include instructions for testing parts after maintenance as required.
- B.2.14 The ICA should include storage and packing instructions and identify special containers, equipment, and tools that may be necessary to comply with those instructions. The storage limits should also include any environmental restrictions, such as limits for temperature or humidity.

## B.3 Airworthiness limitations section

### B.3.1 General

B.3.1.1 For type certificated aircraft, there must be a separate and distinguishable ICA section, called the Airworthiness Limitations Section (ALS). The ALS provides the critical continuing airworthiness requirements for the aircraft, aircraft engine, or propeller.

B.3.1.2 The regulations require the following to be set out in the ALS:

- a. mandatory replacement times for type certification
- b. mandatory inspection times for type certification
- c. inspection procedures for those approved mandatory times
- d. critical design configuration control limitations (CDCCL).

B.3.1.3 Examples of items to be included in the ALS are structural inspections per regulations 23.571, 23.572, 23.573, 25.571, 27.571, and 29.571, and fuel system requirements per regulation 25.981.

**Note:** See the applicable airworthiness certification regulations for the specific ALS requirements applicable to a particular design.

B.3.1.4 If the ICA consists of multiple manuals, then the ALS must be in the “principal manual”.

B.3.1.5 If an approved design affects the ALS then the ALS must be amended accordingly. This may be in the form of a manual supplement.

### B.3.2 Certification maintenance requirements

B.3.2.1 Certification maintenance requirements are required inspections or maintenance tasks used primarily for transport category aircraft. They apply to equipment, systems, and powerplant installations.

B.3.2.2 The CMRs are required tasks, and associated intervals, developed to achieve compliance with regulation 25.1309/29.1309 and other regulations requiring safety analyses (such as regulation 25.671, 25.783, 25.901, and 25.933, and Part 29 equivalents).

B.3.2.3 A CMR is intended to detect safety-significant latent failures (failures not known to the flight or ground crew) that would, in combination with one or more other specific failures or events, result in a hazardous or catastrophic failure condition. A CMR can also be used to establish a required task to detect an impending wear-out of an item whose failure is associated with a hazardous or catastrophic failure condition.

B.3.2.4 CMRs are functionally equal to airworthiness limitations and may be included as part of the ALS, or recorded separately.

### B.3.3 Approval of the ALS and CMRs

B.3.3.1 The ALS and CMRs, and changes to the ALS and CMRs, may only be approved by CASA. This function cannot be carried out by an ADO or authorised person.

B.3.3.2 Changes to the ALS (e.g. a new item or variation of an existing item), including CMRs, are a major change to a type design and therefore should generally be processed as an STC.

- B.3.3.3 If a proposed design change would require amendment of the ALS or CMRs and is to be processed as a modification/repair design, then the design may be approved by an ADO or authorised person, but an application must be made to CASA for approval of the ALS/CMR. The application should include:
- a. a brief description of the modification/repair design
  - b. a brief description of why an ALS/CMR amendment is required
  - c. a copy of the proposed ALS/CMR amendment
  - d. a copy of the technical data and compliance plan related to the proposed ALS/CMR amendment.
- B.3.3.4 An aircraft, aircraft engine or propeller may not be released into service with the modification/repair design incorporated until the ALS/CMR amendment has been approved by CASA.

#### **B.3.4 Difference between ALS/CMR and other conditions on an approval**

- B.3.4.1 ALS and CMR items are only those items that are specifically required by the applicable airworthiness standards as ALS or CMR items. These items must be approved by CASA.
- B.3.4.2 A design may also be approved subject to any condition that is necessary in the interests of the safety of air navigation. Under regulations 11.055 and 11.056, such conditions may be approved by an ADO or authorised person. See subsection 5.17.5 for more information on conditions on an approval.



### Instructions for continued airworthiness checklist

A/C Make: \_\_\_\_\_ Model: \_\_\_\_\_ S/N: \_\_\_\_\_ Reg: VH- \_\_\_\_\_

Revision: \_\_\_\_\_ Date: \_\_\_\_\_

Item	Subject
1.	Introduction: Briefly describes the aircraft, engine, propeller, or component that has been modified. Include any other information regarding the content, scope, purpose, arrangement, applicability, definitions, abbreviations, precautions, units of measurement, list of parts used, referenced publications, and distribution of the ICA, as applicable.
2.	Description: Of the modification and its functions, including an explanation of its interface with other systems, if any.
3.	Control and operation information: Or special procedures, if any.
4.	Servicing information: Such as types of fluids used, servicing points, and location of access panels, as appropriate.
5.	Maintenance instructions: Such as recommended inspection/maintenance periods in which each of the modification parts are inspected, cleaned, lubricated, adjusted, and tested, including applicable wear tolerances and work recommended at each scheduled maintenance period. This section may refer to the manufacturers' instructions for the equipment installed where appropriate (e.g. functional checks, repairs, inspections). It should also include any special notes, cautions, or warnings, as applicable.
6.	Troubleshooting information: Describes probable malfunctions, how to recognise those malfunctions, and the remedial actions to take.
7.	Removal and replacement information: Describes the order and method of removing and replacing products or parts, and any necessary precautions. This section should also describe or refer to part manufacturer's instructions to make required tests, checks, alignment, calibrations, centre of gravity changes, lifting, or shoring, etc., if any.
8.	Diagrams: Of access panels and information, if needed, to gain access for inspection.
9.	Special inspection requirements: Such as X-ray, ultrasonic testing, or magnetic particle inspection, if required.
10.	Application of protective treatments: To the affected area after inspection and/or maintenance, if any.
11.	Data: Relative to structural fasteners such as type, torque, and installation requirements, if any.
12.	List of special tools: Special tools that are required, if any.
13.	Recommended overhaul periods: Specifies recommended overhaul periods for parts used in the design, if any. This should include overhaul periods established by the manufacturer of the parts, if applicable.
14.	Airworthiness limitation section: This section must set out each mandatory replacement time, structural inspection interval, and related structural inspection procedure required by the applicable airworthiness standards for the design, if any.  <b>Note:</b> The airworthiness limitations section of the ICA must be approved by CASA.

## B.4 Approval of alternative ICA as a modification/repair design

- B.4.1 A type certificate holder, manufacturer or other design approval holder provides ICA that covers the full range of aircraft or aeronautical products of that type or are covered by the design. Such ICA is therefore often general in nature and may be based on certain assumptions that are not consistent with the actual circumstances or use of a particular aircraft or product.
- B.4.2 A modification/repair design may therefore be used to approve alternative ICA for an aircraft or aeronautical product that covers any or all of the elements of paragraph B.1.2.

**Note:** This method cannot be used to approve or vary an approved maintenance program, schedule of maintenance, or the CASA maintenance schedule. See subsection B.4.5 for further information.

### B.4.3 Major/minor determination

- B.4.3.1 A major change would include changes such as:
- a change that affects the airworthiness limitations
  - a change that affects certification maintenance requirements
  - a change to what constitutes an overhaul for an engine or propeller
  - a change to the ICA for a principal structural element or a critical part, that has an appreciable effect on the part
  - a change, or combination of changes, that is so extensive that the maintenance schedule for the aircraft would no longer substantially be the manufacturer's maintenance schedule or the CASA maintenance schedule
  - a change that affects an airworthiness directive.
- B.4.3.2 See AC 21-12 for more information on classification of design changes.

### B.4.4 Technical requirements for approval of alternative ICA

**Note:** The following are specific considerations for approval of alternative ICA as a modification/repair design that are to be used in addition to the general guidance for ICA provided in section B.2.

- B.4.4.1 The applicant for the modification/repair design approval for alternative ICA should provide the approver with details of the original ICA. The showing of compliance must consider the original ICA and the effect that the proposed change would have in relation to ensuring that the aircraft or aeronautical product continues to comply with the applicable airworthiness standards and remains safe throughout its lifetime.
- B.4.4.2 The showing of compliance should be derived from information from the type certificate holder, manufacturer or design approval holder, testing, analyses, service experience of the same or similar item, or a combination of these.
- B.4.4.3 The assumptions and methods used to develop the affected design and ICA should be considered. For example, for structural ICA, is the design based on fail-safe or damage-tolerance criteria.
- B.4.4.4 The amended ICA must ensure compliance with the safety and reliability standards required by the applicable airworthiness standards that apply for approval of the alternative ICA as a modification/repair design. The assessment should also consider,

and not reduce the safety or reliability levels of the aircraft or aeronautical product below, the safety and reliability levels:

- a. required by the original certification basis of the aircraft or aeronautical product
- b. that were intended for the development of the original ICA.

B.4.4.5 The showing of compliance should consider the purpose of the affected ICA, in particular:

- a. whether the ICA is associated with safety, operational or economic effects (for ICA associated with safety effects, either hidden or evident, it should be shown how the alternative ICA would ensure an equivalent level of safety for the lifetime of the aircraft or aeronautical product)
- b. to ensure that the alternative ICA does not make any associated maintenance tasks inapplicable or ineffective.

B.4.4.6 Consideration should be given to ensure that the alternative ICA would not increase the likelihood of maintenance-induced errors.

B.4.4.7 An approval of alternative ICA may be conditional. For example, an approval may be subject to time limitations, operating conditions or environmental conditions (e.g. non-coastal areas).

B.4.4.8 Alternative ICA should be provided in a form that is consistent with the original ICA. It must be clear to the user how to apply the alternative ICA; in particular, how the alternative ICA relates to the original ICA.

B.4.4.9 Airworthiness limitations section and certification maintenance requirements

B.4.4.10 Changes to the ALS (e.g. a new item or variation of an existing item), including CMRs, are a major change to a type design and therefore should generally be processed as an STC.

B.4.4.11 Changes to the ALS may only be approved by CASA. This function cannot be carried out by an ADO or authorised person.

### **Changes to CMRs**

B.4.4.12 Since the purpose of a CMR is to limit the exposure time to a given significant latent failure, or a given wear out, as part of an engineering analysis of overall system safety, instances of a CMR task repeatedly finding that no failure has occurred may not be sufficient justification for deleting the task or increasing the time between repetitive performances of the CMR task. In general, a CMR task change or interval escalation could only be made if world fleet service experience indicates that certain assumptions regarding component failure rates made early during the engineering analysis were too conservative, and a re-calculation of system reliability with revised failure rates of certain components reveals that the task or interval may be changed.

### **B.4.5 Integration of alternative ICA into a maintenance program/schedule**

B.4.5.1 It is the operator's responsibility to have the alternative ICA integrated into the maintenance program or maintenance schedule for the aircraft, and to obtain any additional approvals that are required under the regulations to do so.

### **Manufacturer's maintenance schedule**

B.4.5.2 The use of alternative ICA approved as a modification/repair design does not affect an election under regulation 42E or CAR of the manufacturer's maintenance schedule. However, an approval (or combination of approvals) that would constitute a major change to the content of the manufacturer's maintenance schedule, to the extent that the maintenance schedule for the aircraft would no longer substantially be the manufacturer's maintenance schedule, would necessitate the transfer of the aircraft onto a system of maintenance.

### **System of maintenance or approved maintenance program**

B.4.5.3 If the aircraft is on a system of maintenance or an approved maintenance program (as applicable under CAR or CASR respectively), then a separate approval under regulation 42R of CAR or Subpart 42.J may be required to integrate the change into the aircraft's system of maintenance or approved maintenance program.<sup>25</sup>

### **CASA maintenance schedule**

B.4.5.4 An approval of alternative ICA as a modification/repair design cannot be used to change the requirements of the CASA maintenance schedule.

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<sup>25</sup> See CAAP 42M-1 and the Part 42 AMC/GM for information on system of maintenance and maintenance program approvals respectively.

## Appendix C

### Commercial off-the-shelf (COTS) parts

**Note:** This appendix provides specific information on integration of COTS parts into a modification/repair design. It should be read in conjunction with the general information in the main body of this AC.

## **C.1 General**

- C.1.1 COTS parts are parts that:
- the product design has not been approved under Part 21;
  - have not been produced under a Part 21 production approval; and
  - are not standard parts.
- C.1.2 A modification/repair design may include COTS parts; however, the requirements for approval of the design apply to the whole design, including the COTS part.
- C.1.3 This appendix provides guidance for integration of COTS parts into a modification/repair design.

## **C.2 COTS parts management plan**

- C.2.1 If a proposed modification/repair design includes COTS parts then the applicant should provide a COTS parts management plan (CPMP) that sets out how the COTS parts will be integrated into the design, including:
- COTS parts classification
  - COTS parts list
  - Design
  - Configuration control
  - Conformity inspection
  - Continuing airworthiness

### **C.2.2 COTS parts classification**

- C.2.2.1 The COTS parts should be classified according to the criticality of their function and safety effect, in both operating and failure modes.
- C.2.2.2 The classification should be made in accordance with the categories below and a documented system safety analysis procedure that is based on a recognised standard appropriate for the certification basis of the applicable aircraft, aircraft engine or propeller (e.g. for a transport category aeroplane, the procedures should be based on regulation 25.1309 standards). Acceptable system safety standards (depending on the certification basis of the aircraft) include:
- SAE International ARP4754/ARP4761
  - EASA CS-25 AMC 25.1309
  - FAA AC 23.1309-1
  - FAA AC 25.1309-1
  - FAA AC 27.1309 (found in FAA AC 27-1)
  - FAA AC 29.1309 (found in FAA AC 29-2)
  - US DoD MIL-STD-882.
- C.2.2.3 The classification must include consideration of relevant adverse operation and environmental conditions and external events (such as EMI/EMC, HIRF, vibration, fires, turbulence or lightning strikes), and the effect that the COTS part would have in the case of such events.

C.2.2.4 COTS parts should be classified into one of the following groups:

- a. **Non-essential, non-required parts that would not degrade the level of safety** – parts that:
- i. are not essential in order for the aircraft, aircraft engine, propeller or appliance to comply with the applicable airworthiness standards; and
  - ii. are not operational or emergency equipment that is required by or under the regulations for operation of the aircraft; and
  - iii. would not degrade the level of safety of the aircraft, aircraft engine, propeller or appliance:
    - A. the system safety assessment for possible failure modes must show those failures to be benign or contained so as to not degrade the level of safety of the aircraft, aircraft engine, propeller or appliance
    - B. the part cannot fail in a manner that would cause damage to the aircraft, aircraft engine, propeller or appliance or cause injury to occupants.

**Note:** Failure is not only defined as the article's intended function stopping, but also a failure must not create a hazardous situation. For example, an electrical short must not create a fire hazard.

- b. **Non-essential, non-required parts with safety effect** – parts that:
- i. are not essential in order for the aircraft, aircraft engine, propeller or appliance to comply with the applicable airworthiness standards; and
  - ii. are not operational or emergency equipment that is required by or under the regulations for operation of the aircraft; and
  - iii. may have a safety effect on the aircraft, aircraft engine, propeller or appliance.

**Note:** The design, including the COTS part, must comply with the applicable airworthiness standards for the design. The safety effect, therefore, must be within the limits defined by the applicable airworthiness standards.

- c. **Essential parts – parts that are necessary for the aircraft, aircraft engine, propeller or appliance to comply with the applicable airworthiness standards.** Proposed use of COTS parts in this category should be subject to a detailed system safety assessment to determine the criticality of the part/function. The detail of the other elements of the CPMP should be provided accordingly. The use of COTS parts in this category will generally be limited to parts that:
- i. are not part of the primary structure
  - ii. are not part of the flight controls
  - iii. are not safety critical parts.

**Note:** These are parts that would be required for type certification.

- d. **Required operational instruments and equipment.** This covers operational or emergency equipment that is required by or under the applicable operational regulations for the operation of the aircraft. Required operational instruments and equipment must be approved by CASA under one of the methods specified in regulation 21.305 or regulation 82 of CAR for radio communication equipment. Any proposed use of COTS parts in these applications must be in accordance with a method approved by CASA for that purpose.

**Note:** See AC 21-46 for further details on airworthiness approval of avionics equipment.

### C.2.3 COTS parts list

- C.2.3.1 The CPMP should include a COTS parts list that provides an accurate description of the COTS parts used in the design. The description should include all the details necessary to establish the exact parts and their configuration required for the design, such as:
- a. manufacturer
  - b. part number, unless the item is too small to practically mark (e.g. a unique part number or dash number extension may be used to identify the part belongs to a particular production approval)
  - c. serial numbers (e.g. to facilitate tracking of life limits, or a specific serial number range established for configuration control)
  - d. specification number
  - e. a description of the characteristics of the part (e.g. physical dimensions, physical characteristics, software version).

### C.2.4 Design

- C.2.4.1 In order for a modification/repair design approval to be granted under regulation 21.435 or 21.437, it must be shown that:
- a. the design complies with the applicable airworthiness standards
  - b. no feature or characteristic of the design makes the relevant aircraft, aircraft engine, propeller or appliance unsafe for its intended use.
- C.2.4.2 In some cases it may be necessary to carry out tests and inspections of the proposed COTS parts in order to verify the COTS part classification and to show compliance with the applicable airworthiness standards. This may include operational tests, functional tests, reliability tests, construction analysis and destructive physical analysis (e.g. fire protection testing). In these cases, the tests must be carried out in accordance with documented procedures (including the sample selection and sample sizes) that are appropriate for the design and the COTS part. If flight testing is required then it should be carried out under an experimental certificate (see AC 21-10 for more information on experimental certificates).
- C.2.4.3 The showing of compliance for the design must include a dedicated section specifically covering the use of any COTS parts included in the design. The necessary scope and detail of the COTS section depends on the COTS part classification as follows:
- a. **Non-essential, non-required parts that would not degrade the level of safety.** The COTS section need only include the safety analysis that shows the part would have no safety effect, including any associated tests that are necessary to verify the analysis. The safety analysis must show that failure of the part as installed in the aircraft, aircraft engine or propeller or appliance, would not degrade the level of safety, and that the part can not fail in a manner that would cause damage to the product or cause injury to occupants.
  - b. **Non-essential, non-required parts with safety effect.** The COTS section must cover all the applicable airworthiness standards relevant to the identified safety effects. It must be shown how any potential adverse effects do not create an unsafe



feature or characteristic (see subsection 3.4 for more information on unsafe feature or characteristic analyses).

- c. **Essential parts – parts that are necessary for the aircraft, aircraft engine, propeller or appliance to comply with the applicable airworthiness standards.** The COTS section must include a full showing of compliance against the applicable airworthiness standards.
- d. **Required operational instruments and equipment.** The COTS section must show that the part meets the standards approved by CASA for the purpose, including performance and reliability.

### C.2.5 Configuration control

- C.2.5.1 A CPMP should include the procedures that will ensure configuration control is maintained. This is of particular significance in cases where the design approval holder does not have a formal contract or arrangement with the manufacturer of the COTS parts.
- C.2.5.2 The design should provide sufficient information in the COTS parts list to identify the approved configuration of the COTS parts.
- C.2.5.3 Availability and level of obsolescence risk should be considered as major component selection criteria. Consideration must be given to:
  - a. existing configurations and versions of the COTS parts that are currently available
  - b. future design and manufacturing changes that may be made by the manufacturer of the COTS parts.
- C.2.5.4 Possible options that could be used to minimise the risks associated with configuration control include:
  - a. formal contract or arrangement with the manufacturer of the COTS parts
  - b. procurement of COTS parts directly from the original manufacturer
  - c. procurement of additional parts from the same manufacturing batch for future use.

### C.2.6 Conformity inspection

- C.2.6.1 A modification/repair design must include sufficient information to accurately identify the parts associated with the design and to establish that the parts are serviceable. A part is serviceable when it:
  - a. conforms with its approved design; and
  - b. is fit for its intended use.
- C.2.6.2 A CPMP should include a conformity inspection for all COTS parts included in the design. The scope and detail of the conformity inspection will depend on the COTS part classification:
  - a. **Non-essential, non-required parts that would not degrade the level of safety.** The conformity inspection for the part need only include the inspections necessary to determine that:
    - i. the part is as specified in the design, including the correct configuration

- ii. there is no evidence of any defects or damage.
- b. **Non-essential, non-required parts with safety effect.** The conformity inspection for the part should also include any necessary inspections relevant to the identified safety effects (e.g. critical dimensions, materials, functional check).
- c. **Essential parts – parts that are necessary for the aircraft, aircraft engine, propeller or appliance to comply with the applicable airworthiness standards.** The conformity inspections should provide an equivalent level of safety as for similar parts manufactured under the production approval.
- d. **Required operational instruments and equipment.** The conformity inspections must be sufficient to ensure compliance with the method specifically approved by CASA for the purpose.

### C.2.7 Continuing airworthiness

C.2.7.1 A modification/repair design must include any ICA that are necessary to ensure that the modified aircraft, aircraft engine, propeller or appliance remains safe throughout its lifetime. This includes the ICA for any COTS parts included in the design.

C.2.7.2 A CPMP should include the ICA for all COTS parts included in the design. The scope and detail of the ICA will depend on the COTS part classification:

- a. **Non-essential, non-required parts that would not degrade the level of safety.** For a non-required part with no safety effect, the ICA may simply consist of instructions to replace parts as necessary.
- b. **Non-essential, non-required parts with safety effect.** For a non-required part with a safety effect, the ICA for the part should also include any necessary ICA relevant to the identified safety effects (e.g. mandatory replacement periods, inspection of critical dimensions for wear or periodic functional checks).
- c. **Essential parts – parts that are necessary for the aircraft, aircraft engine, propeller or appliance to comply with the applicable airworthiness standards.** For a part that is required in order for the aircraft, aircraft engine, propeller or appliance to comply with the applicable airworthiness standards, the ICA must be sufficient to ensure compliance with the applicable airworthiness standards.
- d. **Required operational instruments and equipment.** For parts that are required by the applicable operational regulations for operation of the aircraft, the ICA must be sufficient to ensure ongoing compliance with the performance and reliability standards specifically approved by CASA.

C.2.7.3 See Appendix B for more information on ICA.

**Note:** The ICA for COTS parts may include repair instructions; however, ARC requirements also apply to any maintained or repaired parts provided for installation on an aircraft (see subsection C.2.8). The ARC for maintained parts must be issued by the maintainer who carried out the maintenance, and the maintainer must be a person who is permitted by or under the regulations to carry out the maintenance.

## C.2.8 Airworthiness release certification

- C.2.8.1 Parts that are aeronautical products<sup>26</sup> or aircraft components<sup>27</sup> (as applicable under CASR or CAR respectively) require an ARC for installation on an aircraft.
- C.2.8.2 In the case of new parts, an ARC may only be issued by the manufacturer, i.e. the holder of the associated production approval (e.g. production certificate, APMA).
- C.2.8.3 The holder of a production approval for an approved design may purchase COTS parts specified in the COTS parts list of the design, subject the parts to the inspection criteria specified in the design, and issue an ARC for the parts accordingly. The production approval holder's procedures and quality system must include and adequately cover the COTS parts.
- C.2.8.4 Piece parts that are provided as part of a higher assembly may be covered by the ARC of the higher assembly. However, if the piece parts are to be provided for installation on an aircraft as a separate item (e.g. as replacement parts) then they would require their own ARC.

## C.3 Other information

### C.3.1 Electronic devices

- C.3.1.1 Electronic devices are a major source of COTS parts and there are various industry documents and standards available that may be used to develop a CPMP. In particular:
- a. AC 21-46: Airworthiness approval of avionics equipment
  - b. EASA Certification Memorandum CM - SWCEH – 001: Development Assurance of Airborne Electronic Hardware
  - c. EUROCAE document ED-80: Design Assurance Guidance For Airborne Electronic Hardware
  - d. RTCA/DO-254: Design Assurance Guidance For Airborne Electronic Hardware
  - e. RTCA/DO-178: Software Considerations in Airborne Systems and Equipment Certification
  - f. RTCA/DO-313: Certification Guidance for Installation of Non-Essential, Non-Required Aircraft Cabin Systems and Equipment
  - g. IEC TS 62239: Process management for avionics – Management plan

## C.4 Examples

- C.4.1 The following examples illustrate some of the elements and considerations of a CPMP.

**Note:** These examples are not definitive requirements that would apply in all cases – the scope and detail of a CPMP will depend on many things, including the classification of the parts and the nature and complexity of the design.

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<sup>26</sup> See Division 42.E.2.

<sup>27</sup> See regulation 42W of CAR.

#### C.4.2 Example: Electrical relay

- a. **Classification:** Non-essential, non-required part that would not degrade the level of safety.
- b. **COTS parts list:**
  - i. Relay specified by manufacturer and part number.
- c. **Configuration control:**
  - i. Relay to be specified in the approved design by manufacturer and part number
  - ii. Relay to be marked with part number
  - iii. Relay to be controlled by manufacturing batch number (either marked or via procurement and airworthiness records).
- d. **Conformity inspection:**
  - i. Part number to be confirmed
  - ii. Batch number to be recorded in airworthiness records
  - iii. Inspection to ensure physical conformity of the relay to the approved design (e.g. industry standard or manufacturer's specification)
  - iv. Testing of the relay to verify the holding voltage/release voltage against the approved design (e.g. industry standard or manufacturers specification).
- e. **Continuing airworthiness:**
  - i. Periodic operational check
  - ii. Replace upon failure.

#### C.4.3 Example: Electrical water pump

- a. **Classification:** Non-essential, non-required part that would not degrade the level of safety.
- b. **COTS parts list:**
  - i. Pump specified by manufacturer and part number.
- c. **Configuration control:**
  - i. Pump to be specified in the approved design by manufacturer and part number
  - ii. Pump to be marked with part number and serial number
- d. **Conformity inspection:**
  - i. Part number to be confirmed
  - ii. Inspection to ensure physical conformity of the pump to the approved design (e.g. industry standard or manufacturer's specification)
  - iii. Testing of the pump, including:
    - A. verify the pump draws the amount of current under normal load that is reflected in the design Electrical Load Analysis
    - B. verify the pump draws current that is within design limits under a locked rotor condition
    - C. Verify that water flow (input and output) is as specified in the design.
- e. **Continuing airworthiness:**
  - i. Periodic functional check
  - ii. Replace upon failure

#### C.4.4 Example: LED

- a. **Classification:** Non-essential, non-required part that would not degrade the level of safety.
- b. **COTS parts list:**
  - i. LED specified by manufacturer and part number.
- c. **Configuration control:**
  - i. LED to be specified in the approved design by manufacturer and part number
  - ii. LED to be controlled by manufacturing batch number (either marked or via procurement and airworthiness records).
- d. **Conformity inspection:**
  - i. Part number to be confirmed (via procurement records if physical marking impractical)
  - ii. Batch number to be recorded in airworthiness records
  - iii. Inspection to ensure physical conformity of the LED to the approved design (e.g. industry standard or manufacturer's specification)
  - iv. Operational check of LED.
- e. **Continuing airworthiness:**
  - i. Replace upon failure.

#### C.4.5 Example: Computer or controller for non-essential equipment

- a. **Classification:** Non-essential, non-required part that would not degrade the level of safety.
- b. **COTS parts list:**
  - i. Computer/controller specified by manufacturer and part number.
- c. **Configuration control:**
  - i. Computer/controller to be specified in the approved design by manufacturer and part number
  - ii. Computer/controller to be marked with part number and serial number
  - iii. Software version(s) to be specified in the approved design (if applicable).
- d. **Conformity inspection:**
  - i. Part number to be confirmed
  - ii. Inspection to ensure physical conformity of the computer/controller to the approved design (e.g. industry standard or manufacturer's specification)
  - iii. Functional check of the computer/controller to design requirements
  - iv. Check to confirm version of software (if applicable) is correctly loaded in computer/controller according to the approved design.
- e. **Continuing airworthiness:**
  - i. Periodic functional check
  - ii. Replace upon failure
  - iii. Software loading instructions (if required) should be included in ICA.

#### C.4.6 Example: Aircraft main battery

- a. **Classification:** Essential part – necessary for the aircraft, aircraft engine, propeller or appliance to comply with the applicable airworthiness standards.
- b. **COTS parts list**
  - i. Battery to be specified by type (electrochemical system), manufacturer and part number, and industry standard (if applicable, e.g. AS/NZS 2176, SAE J537).
- c. **Design** (substantiation of use of COTS parts only)
  - i. All safety effects of the battery identified, including all operating modes, failure modes and external events
  - ii. Explanation of how the design complies with the applicable airworthiness standards and does not create an unsafe condition in relation to each of the identified safety effects
  - iii. Example, lead acid battery:
    - A. Safety effect: corrosive acid contents. Mitigation: design includes acid proofing for battery compartment.
    - B. Safety effect: outgassing of explosive gasses. Mitigation: design includes adequate battery compartment ventilation.
    - C. Design limits applicability to small, non-aerobatic aircraft and operations under VFR only.
    - D. Design includes shelf life and time in service limits on the battery. Service life limit commences on conformity inspection test (i.e. shelf/storage time included in service life).
- d. **Configuration control:**
  - i. Battery to be specified in the approved design by type, manufacturer, part number and industry standard (if applicable)
  - ii. Battery to be marked with part number and serial number
  - iii. Battery operating parameters (e.g. capacity, voltage) to be specified in the approved design
  - iv. Date of conformity inspection to be recorded in airworthiness records or on the battery (for replacement time limit).
- e. **Conformity inspection:**
  - i. Part number and standard to be confirmed
  - ii. Inspection to ensure physical conformity of the battery to the approved design
  - iii. Functional check of the battery operating parameters to design requirements.
  - iv. Date of conformity inspection to be recorded in airworthiness records or on the battery (for replacement time limit)
- f. **Continuing airworthiness:**
  - i. Periodic clean, inspection and test of battery. Discard batteries that:
    - A. fail capacity tests
    - B. are damaged in any way
    - C. exceed temperature limits during charging
    - D. do not hold a charge

- E. have reached their service life limit
- ii. Decreased intervals of capacity checks for marginal performing batteries
- iii. Periodic visual inspection of battery, cables and mount for serviceability
- iv. Maximum service life specified in design
- v. ICA to include appropriate battery disposal instructions.