CIVIL AVIATION SAFETY AUTHORITY AUSTRALIA

Advisory Circular

AC 21.16 (0) **SEPTEMBER 1999**

APPROVAL OF MATERIALS, PARTS, PROCESSES AND APPLIANCES

CONTENTS

1. REFERENCES

- Civil Aviation Safety Regulations (CASRs) Parts 21 to 35.
- Advisory Circular AC 21.27 "Manufacturing Approval – Overview"

Note: CASRs referred to in this AC as CASR Parts 21 - 35 are currently enacted as CAR 1998.

2. PURPOSE

This Advisory Circular (AC) is promulgated in order to explain the requirements of CASR Part 21, Subpart K "Approval of Materials, Parts, Processes and Appliances" and describes acceptable means, but not the sole means, of compliance with its requirements.

3. STATUS OF THIS AC

This is the first AC to be issued on this subject.

Advisory Circulars (ACs) are advisory only. ACs provide recommendations and guidance to illustrate a method, or several methods, not necessarily being the only method by which legislative requirements may be met. They also provide a means of illustrating the meaning of certain requirements by offering interpretive and explanatory guidance. ACs should always be read in conjunction with the referenced regulations.

4. BACKGROUND

4.1 This AC is one of several that provides assistance and advice concerning manufacturing approval of aircraft and related parts following the introduction of CASR Part 21 and in respect of manufacturing, supersedes those arrangements previously in place under regulation 30 of CAR 1988 and those further described in CAAP 30-1(1). Other related ACs include:

AC 21.14 Production Certificates

AC 21.20 Production Under a Type Certificate Only

AC 21.27 Manufacturing Approval - Overview

4.2 This AC provides information and guidance with respect to the approval for manufacture of parts, including replacement and modification parts, for sale and installation in a type-certificated aircraft, aircraft engine or propeller under the provisions of CASR Part 21 Subpart K. It does not apply to:

(a) parts manufactured in the course of maintenance by an organisation holding a Certificate of Approval under regulation 30 of CAR 1988;

(b) parts produced under a Type Certificate (TC), Supplemental Type Certificate (STC) or a Production Certificate, and released under an Authorised Release Certificate Approval Tag DA1 (Form One);

(c) parts manufactured by an owner or operator of an aircraft, aircraft engine or propeller manufactured by the owner or operator for maintaining or altering the aircraft, aircraft engine or propeller;

(d) parts produced under an Australian Technical Standard Order (ATSO) authorisation, or under a Technical Standard Order (TSO) authorisation, or a Parts Manufacturer Approval (PMA), issued under Part 21 of the US Federal Aviation Regulations or an equivalent document issued by the National Airworthiness Authority of a recognised country;

(e) standard parts (such as bolts and nuts) conforming to established industry or Australian specifications.

4.3 This AC will cover only those sections of Subpart K where further discussion, information and examples would be helpful in providing an acceptable means of compliance.

4.4 Until the introduction of CASR Part 21, manufacturing was one of the activities for which a Certificate of Approval under regulation 30 of CAR 1988 could be issued thus identifying the holder as an Approved Manufacturing Organisation. Many Certificates of Approval issued under regulation 30 of CAR 1988 to carry out maintenance also include a reference to manufacture of parts. Until CASR Part 145 and related requirements are promulgated, Approved Maintenance Organisations under regulation 30 of CAR 1988 will retain their privileges to manufacture where currently specified.

4.5 Except as mentioned above, it is now necessary to obtain manufacturing approval under CASR Part 21 to manufacture aircraft, aircraft engines, propellers and related parts where manufacture is taking place outside an existing CAR 1988 Certificate of Approval as provided for in regulation 318 of CAR 1988.

5. DEFINITIONS

For the purpose of this AC the following definitions apply:

supplier: any person who furnishes articles or services related to the manufacture of a part.

part: a part is an item to be installed on a type-certificated aircraft, aircraft engine or propeller. Such an item may comprise a component, an assembly, material as well as proprietary parts not designed or manufactured by the Australian Parts Manufacture Approval (APMA) holder.

APMA holder: the producer of parts including replacement or modification parts for sale and installation on a type-certificated aircraft, aircraft engine or propeller who has been issued with an APMA under CASR Part 21.

appliance: any instrument, mechanism, equipment, part, apparatus, appurtenance or 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 a part of an airframe, engine or propeller.

6. AUSTRALIAN PARTS MANUFACTURE APPROVAL

6.1 Application is made for an APMA by lodging an application letter and a completed CASA Form No. 849 "Production Approval - Application" to the local CASA Office responsible for manufacturing approvals in the applicant's geographical area. Copies of CASA Form No. 849 are available from CASA Offices. A sample application letter is included at Appendix 1. An application may be made for one or more parts. A list of all CASA Offices with contact details is contained in AC 11.1 "Advisory Circular - Guidelines". Applications should also include the following information:

(a) the identity of the aircraft, aircraft engine or propeller on which the part is to be installed;

(b) the name and address of the manufacturing facilities at which the part is to be manufactured;

(c) the design of the part which consists of:

(i) drawings and specifications necessary to show the configuration of the part; and

(ii) information on dimensions, materials and processes necessary to define the structural strength of the part;

(d) test reports and computations necessary to show that the design of the part meets the airworthiness requirements of the regulations applicable to the aircraft, aircraft engine or propeller on which the part is to be installed, unless the applicant shows that the design of the part is identical to the design of the part that is covered under a TC. If the design of the part was obtained by a licensing agreement, evidence of that agreement must be furnished; and

(e) a statement certifying that a fabrication inspection system has been established.

6.2 An APMA will be issued when the Authority is satisfied that the design meets the applicable airworthiness requirements and that the Fabrication Inspection System (FIS) requirements of CASR 21.303(11) have been met. The holder of an APMA must establish and maintain a FIS that ensures that each completed part conforms to its design data and is

safe for installation on applicable type-certificated aircraft, aircraft engines or propellers. The system should include procedures that are outlined in AC 21.27 section 10.

6.3 The Authority is not required to issue an APMA if the manufacturing facilities for the part are located outside Australian territory unless the location of the manufacturing facilities places no undue burden on the Authority in administering the applicable airworthiness requirements.

6.4 The Authority will issue a separate APMA to an existing APMA holder to include additional parts when satisfied that the design and FIS meet the applicable requirements for additional parts.

6.5 The Authority may issue an APMA for modifying or performing processes on new or used parts e.g. cylinder chrome plating and machining etc. In such cases the approval will only be relative to the work accomplished to conform to the APMA approved design data. The complete part can only be identified as APMA approved if the approved design data includes the detail necessary to make a conformity determination for the complete part as well as the modification or process which was performed.

6.6 If an existing APMA holder expands or re-locates its facility or wishes to manufacture additional parts a new application is to be submitted to the Authority.

7. DESIGN APPROVAL

7.1 Data Requirements

Data to be submitted as part of the application for approval includes:

(a) evidence of any licensing agreement with the TC or STC holder, together with all the design data covering such a licensing agreement; or

(b) detailed drawings and specifications, together with the test or other substantiating data showing that the part design complies with the applicable airworthiness requirements; or

(c) data substantiating that the parts produced will be identical in all respects to the corresponding part of an approved Type Design. If the applicant can show that the part to be approved is identical in design, material and processing to the corresponding approved part, the Authority may approve the data. When the data submitted does not substantiate that the two parts are identical it will be returned with the notification that it does not conform to the approved Type Design. The Authority reserves the right to require substantiation in accordance with paragraph (b) above when in its opinion the airworthiness of a critical part or design cannot be assured by showing that it is identical to an approved design, or when the part or design to which it is attempting to show that it is identical is not performing satisfactorily in service; and

(d) a compliance statement against the relevant design requirements should be provided in the format at Appendix 2.

7.2 Part Numbering

All APMA parts will carry a part number with the letters “APMA” in front of the part number. Where an APMA part is approved on the basis of being identical, it may use the same number as the original part except that a prefix should be used to identify the manufacturer. Where the parts are not identical or if the parts manufacturer has chosen to use a different number, the part should be identified as such and release documentation for

such an APMA part must show the original equipment manufacturer part number that it replaces.

8. DESIGN REQUIREMENTS

The applicant should determine that the design meets the certification requirements applicable to the product on which the part is to be installed. For example, airworthiness standards are specified in Parts 22 through 35 of the CASRs. An applicant should also be aware of the defect reporting requirements for manufacturers under CASR 21.3.

9. FABRICATION INSPECTION SYSTEM

9.1 The description of the FIS may be in the form of a manual or controlled database which is durable and affords easy access and reference. The FIS should describe the facilities, methods, procedures, inspections and tests which the applicant and any outside sub-contractors and suppliers intend to use to meet the requirements of CASR 21 Subpart K.

9.2 The holder of an APMA must establish and maintain a FIS that ensures that each completed part conforms to its design data and is safe for installation on applicable type-certificated aircraft, aircraft engines or propellers. The system must include procedures to ensure that:

(a) incoming materials used in the finished part are as specified in the design data; and

(b) incoming materials are properly identified if their physical and chemical properties cannot otherwise be readily and accurately determined; and

(c) materials subject to damage and deterioration are suitably stored and adequately protected; and

(d) processes affecting the quality and safety of the finished aircraft, aircraft engine or propeller are accomplished in accordance with acceptable specifications; and

(e) parts in process are inspected for conformity with the design data at points in production where accurate determination can be made. Statistical quality control procedures may be employed where it is shown that a satisfactory level of quality will be maintained for the particular part involved; and

(f) current design drawings are readily available to manufacturing and inspection personnel, and used when necessary; and

(g) major changes to the basic design are adequately controlled and approved before being incorporated in the finished part; and

(h) rejected materials and components are segregated and identified in such a manner as to preclude their use in the finished part; and

(i) inspection records are maintained, identified with the completed part, where practicable, and retained in the holder's file for a period of at least 2 years after the part has been completed.

9.3 In describing the FIS, references to other documents or data maintained by the applicant may be utilised in lieu of a detailed description of a particular procedure, provided that a brief description is also included in the manual and that the referenced documents

provide a complete description of the system. The description should also include a facsimile of the APMA holder's symbol or trade mark, if one is used.

9.4 AC 21.27 Appendix 1 provides advice on establishing an acceptable quality system.

10. FINAL INSPECTION

This aspect of the FIS would ensure that each completed part is subject to a final inspection to determine conformity with approved design data, compliance with applicable Airworthiness Directives or Service Bulletins and whether the part is safe for installation on the type-certificated product. Such a system would usually incorporate procedures to ensure that:

(a) each part is inspected for completeness, adjustments, safety, calibration, markings, placards etc., as applicable to the part;

(b) if applicable, each completed part is subjected to a functional test to ensure that the operating characteristics are in accordance with the approved design provisions; and

(c) appropriate arrangements are made for packaging, preservation, storage and dispatch of the finished articles.

Richard G. Yates
Assistant Director
Aviation Safety Standards

APPENDIX 1. SAMPLE LETTER OF APMA APPLICATION

To: Team Leader, Engineering Support Group,
Melbourne District Office,
505 Lt. Collins Street,
Melbourne, Vic 3000

Request for Australian Parts Manufacturer Approval (APMA)

Date Submitted: 1 December 1998

From: SMITH MANUFACTURING P/L
12 Aviation Street,
TULLAMARINE, Vic 3043

Manufacturing Facilities Address: As Above

Contact Person John Smith

Phone (03) 9265-1234

Dear Sir,

Part for which APMA is requested:

Part Description:	Spring
Part P/N :	SMITH 4689
For Installation on :	General Aircraft
Replacement for original Part P/N:	Bendix Spring P/N CF 89
Design Data :	Drawing No xxxxx
Design Approval:	CAR (88) 35/36 by Jim Brown
License Agreement:	Nil

(See attached documentation for application design data and manufacturing procedures)

ENCLOSED ARE THE FOLLOWING:

X Two copies of the Spring Drawing No xxxx

X One copy of the procurement Bill of Material

X One copy of Manufacturing Procedures Manual (including Fabrication Inspection System (FIS)).

X One copy of Heat Treatment Process Specifications

X One copy of technical justification for identicality and other supporting documentation.

X Statement from Type Certificate holder: Nil

X A statement that the Smith Manufacturing has established the FIS in compliance with CASR 21.303 (11).

X A Compliance Statement Summary of Design and Manufacturing against the Regulatory Requirements.

It is our understanding that if the APMA is granted, one copy of the approved drawings (stamped approved) will be returned to Smith Manufacturing (to contact person listed above) and that these approved drawings are to be kept on file at Smith Manufacturing for future CASA reference.

Yours Faithfully

John Smith
Managing Director

Appendix 2

SAMPLE COMPLIANCE STATEMENT

1 The compliance statement for design may vary according to the complexity and the criticality of the AMPA component. A simple non structural component such as a replacement composite wing fairing with no aerodynamic change may require only a simplified statement of compliance against the aircraft original design standard as meeting the original strength requirement. Provided together with the appropriate composite strength justification and in service maintenance inspections. A critical primary structure modified component (product improvement type) would require a far more detailed compliance statement with the relevant design standard.

2 For example the product improved PA-31-350 modified Aileron Control Bracket (modification approved under regulation 35/36 of CAR 1988 replacement) for control rod pick up is a critical primary flight control item which would require a more detailed compliance statement. Original aircraft design standard was FAA CAR 3, however, elected modification component design standard is FAR 23. A sample statement for the structural design standard compliance in this case may be as illustrated below:

AIRCRAFT APPLICABILITY: PA-31-350

COMPONENT: New Aileron Control Bracket Smith Manufacturing P/N 441284 A as a replacement for Piper P/N 441284

DESIGN STANDARD: FAR 23 Amendment 42

Requirement	Compliance Claimed	Method of Compliance	Document Ref	Accepted by the Authority (Reserved for CASA use)
FAR 23.603 Workmanship	Yes	APMA FIS	Doc No 186	
FAR 23.605 Fabrication	Yes	APMA FIS	Doc No 186	
FAR 23.613 Material Strength	Yes	Analysis/Test	Report No 1	
FAR 23.619 Special Factors	Yes	Analysis	Report No 1 Para 6	
FAR 23.621 Casting Factor	N/A	Nil castings	-	
FAR 23.623 Bearing Factor	Yes	Test	Report No 1 Para 5	

FAR 23.625 Fitting Factor	Yes	Analysis/Test	Report No 5
FAR 23.627 Fatigue Strength	Yes	Test and Analysis	Report No 3
FAR 23.629 Flutter	Yes	Analysis	Report No 6
FAR 23.641 Strength	Yes	Test	Report No 2
FAR 23.657 Hinges	Yes	Test	Report No 4
FAR 23.689 Cables	Yes	Cable system unchanged	Refer Drg No 884
FAR 23.693 Joints	Yes	Test	Report No 4
FAR 23.697 Wing Flap	N/A	Aileron component	

Note: Only the relevant sections of the design requirements need be addressed, the other items are to be noted as N/A (Not Applicable). Also in this example case no aerodynamic change is made, and the flight envelope, landing and take-off performance are not affected. Thus no detailed compliance statement is required for those items, although statement to this effect needs to be included.