



Instituto Nacional de Aviação Civil
CIVIL AVIATION AUTHORITY

SUBJECT: MODIFICATIONS/REPAIR

Date: 01/12/2012

1. PURPOSE

- A. This Airworthiness Advisory circular describes the acceptance process for modifications and repairs to Aircraft, Engines, Propellers and Equipment, the classification of such modifications/repair into major or minor and the recording upon completion.

2. REFERENCES

- The Civil Aviation Regulation Part 5.10.G.20 (d) e (e).
- The Civil Aviation Regulation Part 9.10.D.15

3. DEFINITION

- A. **Modification.** A modification to an aeronautical product means a change to the type design which is not a repair.

(1) Major. A major modification means a type design change not listed in the aircraft, aircraft engine or propeller specifications:

- a) that might appreciably affect the mass and balance limits, structural strength, performance, powerplant operation, flight characteristics or other qualities affecting airworthiness or environmental characteristics; or
- b) that will be embodied in the product according to non-standard practices.

(2) Minor. A minor modification means a modification other than a major modification.

Note: Some States use the term "alteration" instead of modification. Throughout this chapter alteration and modification are intended to be synonymous.

- B. **Repair:** A repair to an aeronautical product means a design change intended to restore it to an airworthy condition after it has been damaged or subjected to wear.

(1) Major. A major repair means a design change which is intended to restore an aeronautical product to an airworthy condition:

- (a) where the damage being repaired might appreciably affect the structural strength, performance, powerplant operation, flight characteristics, or other qualities affecting airworthiness or environmental characteristics; or

- (b) that will be embodied in the product using nonstandard practices.
- (2) Minor. A minor repair means a repair other than a major repair. Guidance is presented in the Appendix 1 to assist in determining whether a particular modification or repair is major or minor.

(A minor repair is one that has no appreciative effect on the mass, balance, structural strength, reliability, operational characteristics, noise, fuel venting, exhaust emissions, or other characteristics affecting the airworthiness of the airplane.)

C. **Approved data:** Data that can be used to substantiate major repairs/major modifications, derived from (but not limited to) the following:

- (1) Type Certificate Data Sheets
- (2) Supplemental Type Certificate (STC) data, provided that it specifically applies to the item being repaired/alterd
- (3) Airworthiness Directives (AD)
- (4) Airframe, engine, and propeller manufacturer's "CAA-approved" maintenance manuals or instructions.
- (5) Component manufacturer's manuals or instruction, unless specifically not approved by the Director or resulting in an alteration to the airframe, engine, and/or propeller
- (6) Major Repair or Modification/Alteration form, when the specified data has been previously approved
- (7) Structural Repair Manuals (SRM), only as a source of approved data for a major repair, when it is a State of Design-approved document. Data that is contained in an SRM that is not approved, can be used on a case-by-case basis if prior CAA approval is granted for that repair.

Note: See STP-CAR 5 for specific definitions

D. **Substantiating Data.** Technical data used to show that an article complies with the applicable airworthiness standards (e.g., FAA Parts 25 or 33). Compliance may be shown by tests, analysis, experience, and/or computations appropriate to the maintenance, alteration, or continue-in-service condition of the article being evaluated. Substantiating data shown to comply with the applicable airworthiness standards is acceptable to the Authority. This is because it establishes that the article meets the regulatory requirements and would be returned to its original or properly altered condition by use of this data.

Note: Data acceptable to the State of Design are considered acceptable to the Authority, by virtue of the Acceptance Type Certificate issued by the Authority.

4. APPROVAL OF MODIFICATIONS

- A. Modifications other than those made mandatory by the Authority and not traceable to any approved continuing airworthiness information disseminated by the manufacturer, such as Service Bulletin, shall be approved by the State of design and accepted by the Authority.
- B. The Authority will not accept any modification or the substantiate modification design data and documents unless it is approved by the State of Design under a Supplement Type Certificate (STC) or similar documents.
- C. Applications for acceptance of substantiate modification design data by the Authority shall be made in accordance with paragraph 7. It is reminded that one application form is effective for one aircraft only.

- D. The person responsible for the modification of the design must have sound knowledge of the design principles embodied in the aircraft type being modified and shall state any particular requirements to be observed when the modification is completed and before an aircraft, component or equipment is released for service. The following aspects shall be considered:
- (1) Whether tests or inspections during the progress or after the completion of the modification are necessary to ensure it complies with the specified requirements.
 - (2) The qualifications of persons who may be required to assess completed work and certify that it complies with the approved design.
 - (3) Whether significant changes in the weight and centre of gravity position of the aircraft will occur and if re-weighing or preparation of a new weight and balance report is necessary.
 - (4) Whether the flight or operating characteristics of an aircraft may have been affected by the work and the necessity to have the aircraft inspected and certified as fit for flight and flight tested.
 - (5) Whether amendments of particulars in the Certificate of Airworthiness or associated documents are required.
 - (6) Whether amendments are necessary to the approved maintenance schedule or other data or documents approved for maintenance or other work on the aircraft.
 - (7) Whether amendments are necessary to any data specified in the flight crew operating manual.
- E. Where a modification affects the instrument panel, it shall be ensured that instruments which are used by any one pilot are so arranged as to permit the pilot to see their indications clearly from his or her station, with the minimum practicable deviation from the position and line of vision normally assumed when looking forward along the flight path.
- F. Where a modification affects equipment required for communications or navigation purposes, or both, it shall be ensured that the failure of any single unit required for communications or navigation, or both, will not result in the failure of another unit required for communications or navigation.
- G. Modification documents shall bear a modification reference number, title, issue number and date and shall indicate the reason for modification, modification instructions, any limitations and inspection requirements, manuals affected and references to other documents or design data, together with a list of parts and assemblies affected by the modification and, where necessary, drawings or sketches giving particulars of parts before and after modification. An example of correctly structured and completed modification application package is shown in Appendix 2
- H. The acceptance of a modification will only be granted when the Authority is satisfied that in respect of the design:
- (1) The drawings, documents, reports, calculations, etc., are adequate to establish that the design complies with the appropriate airworthiness requirements.
 - (2) Any tests or inspections considered necessary for the approval have been completed satisfactorily.

(3) The drawings and other documents required for the work are of a satisfactory standard and in accordance with acceptable aeronautical practices.

- I. The Authority may require compliance checks after the completion of the modification and before an aircraft; component or equipment is released for service. The modification approval applicant shall arrange for such checks to be carried out by the Authority.

5. APPROVAL OF REPAIR

- A. Where a repair falls outside the scope of approved maintenance data as specified in STP-CAR 6.10.E.45 then such a repair will require the approval of the State of design and the acceptance of the Authority.
- B. The Authority will not accept any modification or the substantiate modification design data and documents traceable to the approval of State of Design under a Supplement Type Certificate (STC) or similar documents are provided.
- C. The Authority will only accept repair or the substantiate design data and documents traceable to the approval of State of Design.
- D. Applications for repair data acceptance by the Authority shall be made in accordance with paragraph 7. It is reminded that one application form is effective for one aircraft only.
- E. The design approval holder must classify the repair as major or minor in accordance with the classification system of the approving airworthiness authority. All repair design should have been classified prior to submission to the INAC.
- F. The person responsible for the repair design must have sound knowledge of the design principles embodied in the aircraft type being repaired.
- G. Where the repair has been a matter of urgency and the repair scheme has been initiated by telephone or telex with the manufacturer, details of the damage or such like should be forwarded to the manufacturer by letter, telex or facsimile and a subsequent confirmation obtained that the scheme is to his satisfaction. In such matters of urgency, work may commence on production of a suitable sketch but final approval may not be granted until such time as a satisfactory working drawing has been produced.

6. COMPATIBILITY OF MODIFICATIONS AND REPAIRS

- A. Consideration should be given during the design process to compatibility between the proposed design change and other existing design changes, such as modifications, repairs and airworthiness directives (AD).
- B. The operator has responsibility to inform the design approval holder for any airworthiness deficiencies discovered in service which relate to the design change. The design approval holder has responsibility to assist the operator and the approving airworthiness authority to correct such deficiencies being informed.
- C. The installer of the modifications or repairs on the aircraft has responsibility to verify compatibility with other existing modifications and repairs before installing any design change.
- D. The operator has the overall responsibility to ensure the compatibility of all design changes incorporated in their aircraft. The operator should report any design change

incompatibilities detected during installation or in service to the design approval holder, to the installer and to the approving airworthiness authority.

7. PROCEDURE

A. The applicant will discuss with the design approval holder whether the proposed modification is to be classified as major or minor. A modification or repair will be deemed to be major if it:

- (1) Is listed in Part 5 Implementing Standard 5.10.A.10 (a)(6) and 5.10.A.10 (a)(7)
- (2) Requires a Flight manual amendment
- (3) Involves major structural changes requiring stress reports
- (4) Involves the Manufacturer or an approved Design Organisation
- (5) Requires approval of an STC or equivalent.

B. Modifications which involve structural deviations outside the SRM must be approved by or technically acceptable to the aircraft manufacturer or approved by the regulatory Authority of the state of manufacture of the item to be modified, eg an STC or other document, as applicable.

C. When a modification has been classified as major the following procedures will apply:

(1) If the modification will introduce a major change in type design, not great enough to require a new application for a type certificate, the applicant shall apply for a Supplemental Type Certificate to the regulatory agency of the State of Design that approved the type certificate for that product. After the issuance of a Supplemental Type Certificate by the State of Design, the applicant shall submit to INAC, a copy of STC and a letter requiring the acceptance of the original Supplemental Type Certificate together with the application package.

(2) Data for major modifications which are approved by the State of Design/manufacture (e.g. FAA approved Supplemental Type Certificate (STC), FAA form 8110-3, Service Bulletin (SB) excluding aircraft components, etc) will not be automatically accepted by INAC. These data, including the application for acceptance of a STC, should form part of the substantiation package for INAC data acceptance.

D. Following, the applicant will prepare a modification application package and submit it to the INAC for acceptance together with the modification design and supporting documents as early as possible. This modification package will contain sufficient information for the Inspector to determine the acceptability of the modification data and the degree of surveillance required.

E. The operator must submit the F-05-008 - Request for modification and repairs data acceptance with the modification package.

Note: The INAC will not approve a request for major modification or major repair unless the application is supported by the required approved data from the state of design;

F. The modification package will contain at least the following information.

(1) Engine/Airframe/Appliance/Avionics and Equipment Modification

- (a) Title page to include: Company name and address, Aircraft type, Registration, Serial Number, Company Mod. Number, Modification title and a brief description of the modification

- (b) If based on an STC or similar document then a copy is to be submitted with a letter requiring the acceptance of the STC.
- (c) Details of equipment to be fitted and its approval basis
- (d) Proposed modification procedure
- (e) Details of proposed ground and air tests as applicable
- (f) Details of manuals requiring amendment as applicable
- (g) Details of any special requirements such as the need to re-weigh the aircraft, changes to weight and centre of gravity
- (h) Details of the impact to noise certification
- (i) Details of changes to the aircraft electrical load
- (j) The requirements for a compass swing if applicable.
- (k) Copies of Flight Manual Supplements approved as part of the STC. See paragraph F below.

Note: The above requirements are not exhaustive and represent a minimum requirement.

- (2) Refer to Appendix 2 for the modification application package specific format and content.

G. Acceptance for Data Only

- (1) The INAC will need to be satisfied that:
 - (a) The proposed modification has no unsafe features;
 - (b) Documentation includes data to ensure continued airworthiness and an appropriate amendment system;
 - (c) The applicant has met the requirements for the provision of approved data and documentation from the State of Design; and
 - (d) The applicant is properly authorized or has contract with an approved organization to perform the modification in accordance with the approved data and the conditions of his operations specifications.
- (2) When the INAC determines that all the conditions are met, the ASI will:
 - (a) Record data acceptance in block 14 of F-05-008 by ticking the "DATA ACCEPTED" box;
 - (b) A copy of F-05-008 will be sent to the applicant allowing the applicant to proceed with the proposed modification.

H. Flight Manual Supplements. Whenever a modification introduces a Flight Manual Supplement approved by a foreign Authority by way of a Supplemental Type Certificate (STC), then the following procedure must be followed:

- (1) Approval of the modification by the São Tomé and Príncipe CAA automatically approves the Flight Manual Supplement referenced in the STC.
- (2) The Operator must therefore submit copies of the supplement's List of Effective Pages (LEP) to the INAC, in order that it may be stamped "approved" prior to insertion in the applicable Flight Manual/Aircraft Operating Manual. Should an STC not include an LEP for its flight manual supplement, then one must be prepared by the applicant for submission to the INAC. In addition, each supplement must be specifically identified to the particular aircraft.
- (3) The supplement shall be placed in the respective section of the Flight Manual. Supplements derived from an STC shall bear the number of the supplement in the

table of contents, so that they may be readily distinguished from supplements issued by the manufacturer.

- I. Form Major Modification/Repair, when the modification/repair has been completed the Operator should:
 - (1) Request the authorised person/organization that performed the work to enter the details and sign the major modification/repair F-05-009, in duplicate. For each major modification/repair, one completed copy of the form shall be forwarded to the INAC within 48 hours after the aircraft or aeronautical product has been approved for return to service and the other copy shall be kept available on the aircraft file for inspection by the INAC
 - (2) Elaborate a report (see appendix 3) of each major modification/repair of an airframe, aircraft engine, propeller, or appliance and sent it to the INAC.
- J. Any repair or modification that is not a major repair or modification does not require the approval/acceptance of the INAC and would not be subject to the same analysis as a major repair or modifications. Notwithstanding, any minor repair or minor modification for which previously approved data is not available such data must be obtained from the State of Design.
 - (1) The record retention requirements for minor modifications and minor repairs are much simplified, as no modification or repair may be called minor if it affects the airworthiness of the aeroplane. It is nevertheless necessary for the aeroplane operator to retain sufficient records to:
 - (a) Identify the modification or repair and record that it has been classified as minor;
 - (b) Record its location on the aeroplane;
 - (c) Record mass and moment change, if significant; and
 - (d) Record the release-to-service approval.

8. RECORDS

- A. Records of incorporation of all repairs and modifications affecting the airworthiness of an aircraft, its components or equipment shall be maintained in the appropriate log book or in a separate record by the owner or operator of the aircraft.
- B. For all modifications and repairs, the design approval holder should retain the records of the analyses and tests performed to demonstrate compliance until the aircraft is permanently withdrawn from service.
- C. All relevant modification and repair design information, drawings, test reports and records shall be held at the disposal of the Authority.
- D. No such records shall be destroyed without authorisation from the Authority.

Approved by: Board of Administration of INAC	
Date:	President of the Board
<u>30/04/2012</u>	 Marcos Angelo Vaz da Conceição (Aeronautic Engineer)

APPENDIX 1

CRITERIA FOR THE CLASSIFICATION OF MAJOR AND MINOR MODIFICATIONS AND REPAIRS

The following criteria outline the decisions needed in assessing a modification or repair as major or minor. For each issue, it must be determined whether or not the proposed change will have other than a negligible effect. The questions require "yes" or "no" responses. An affirmative answer to any individual question indicates that the changes should be classified as major. The examples and tests listed are for illustration only and not intended to be all-encompassing. Organisations are encouraged to develop their own internal checklist to determine major and minor repairs / modifications.

Criteria for the classification of major and minor modifications and repairs			
Instruction: Insert a tick (X) if the criteria is Yes or No. If the criteria is not applicable, fill in "NA".			
Number	Criteria	Yes	No
1	General		
	a) Is the change being accomplished as an alternative means of compliance with an airworthiness directive or equivalent?		
	b) Does the change affect type approval status?		
2	Mass and balance		
	a) Does the change involve a revision in the approved mass limitations or centre of gravity range limits?		
	b) Does the change require the installation of ballast or use of other methods to maintain the centre of gravity within the approved limits?		
3	Performance and flight characteristics		
	Does the change involve alterations to the configuration of the aircraft which may:		
	a) increase drag;		
	b) alter the thrust or power;		
	c) affect stability or controllability;		
	d) induce flutter or vibration; or		
	e) alter the stalling characteristics to an extent which necessitates analysis or test?		
4	Structural strength		
	a) Does the change involve a principal component of the aircraft structure such as a frame, stringer, rib, spar or stressed skin?		
	b) Does the change involve a structural element which is addressed as part of a damage tolerance or fatigue/failsafe evaluation?		
	c) Is a pressure vessel penetration or change involved?		
	d) Does the change involve the installation of an item of mass necessitating structural re-evaluation?		
	e) Does the change involve the installation or alteration of a containment or restraint system intended for the stowage of items of significant mass?		
	f) Does the change involve repairs or modifications to the load-bearing structure of seats, harnesses or their means of attachment or any other occupant restraint equipment?		
	g) Does the change involve the substitution of materials?		
5	Powerplant operation		
	a) Does the change significantly affect the powerplant or propeller or their accessories?		
6	Other qualities affecting airworthiness		
	a) Does the change involve equipment for which there is no performance standard which has been approved or accepted by the airworthiness authority?		
	b) Does the change affect the probability of failure conditions that could impair or preclude continued safe flight or landing?		
	c) Does the change affect the pilot's visibility or impair the pilot's capability to control the aircraft?		
	d) Does the change involve alterations to the interior arrangement or cabin materials?		
	e) Does the change involve systems for cabin pressurization or the provision of breathing oxygen?		
	f) Does the change involve flight controls or an autopilot?		
	g) Does the change involve critical- or essential components of the electrical system such as generators, alternators, inverters, batteries, distribution buses, or bus protection and control devices?		
	h) Does the change affect instruments or indicators or their subsystems that provide navigation information?		
	i) Does the change affect instruments, indicators or their subsystems that provide essential or critical information concerning the aircraft status?		
	j) Does the change affect a regulated placard?		
	k) Does the change affect any approved information		
7	Other qualities affecting environmental characteristics		
	a) Does the change alter the aircraft noise or emission characteristics?		
8	Non-standard practices		
	a) Does the change involve practices or techniques which are novel or unproven in the proposed application?		
9	Software criticality		
	a) Does the change have a significant impact on flight operation?		

APPENDIX 2

MODIFICATION APPLICATION PACKAGE

Submission format

The modification application package should be structured to cover the required information under at least the following suggested subject headings. If any particular item is not applicable to an application then a brief statement to indicate why this is so, must be recorded. This listing as a whole should not be considered to be exhaustive, it is conceivable that some additional information may be requested in order to substantiate, investigate and review any unusual design features of the applicants submitted modification package.

COVER PAGE

Organisation Name:
Company Modification Number:
Modification Classification:
Aircraft Type/Model:
Aircraft Registration:
Aircraft Serial Number:
Company:
Applicant:
Date:
Signature:

CONTENTS

1. Description of Modification.
2. Reason/Purpose for Modification.
3. Existing Approval of Modification (*Proprietary items require evidence of permission to be used*).
4. Applicability & Relevant Certification Basis (*FAA, EASA, etc*)
5. Supplemental type Certificate (if applicable)
6. *Drawings Required.
7. Modification Procedures and Accomplishment Instructions
8. *Equipment Approval/Component listing (*Include Type approval FAATSO/ EASATSO & Class, Flammability compliance, etc*).
9. Physical Installation Issues (*Stress analysis, Interface, Egress, Support Devices, Visibility etc*).
10. *Electrical Arrangements (*Electrical load analysis, circuit protection, wire type etc*).
11. Environmental Issues (*Cooling, vibration, contamination risks etc*).
12. *Weight Schedule Amendment.
13. Structural Provisions/Implications.
14. Indicator/Display/Area Lighting.
15. Post Installation Ground Checks (*Verify design with regard to performance, interface and safety*).
16. * Flight Test Requirements (*Verify design with regard to performance, and system functions*).
17. Interface Considerations (*Effects on other systems, previous modifications, operating procedures, etc*).
18. Cockpit Notices, Labels, Placards and Passenger Information.
19. Continued Airworthiness Requirements (*Scheduled tasks and reliability assessment*)
20. *Documents to be Amended (FM, AMS, AMM, IPC, SRM, SB, O/H Manual, Wiring Manual, etc) as applicable

Note: Copies of documents annotated thus "*" should, if applicable accompany the modification submission to support it. Additional supporting information may be required in the form of STC, other States approval supporting documentation, TSO, Declaration of Design and Performance (DDP), and general build specifications.

APPENDIX 3

MODIFICATION/REPAIR REPORT

APPLICANT:

AIRCRAFT TYPE:

REGISTRATION NO:

OPERATOR:

INSTALLER:

DESIGN ORGANISATION:

CERTIFICATE CATEGORY:

MODIFICATION NO:

MODIFICATION TITLE:

1. Introduction
2. Description
3. Basis of Certification
4. Compliance with Requirements
5. Flight Test
6. Flight Manual
7. Noise
8. Limitation/Concessions
9. Required Inspections
10. Approval/Acceptance