



TECHNICAL GUIDANCE MATERIAL FOR MODIFICATIONS

SUBJECT: TECHNICAL GUIDANCE MATERIAL FOR MODIFICATION

EFFECTIVE DATE: 28 September 2021

APPLICABILITY

This guidance material is applicable to Approved Maintenance Organisations (AMO), Approved Design Organisation (ADO), Aircraft Owners/Operators and other related Aviation Industry

PURPOSE

The purpose of this technical guidance material (TGM) is to provide procedural guidelines concerning the planning and conducting a modification on type certified aircraft or aeronautical products.

REQUIREMENTS

1. REFERENCE:

It is intended that the following reference materials be used in conjunction with this document:

- i. Part 43 of the Civil Aviation Regulations (CAR's); GMR
- ii. Part 147 of the South African Civil Aviation Regulations (CAR's); Design Organisation
- iii. SA-CATS 43, South African Aviation Technical Standards (SA-CATS);
- iv. Part 21 of the Civil Aviation Regulation (CAR's); Certification of Products
- v. Part 187 of the CAR's, Fees.
- vi. Part 185 of the CAR's, Legal and Compliance.
- vii. ICAO Annex 8

2. TERMS AND ABBREVIATIONS:

TERM	DEFINITION
Aircraft Type:	means all aircraft of the same basic design, including all modifications thereto, except those modifications which result in a change in handling or flight characteristics;
Aircraft:	means an aircraft as defined in the Act, including its engine, propellers, rotor, components, parts, equipment, instruments, accessories and materials;
Modification:	means a change in the physical characteristics of aircraft, accomplished either by a change in production specifications or by

alteration of items already produced

(i) a minor modification is a design change that has a negligible, or no appreciable, effect on the mass, balance, structural strength, reliability, operational characteristics or other characteristics affecting the airworthiness of the aeronautical product. The accomplishment of minor modifications normally involves use of standard or generally accepted practices.

(ii) a major modification has an appreciable, or other than negligible, effect on the airworthiness of an aeronautical product. The effect of a major modification is usually confined to a single area, system or component of an aircraft, engine or propeller

Approved Data:

means data that can be used to substantiate modifications derived from the following:

- Type Certificates Data Sheets
- Supplemental Type Certificates data provided that it specifically applies to the item being modified or altered
- Airworthiness Directives
- Airframe, engine, and propeller manufacturers approved maintenance manuals and/or instructions

Airworthiness Data:

means any information necessary to ensure that an aircraft or aircraft component can be maintained in an airworthy condition;

Authority:

means the National Airworthiness Authority of the certifying

Product:

means an aircraft, aircraft engine or propeller, and includes the classes of products or types of aircraft referred to in Part 21;

Design Change:

A change in the approved design of an aircraft, aircraft engine or propeller.

Applicant:

means the applicant who is the legal entity i.e design organization approval holder (DOA), aircraft maintenance organization (AMO)

ABBREVIATION	DESCRIPTION
AD	Airworthiness Directive
ADO	Approved Design Organization
AMO	Approved Maintenance Organization
C of A	Certification of Airworthiness
CRMA	Certificate Relating to Maintenance of an Aircraft
DER	Designated Engineering Representative
ICAO	International Civil Organization

NAA	National Aviation Authority
OEM	Original Equipment Manufacture
TGM	Technical Guidance Material

3. BACKGROUND

After issuance of an initial or original type certificate, there are many activities that can be performed or required by the type certificate holder, the State of Design, the State of Registry, air operators and other design organizations that will result in the modification of an aeronautical product. For example, the type certificate holder may want to develop a model derivative of the same aeronautical product, or an aircraft owner or air operator may want to replace an aircraft's existing navigation systems with state-of-the-art technology.

Modifications are intended to change a function, operation, limitation, performance, and/or characteristic of the physical or functional element(s) of an existing aircraft, engine and/or propeller for the purpose of achieving a desired feature, role or capability for the affected aeronautical product. Modifications will vary in design philosophy, application technology, complexity, and magnitude.

As per the regulations referenced above (Section 1) the CAA will does not accept modification and design data generated by organizations not approved to design such changes. Only design data generated by organization approved to design such changes (ADO) will be eligible as substantiation data to the applications for modification approval.

Although such data may be submitted by the applicant (AMO) or the ADO, it is important to note that the design data as generated by the ADO will only be considered if it is a complete pack and properly approved and released by the ADO concerned.

4. CLASSIFICATION

Design changes must be classified as either major or minor modification. A minor modification 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. All other changes are major modifications.

On some occasions, the classification process is initiated at a time when some data necessary to make a classification decision is not yet available. Therefore, the applicant should wait for availability of data before making a decision. Wherever there is doubt as to the classification of a change, CAA should be consulted for clarity. The reasons for a classification decision should be recorded and retained with the technical data for the design.

5. APPLICATION

The modification approval process whether requiring data and installation approval or if using already approved data (i.e, STC) remains the same.

5.1 SUBMISSION OF APPLICATION

An applicant must submit a properly completed application form (Form Number: CA 43-14) accompanied by proof of payment to eng@caa.co.za. Proof payment can be through a stamped application form if payment was done at any of the CAA counters or evidence of EFT payment if

payment was done through internet banking. No technical data (substantiation material) shall be submitted with the application form.

Note: *For efficient processing of modification information, applicants must submit applications in advance, at least 15 working days before installation is initiated or anticipated. For administrative purposes, no substantiation data must be submitted with the application form.*

5.2. ACKNOWLEDGEMENT OF RECEIPT OF THE APPLICATION

The CAA's allocated project leader will acknowledge receipt of the application and request that all communications and supporting data be submitted directly to him/her for review.

6. SUBMISSION OF SUPPORTING DATA (TECHNICAL DATA)

The applicant must submit the required supporting data or complete work-pack to the allocated CAA project leader within 30 days after acknowledgement of receipt of the modification approval application.

In case of a modification approval application requiring data and installation approval the applicant must submit a complete design pack properly approved and released by the ADO concerned.

In case of application where the applicant is using already approved data (STC) the applicant (AMO) must submit a complete post installation documentation pack bearing evidence of approval by its Quality Department representative or the relevant certifying person.

Note: *AMO's are encouraged to contact the manufacturers directly for clarification of manufacturer's promulgated data and any instruction or contact the SACAA for any clarity*

6.1. MINIMUM SUPPORTING DATA REQUIRED (but not limited to the below list)

- i. Certification Plan, Certification Basis, STC, Permission letter*
- ii. Compatibility Assessment report*
- iii. ARC (8130 or EASA Form 1. etc)*
- iv. CRMA / Logbook entry*
- v. Ground/ Functional test results*
- vi. ELA / Structural analysis*
- vii. EMI*
- viii. Mass & Balance report*
- ix. Installation Instructions Manual*
- x. Master Data list*
- xi. For ELT substantiation (proof of registration must be provided)*

6.2. EVALUATION OF SUPPORTING DATA

The CAA will evaluate the submitted substantiation data to find compliance with the appropriate airworthiness design standards and regulatory framework. This may include inspections of the aircraft or product concerned.

7. COMMERCIAL/OFF-THE-SHELF PRODUCTS (COTS)

7.1. COTS parts/products are parts that are generally not developed for airborne system purposes, and their design has not been approved under CAR Part 21 nor produced under the production or manufacturing approval. Most COTS products are not developed to meet aviation design and development assurance standards and, therefore, there are risks associated with their use in an aircraft systems or equipment.

7.2 An increasing number of manufacturers are offering products that are not designed or meant for aviation use, such as multifunction displays and radios. These products generally lack any formalised configuration control from the manufacturers, which may imply that:

7.2.1 equipment initially fitted during a modification may differ significantly to an item purchased at a later date as a replacement part.

7.2.2 embedded software may not have been verified against a known standard or tested to ensure that all software functions operate correctly without producing unexpected outcomes. Manufacturers may also change and improve the software at any time. This software may appear to function correctly but may contain latent errors.

7.2.3 manufacturers may not intend to support the existing equipment configuration in the longer term.

7.3 A modification/repair design may include COTS parts, however, the requirements for approval of the proposed design applies to the entire design, including the COTS parts/ component detail design and verification of the overall design process.

7.4 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.

8. TRACEABILITY OF AIRCRAFT PARTS AND COMPONENTS

The following guidance is for the documentation to be provided by the applicant AMO to ensure the traceability of new or used aircraft parts and components to be approved for installation in an aircraft:

8.1 New Parts: Component Release Certificate (FAA 8130, EASA Form 1, or equivalent) attesting that the part or component is in new condition.

8.2 Used Parts: Component Release Certificate (FAA 8130, EASA Form 1, or equivalent) attesting that the part or component is in a serviceable condition/ Released to Service/Overhauled. Other traceability documents that may be requested include traceability back to birth or back to the last logbook entry from the last aircraft that the aircraft parts or components were installed or removed from. The aircraft parts and components removed from an aircraft with the intention to install in a new aircraft or put away in storage should be in a serviceable condition and from an airworthy aircraft

Note: Approved parts are eligible for installation on a specific aircraft if they meet the approved design data applicable to the aircraft on which they are to be installed.

9. MODIFICATION THAT MAY HAVE FLIGHT TEST IMPLICATIONS WOULD INCLUDE:

9.1 any modification that influences the performance or handling characteristics of the aircraft.

9.2 any systems change with the potential to affect aircraft operation or that have consequences for the pilot and crew.

9.3 any change that results in amendment to the Aircraft Flight Manual (AFM).

However, the need for flight testing should be considered in relation to the proposed modification. The applicable airworthiness requirements, and the regulations.

10. ADDITIONAL INFORMATION TO CONSIDER

10.1. LIMITATIONS

Detail out any limitations affecting the approval, such as limited cycles, flight hours, calendar time, operating limitations (airspeed, flight rule etc.) airworthiness limitations (mandatory inspections). If limitations are applicable to the modification, then SACAA will stipulate such limitations on the Final Modification Approval Letter.

10.2. A CHANGE TO FLIGHT MANUAL

Must be developed and approved for designs which information is necessary for safe operation because of design, operating, or handling characteristics, such as:

10.2.1 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

10.2.2 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.

10.3. MODIFICATION TRANSFER

The holder of a modification design approval may transfer the approval to another person, with the written agreement of the other person. If an approval is transferred to another person then a copy of the records required to be kept under such regulation must be provided to the new holder. The new holder becomes responsible for the records. The new holder also becomes responsible for all the other ongoing obligations associated with the approval, including defect reporting under such regulation, and providing up to date ICA and AFM amendments.

10.4. RESPONSIBILITY OF HOLDER OF MODIFICATION APPROVAL

The holder of the modification approval remains responsible for the continued integrity of the design change to approved type design and it or its representative must continue to be the CAA's contact point for resolving issues that may require corrective action. To fulfil this responsibility, the holder should have the continued capability, or access to a capability, of providing appropriate technical solutions for service difficulties when service experience warrants it, or when the CAA requires mandatory corrective action. If the holder is no longer capable, the CAA must take action accordingly. If the approval is transferred to another holder, the CAA should determine that the new holder is capable of fulfilling the minimum responsibilities described herein.

10.5. SUSPENSION OR CANCELLATION

10.5.1 Suspension or Cancellation of modification approval may be carried out in accordance with SA-CAR Part 185

10.5.2 A modification approval may be suspended or cancelled if,
(i) it was erroneously issued.
(ii) there is a safety concern with the modification.

11. FEEDBACK ON ASSESSMENT OF SUPPORTING DATA

The CAA will provide feedback after evaluation of the submitted substantiation data and it is expected that the applicant to rectify the shortcomings identified during evaluation and provide evidence of

rectification to the CAA project leader at least within 30 days from the date of CAA feedback notification.

12. ENGINEERING INSPECTION

The applicant should give the CAA access to the aeronautical product being modified in order to make any inspections, test, and engineering assessment that may be necessary to determine compliance with the approval basis of the modification. An engineering compliance inspection is to assure that an installation and its relationship to other installations on an aeronautical product comply with the design requirements, however, the applicant should perform its own inspection and test necessary to demonstrate compliance, prior to presenting the modified aeronautical product to the AED for testing or evaluation.

13. APPROVAL

13.1 The approval of the modification means that:

- a) the airworthiness requirements affected by the modification meet all the relevant requirements specified in the certification basis, including special conditions of airworthiness issued by the CAA;
- b) all engineering and conformity inspections have been completed and the modified aeronautical product has been found to meet all pertinent requirements; and
- c) in the case of aircraft, the modified aircraft has been test flown, as required, and found to comply with all the performance requirements of the pertinent airworthiness standards.

13.2 Unless the modification design has been approved by either: SACAA or a DER (acting in accordance with SA-CAR Part 43.02.15); the aircraft is not considered to be in compliance with the Regulations and, since the airworthiness cannot be established, it is not permitted to fly.

13.3 Following a successful demonstration of compliance by the applicant, the CAA will make a finding of compliance and conclude the approval process. The approval process is then concluded by the issuance of Modification Approval letter.

Note: *The hours worked on the supporting data review & inspections will be invoiced to the applicant using the hourly rate as per CAR 187.*

If limitations are applicable to the modification, the SACAA will stipulate such limitations on the Final Modification Approval Certificate.

14. CANCELLATION OR DECLINATION


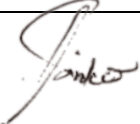


The CAA will approve applications found compliant and cancel or decline applications not meeting the requirements and will also provide reasons for cancellation or declination of such applications.

Note: *Although the current regulations do not prohibit modifications on aircraft prior to written approval by the Director, aircraft owners and maintenance organizations shall be cognisant that unapproved modifications invalidates the certificate of airworthiness (C of A) of the aircraft concerned.*

15. RECORDS

The applicant, AMO, ADO and Aircraft Owners/Operators should keep all records of approvals for modification design and installations not limited to supporting data submitted with the application.

16. DOCUMENT AUTHORIZATION

DEVELOPED BY:		
	LESEDI MOFOKENG	28 SEPTEMBER 2021
SIGNATURE OF CE:	NAME IN BLOCK LETTERS	DATE
REVIEWED BY:		
	JABULILE SIBEKO	28 SEPTEMBER 2021
SIGNATURE OF M: AED	NAME IN BLOCK LETTERS	DATE
VALIDATED BY:		
	LOBANG THABANTSO	28 SEPTEMBER 2021
SIGNATURE OF SM:	NAME IN BLOCK LETTERS	DATE
APPROVED BY:		
	SIMON SEGWABE	28 SEPTEMBER 2021
SIGNATURE OF E: ASO	NAME IN BLOCK LETTERS	DATE

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