

# TECHNICAL GUIDANCE MATERIAL

## for

# Repairs On Type Certified Aircraft

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**SUBJECT:** TECHNICAL GUIDANCE MATERIAL FOR REPAIRS

**EFFECTIVE DATE:** 16 MARCH 2023

### APPLICABILITY

This technical guidance material is applicable to Approved Maintenance Organizations (AMO), Approved Design Organizations (ADO), Aircraft Owners/Operators and other related Aviation Industry Stake Holders.

### PURPOSE

The purpose of this technical guidance material is to provide procedural guidelines pertaining to planning and conduct of a major repair on type certified aircraft or aeronautical products.

### REFERENCE DOCUMENTS

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

- i. ICAO Doc 9760 Airworthiness Manual
- ii. Part 147 of the South African Civil Aviation Regulations: Design Organisation for Products, Parts and Appliances.
- iii. Part 185 of the SACARs: Enforcement
- iv. Part 187 of the SACARs: Fees and Charges
- v. Part 21 of the Civil Aviation Regulations (SACAR's): Certification Procedures for Products and Parts
- vi. Part 43 of the Civil Aviation Regulations: General Maintenance Rules
- vii. SACATS 43, South African Aviation Technical Standards: General Maintenance Rules

### 1. TERMS AND ABBREVIATIONS:

TERM	DEFINITION
<b>Aircraft</b>	means an aircraft as defined in the Act, including its engine, propellers, rotor, components, parts, equipment, instruments, accessories, and materials.
<b>Airworthiness Data</b>	means any information necessary to ensure that an aircraft or aircraft component can be maintained in an airworthy condition.
<b>Approved Data</b>	means data that can used to substantiate major repairs or major alterations derived from the following: <ul style="list-style-type: none"> <li>• Type Certificates Data Sheets.</li> <li>• Supplemental Type Certificates data if it specifically applies to the item being</li> </ul>

repaired or altered.

- Airworthiness Directives.
- Airframe, engine, and propeller manufacturers approved maintenance manuals and/or instructions.

**Authority** means the National Airworthiness Authority of the certifying country or State of Design

**Major Repair** means a repair that might appreciably affect weight, balance, structural strength, performance, power plant operation, flight characteristics, or other qualities affecting airworthiness; or which is not done according to accepted practices or cannot be done by elementary operations. Major repairs that are not included in the maintenance manuals, service manuals, overhaul manuals, repair manuals, and where the repair action specifically requires designing of a repair scheme

**Minor Repair** means a repair 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 aircraft.

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

**Repair** means the restoration of an aeronautical product to an airworthy condition to ensure that the aircraft continues to comply with the design aspects of the appropriate airworthiness requirements used for the issuance of the type certificate for the respective type, after it has been damaged or subjected to wear.

ABBREVIATION	DESCRIPTION
AD	Airworthiness Directives
ADO	Approved Design Organisation
AFM	Aircraft Flight Manual
AFMS	Aircraft Flight Manual Supplement
AID	Airworthiness Department
AMO	Approved Maintenance Organisation
AOG	Aircraft On Ground
ARC	Authorised Release Certificate
C of A	Certificate of Airworthiness
C of C	Certificate of Conformance
CRMA	Certificate Relating to Maintenance of an Aircraft
DAR	Delegated Airworthiness Representative
ICA	Instructions for Continued Airworthiness
ICAO	International Civil Organisation Organization
NAA	National Aviation Authority
OEM	Original Equipment Manufacturer
SACAA	South African Civil Aviation Authority
SACAR	South African Civil Aviation Regulations
SA-CATS	South African Civil Aviation Technical Standards
SRM	Structural Repair Manual
STC	Supplemental Type Certificate
TC	Type Certificate
TCDS	Type Certificate Data Sheet
TGM	Technical Guidance Material

## 2. BACKGROUND

ICAO (maintenance provisions of Annex 6 and type certificate and continuing airworthiness requirements of Annex 8) prescribes that the State of Registry shall be responsible for approval of all design changes (repairs) to type certified aircraft under its jurisdiction including the installations of already approved data.

An aircraft may experience accidental damage, wear and tear, environmental deterioration, fatigue, malfunction, and failure during its operational life. A repair is a corrective action intended to restore an aeronautical product to an airworthy condition as defined by the appropriate airworthiness requirements and its regarded primarily as a manufacture function. An unapproved repair design could render a Certificate of Airworthiness invalid.

## 3. CLASSIFICATION PROCESS FOR MINOR AND MAJOR REPAIRS

The general intent behind categorization is to optimize the CAAs' resources by identifying those repair designs that require their direct participation in the approval process, determining the kind of data needed to substantiate the repair, and establishing the type and form of approval. CAA will process and approve minor and major repairs respectively.

An applicant seeking foreign approval of its repair design should coordinate its request with CAA during consultation with foreign CAAs to clarify potential differences in the repair category, and consequently their approval requirements.

### 3.1 MINOR REPAIR

A minor repair involves any repair that does not fall under the major repair category, meaning the repair has a negligible effect on the airworthiness of the affected aeronautical product. The accomplishment of minor repairs normally involves use of standard or generally accepted practices as per below:

3.1.1 Accomplishing a repair on an aircraft may involve such actions as performing maintenance or servicing procedures, replacing a defective part with a like serviceable unit or with an approved substitute part, or designing and incorporating a repair scheme. Generally, the documents encompassing the ICA such as, but not limited to, maintenance manuals, servicing instructions, overhaul manuals and repair manuals contain adequate maintenance procedures that are recognized by Contracting States as either approved or acceptable for purposes of accomplishing repairs to aircraft. For example, a structural repair manual (SRM) contains several State of Design approved repair schemes for typical damages or structural failures that can be readily applied by an operator, without the need to obtain prior approval of the CAA. However, where the repair action specifically requires designing a repair scheme, the repair design must be approved by the CAA. All changes to limited life components limits must be incorporated in the maintenance programme following the design repair approval.

### 3.2 MAJOR REPAIR

A repair in this category normally requires some form of engineering analysis or assessment. The CAA will evaluate the technical merit of a repair design proposal and establish a clear understanding of the intended or consequential effect on the affected aeronautical product. For example, it may not be appropriate to approve a repair that is purposely designed to be much stronger than the structure being repaired because the effect may be an undesirable change in the original structural load distribution. The threshold or level that distinguishes a major from a minor repair may vary from State to State. For illustration, the following examples can be used to categorize a major repair:

- a) repairs involving a principal component of the aircraft structure, such as a frame, stringer, rib, spar, or stressed skin.
- b) repairs to structural elements that were approved using damage tolerance or fail-safe evaluation. repairs to pressurized areas.
- c) repairs involving the installation of an item of mass necessitating structural re-evaluation.
- d) repairs to structural attach points intended for the stowage or retention of significant mass.

- e) repairs to load-bearing structure of aircraft seats, harnesses, or to occupant restraint equipment.
- f) repairs involving substitution of materials, or use of a different repair process or technique; and
- g) repairs to components, parts, appliances where form, fit, and function may be affected.

A major repair to an aircraft should be accomplished in accordance with design data approved by the State of Registry or an authorized person or organization, such that the repair conforms to applicable standards of airworthiness.

#### 4. REPAIR DESIGN APPROVAL PROCESS

##### 4.1 REQUIREMENTS FOR REPAIR DESIGN APPROVAL

AMO's, Aircraft Owners/Operators have two standard ways to obtain approved repair schemes, through ADO, State of design CAA (Approved designees from the state design).

- (a) Design data originating from foreign sources, CAA will only consider such repair data provided if it is traceable for approval from state considering having an equivalent safety standard to the state of design.
- (b) Design data from CAA approved Design Organisation and approval of either minor or major repair is issued by CAA following satisfactory evidence that the aircraft follows applicable airworthiness requirements used for issuance of the TC, its amendments or later requirements when determined by CAA.

The operator should ensure that the contracted ADO/Foreign Designees/Engineers and Personnel involved in designing the repair data possess a comprehensive knowledge, experience, and capabilities in the applicable technologies, such that in-depth analysis can be performed where required, information on prior repairs in the area where approval is sought and sufficient information on the type design of the aircraft involved.

An applicant for approval of repair design should submit design report which includes the listed at minimum. The data should be complete and in logical format for CAA to review.

- (a) Name of Applicant/Organisation
- (b) Make and model of affected aeronautical product (aircraft registration/tail number and manufacture serial number) and its type certificate number (or approval reference)
- (c) Title, detailed description, and purpose of repair design.
- (d) Proposed airworthiness standards to which the proposed repair is intended to show compliance, including the identification of any impact on approved airworthiness limitations contained in the ICA for affected aeronautical product (certification plan)
- (e) For foreign approved data, evidence of prior approval by the state that has jurisdiction over the individual or organisation responsible for the repair design.
- (f) Compliance with certification basis requires that the applicant submit substantiating data (compliance checklist, system safety assessment, design data, reports, analysis, drawings, processes, repair procedures, accomplished instructions, material specifications and ICA.
- (g) Test plans, where demonstration of compliance involves a test, a test plan should be developed and approved prior to any actual test being performed. Official certification tests should be witnessed by CAA personnel.
- (h) Environmental consideration, in that case, because of repairs affecting acoustics characteristics of the aircraft, a noise re-certification is requested, the State of Registry, upon completion of all required inspections, should grant or validate it based on satisfactory evidence that the aircraft:
  - i. Complies with the requirements that are at least equal to applicable standards stipulated in Annex 16.
  - ii. Aircraft Flight Manual-as a result of repair embodiment, if any AFMS is introduced.
  - iii. Limitations-detail out any limitations affecting the approval such as limited flight cycles, flight hours, calendar time, operating limitations (airspeed, flight rules etc.) and airworthiness limitations (mandatory inspections etc.)
- (i) The applicant should give the CAA access to the aeronautical product being repaired to make any inspections, test, and engineering assessment that may be necessary to determine compliance with the approval basis of the repair. However, the applicant should perform its own inspection and test necessary to demonstrate compliance, prior to presenting the repaired aeronautical product to the AED for testing or evaluation.

- (j) Compatibility Assessment should be established during design process, and it is the responsibility of the operator/installer to establish.

## 4.2 APPLICATION FOR APPROVAL

The repair approval process whether requiring data and installation approval or if using already approved data (approved STC or approved repair scheme from the OEM remains the same.

Any person or organization may apply for approval of a repair design to an aircraft. This could include the aircraft owner or air operator of an aircraft, a type certificate holder, a maintenance, repair and overhaul facility, a specialized engineering organization, an engineering consultant, or, where allowed by a State, their representatives. The approval will be granted to the organization or individual that has responsibility for the repair design.

## 4.3 SUBMISSION OF APPLICATION FOR APPROVAL

An applicant must submit a properly completed application form (Form Number: CA 43-18 accessible on [www.caa.co.za](http://www.caa.co.za)) accompanied by proof of payment to [eng@caa.co.za](mailto: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.**

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 repair approval application.

In case of a repair 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 or approved repair scheme) 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

## 4.4 ACKNOWLEDGEMENT OF RECEIPT OF THE APPLICATION FOR APPROVAL

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.

**Note:** For efficient processing of repair 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. **Please refer 4.5 and 4.6 below.**

## 4.5 SUBMISSION OF SUPPORTING DATA REQUIRED FOR MINOR & MAJOR REPAIR OUTSIDE SRM

- (a) Repair Classification Checklist
- (b) Damage Assessment Report
- (c) Certification Plan
- (d) Certification Compliance Checklist
- (e) Approved Repair Scheme
- (f) Instructions for Continued Airworthiness (ICA)
- (g) Master Data List (MDL)
- (h) Material Certificates (i.e. C of C and/or ARC)
- (i) Noise Evaluation Data if Applicable
- (j) Mass and Balance Report of Aircraft if applicable
- (k) Test Plans/Reports if applicable
- (l) Compatibility Assessment Report

- (m) CRMA / Logbook entry
- (n) CA 43-04 Signed by Quality Assurance Head

#### 4.6 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.

#### 4.7 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.

#### 4.8 ISSUANCE OF REPAIR APPROVAL

Following a successful demonstration of compliance with applicable airworthiness standards by the applicant, the CAA will conclude the repair approval process and issue a Repair Approval Certificate.

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

If limitations are applicable to the repair, the SACAA will stipulate such limitations on the Repair Approval Letter.

### 5. CANCELLATION OR DECLINATION

The CAA will 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 repairs or installations on aircraft prior to written approval by the Director, aircraft owners and maintenance organizations shall be cognizant that unapproved repairs invalidate the certificate of airworthiness (C of A) of the aircraft concerned.*

### 6. POST-APPROVAL ACTIVITIES

#### 6.1 Instructions for Continued Airworthiness (ICA)

- 6.1.1 ICA is not required for a minor repair if it is deemed to have no significant impact on the aircraft's airworthiness or safety.
- 6.1.2 For repairs with an approved repair data, when ICA is already provided for by the TC holder, ICA is important for ensuring the ongoing safe operation of the repaired aircraft.


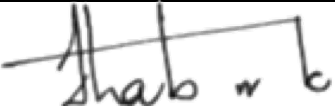

**NB:** *AID is mostly involved where there is a major change that has an impact on maintenance limitations.*

#### 6.2 Retention of Repair Design Data

The activities following approval of a repair design involve accomplishing the repair on the aeronautical product, documenting the repair accomplished, and issuing the maintenance release of the affected aeronautical product. Where necessary, the relevant manuals should also be updated.

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

7. DOCUMENT AUTHORISATION:

<b>DEVELOPED BY:</b>		
	<b>EPHRAIM MAROLE</b>	<b>16 MARCH 2023</b>
<b>SIGNATURE OF ACTING M: AED</b>	<b>NAME IN BLOCK LETTERS</b>	<b>DATE</b>
<b>REVIEWED &amp; VALIDATED BY:</b>		
	<b>LOBANG THABANTSO</b>	<b>16 MARCH 2023</b>
<b>SIGNATURE OF ACTING SM: AW</b>	<b>NAME IN BLOCK LETTERS</b>	<b>DATE</b>
<b>APPROVED BY:</b>		
	<b>SIMON SEGWABE</b>	<b>16 MARCH 2023</b>
<b>SIGNATURE OF E: ASO</b>	<b>NAME IN BLOCK LETTERS</b>	<b>DATE</b>

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