CIVIL AVIATION AUTHORITY OF BOTSWANA

AIRWORTHINESS ADVISORY CIRCULAR

CAAB Document AAC-004 Rev. 02

ALTERATIONS (MODIFICATIONS) AND REPAIRS

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1. PURPOSE

This Airworthiness Advisory Circular (AAC) provides information and guidance to CAAB inspectors and industry, and serves as acceptable means of compliance with Regulation 40 of the Civil Aviation (Airworthiness) Regulations, 2012 which requires all alterations and major repairs to aircraft to be authorized by the Authority before they are carried out.

2. STATUS OF THIS ADVISORY CIRCULAR

This Airworthiness Advisory Circular (AAC-004) Revision 02 supersedes all previous revisions of AAC-004 and Aeronautical Engineering Notice (AEN) No. 05.

3. EFFECTIVE DATE

This AAC revision becomes effective immediately.

4. APPLICABILITY

This AAC is applicable to air operators, maintenance organizations, and other entities seeking authorization to perform an alteration (modification) or a major repair on any type and class of aircraft for which a Type Certificate or equivalent document has been issued.

5. RELATED REGULATIONS

Copies may be obtained from the Government Printer.

- Civil Aviation (Airworthiness) Regulations, 2012
- Civil Aviation (Approved Maintenance Organizations) Regulations, 2012

6. RELATED PUBLICATIONS

Copies may be obtained from Document Sales Unit, ICAO, 999 University Street, Montreal, Quebec. Canada H3C 5H7.

- ICAO Annex 6 Part 1 – Operation of Aircraft
- ICAO Annex 8– Airworthiness of Aircraft
- ICAO Doc 9760 – Airworthiness Manual
- ICAO Doc 9501, Volume I – Procedures for the Noise Certification of Aircraft
- ICAO Doc 9501, Volume II – Procedures for the Emissions Certification of Aircraft Engines

7. DEFINITIONS AND ACRONYMS

7.1 The following definitions are used in this circular:

Authority means the CAAB, unless otherwise specified.

Alteration. The alteration (modification) of an aircraft or aeronautical product in accordance with an approved standard. An alteration (modification) to an aeronautical product means a change to the type design which is not a repair. *Guidance for determining whether a particular alteration is major or minor may be found in the Fifth Schedule of the Civil Aviation (Airworthiness) Regulations, 2012.*

Note: *For the purpose of this Advisory Circular and the Civil Aviation Regulations, the words "Alteration" and "Modification" are synonymous.*

Major Alteration means a type design change not listed in the aircraft, aircraft engine or propeller specifications that has an appreciable effect on the mass, balance, structural strength, reliability, operational characteristics, noise, fuel venting, exhaust emission, or other characteristics affecting the airworthiness of the product, and will be embodied in the product according to standard practices.

Advisory Circulars (ACs) are intended to provide advice and guidance to illustrate an acceptable 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. Where a regulation contains the words "prescribed by the Authority," the AC may be considered to prescribe a viable method of compliance, but status of that "prescription" is always "guidance" (never regulation).

Minor Alteration. An alteration that has an appreciable, other than negligible, effect on the airworthiness of an aeronautical product.

> ***Note**: The approval of the design of an alteration to an aircraft is signified, in some States, by the issuance of a Supplemental Type Certificate (STC) or amended Type Certificate.*

Repair.

(i) The restoration of an aeronautical product to an airworthy condition as defined by the appropriate airworthiness requirements. (ICAO Annex 8);

(ii) 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 aircraft type, after it has been damaged or subjected to wear. (ICAO Annex 6 definition).

Major Repair. A major repair is usually considered a repair that is not covered by the Structural Repair Manual (SRM) or acceptable standard techniques such as FAR 43, or a repair classified as such in the Fifth Schedule of the Civil Aviation (Airworthiness) Regulations, 2012.

Minor Repair. Any repair that does not fall under the major repair category, meaning the repair has a negligible effect on the airworthiness of the affected product. The accomplishment of minor repairs normally involves use of standard or generally accepted practices such as FAA AC 43-13.

State of Design means the State which has jurisdiction over the organization responsible for the type design.

7.2 The following acronyms are used in this circular

ACAS Airborne Collision Avoidance System

AD Airworthiness Directive

CAAB Civil Aviation Authority of Botswana

CASA Civil Aviation Safety Agency (Australia)

DOA Design Organization Approval

EASA European Aviation Safety Agency

FAA Federal Aviation Administration (United States of America)

ICA Instructions for Continued Airworthiness

ICAO International Civil Aviation Organization

MRC Maintenance Release Certificate

SB Service Bulletin

SRM Structural Repair Manual

STC Supplemental Type Certificate

TCCA Transport Canada Civil Aviation

8. BACKGROUND

Alterations (also called “modifications”) and repairs may be performed to aircraft for a variety of reasons, including rule changes, mandatory actions, product improvements or incorporation of customer options, or sustained damage. A State of Registry has an obligation under the Convention on International Civil Aviation to approve alterations and repair designs, as a way of ensuring that the aircraft will continue to comply with the design aspects of the airworthiness standards used for the type certification of that aircraft. An unapproved alteration or repair design renders a Certificate of Airworthiness invalid.

Currently, there is no design approval system for alterations and repairs in Botswana. For that reason, the CAAB only authorizes, for embodiment on Botswana registered aircraft, alterations or major repairs whose designs have been approved by the State of Design or other authorities acceptable to the CAAB. The CAAB should be furnished with substantiating data and evidence showing that alterations and repairs comply with Botswana airworthiness requirements, for the purpose of maintaining validity of a Certificate of Airworthiness. This could be in the form of Airworthiness Directives (AD), Service Bulletins (SB), Supplemental Type Certificates (STC), approved repair schemes, and/or other relevant engineering data.

9. POLICY

9.1 Regulation 40 of the Civil Aviation (Airworthiness) Regulations, 2012 prohibits any person from carrying out alterations or major repairs to Botswana registered aircraft without CAAB authorization.

9.2 All alterations (modifications) and major repairs, including those sanctioned by ADs, SBs, STCs, or approved repair schemes, require CAAB authorization prior to commencement of the work.

9.3 The CAAB can only authorize an alteration or major repair whose design has been approved for the aircraft type in question by:

(a) State of Design (or type certification);
(b) Holder of a Design Organization Approval issued by the State of Design; or,
(c) Recognized Authorities (e.g. FAA, CASA, EASA, TCCA).

9.4 Repairs performed within the limits of the SRM do not need CAAB authorization, provided they are performed by an appropriately licensed person.

9.5 The application for authorization may be made to the Authority in accordance with paragraph 12 of this advisory circular, and should be accompanied by, among others, engineering data approved by the State of Design.

9.6 An applicant seeking foreign approval of its alteration or repair design should coordinate the request with the CAAB during consultation with foreign civil aviation authorities to clarify potential differences in the alteration or repair category, and consequently their approval requirements.

10. ALTERATIONS (MODIFICATIONS)

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

10.2 All alterations to Botswana registered aircraft should be appropriate for the aircraft (Variant and Serial Number), and be compatible with other alterations embodied on the aircraft.

11. REPAIRS

11.1 An aeronautical product (aircraft, engine, propeller, component, etc.) 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 and, is regarded primarily as a maintenance function. An unapproved repair design could render a Certificate of Airworthiness invalid.

11.2 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 instructions for continued airworthiness (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) contain several State of Design approved repair schemes for typical damages or structural failures that can be readily applied by an operator, without the need for obtaining prior approval of the CAAB.

11.3 However, where the repair action specifically requires designing a repair scheme (e.g. when a repair scheme needed is not included in the SRM), the operator may consult the aircraft/component manufacturer or other organization holding a Design Organization Approval from the State of Design to be assisted with a repair scheme, and apply for CAAB authorization prior to commencing the repair work.

12. PROCESS AND APPLICATION: APPLYING FOR CAAB AUTHORIZATION

12.1 An application for authorization should be made in CAAB Form AIR 129 and submitted to the Authority, together with the required fee.

12.2 The completed form should be accompanied by documentation and/or substantiating data of the alteration or repair scheme, including, where applicable:

(a) STCs, SBs, ADs, or equivalent documents;

(b) Verification by the applicant that the aircraft (or aeronautical product) has been inspected, and its records reviewed to ensure compatibility of the alteration or major repair with those previously authorized by the Authority; and,

(c) Permission from the STC holder authorizing the applicant to use the STC for the aircraft in question;

> ***NOTE**: STC holder permission must identify the authorized entity, and the concerned aircraft by Make and Model, Serial Number, and Nationality & Registration Marks.*

(d) Detailed description of the proposed modification or major repair;

(e) A master drawing list detailing the individual drawings and specifications which define the modification or major repair;

(f) Installation Instructions;

(g) Approved Maintenance Program amendment, if applicable;

(h) A record of the change in mass and moment arm;

(i) A record of the change in electrical load when the modification or repair is installed in the aircraft;

(j) Supplements to:

(1) The approved flight manual
(2) Maintenance instructions
(3) Instructions for continuing airworthiness
(4) Repair instructions
(5) Wiring diagrams
(6) Illustrated Parts Catalogue

(k) Functional test procedures; to ensure that the alteration is correctly embodied and that the installation functions as intended.

(l) Flight test requirements: Performance and handling test requirements/flight test of radios, if necessary;

(m) Evidence of compliance with noise and emissions levels, where applicable.

(n) Any other factors affecting safety or airworthiness.

12.3 The application package will be evaluated by the CAAB for completeness and acceptance. Incomplete applications will not be processed further but will be returned to the applicant. Detailed evaluation of the application will continue only when the submission has been found acceptable by the Authority.

12.4 When the application has been thoroughly evaluated and found to meet the applicable regulations and requirements, the CAAB will grant authorization to proceed with the alteration or major repair. The Authority will indicate authorization by issuing a letter (**CAAB Form AIR 905**) specifying the authorization number.

12.5 In the event the CAAB Inspector requires to inspect the alteration or repair work before the aircraft is released to service, the applicant will be informed and will be expected to facilitate the inspection.

12.6 Within 48 hours of completing the alteration/repair work, the applicant must submit a copy of the completed work pack to the CAAB.

13. ENVIRONMENTAL ASPECTS OF ALTERATIONS AND REPAIRS

13.1 Where a change is made to an aircraft or aircraft engine, the effect of the change on the product's environmental characteristics should be taken into account. Some of the changes, such as those listed in paragraphs 13.3.1 and 13.3.2 might have an appreciable effect on the product's environmental characteristics, and might therefore be classified as a major change. An appreciable effect is considered to be one which exceeds the ICAO criteria for a no-acoustical change or a no-emissions change. For the definition of a no-acoustical change refer to the section of the ICAO Environmental Technical Manual, Volume I (ICAO Doc 9501, Volume I – *Procedures for the Noise Certification of Aircraft*) concerning changes to aircraft type designs involving no-acoustical changes (see also the definitions of a 'derived version' in ICAO Annex 16, Volume I). For the definition of a no-emissions change refer to the section of the ICAO Environmental Technical Manual, Volume II (ICAO Doc 9501, Volume II – *Procedures for the Emissions Certification of Aircraft Engines*) concerning no-emissions changes.

13.2 When assessing alterations and repair applications for authorization in accordance with Regulation 40 of the Botswana Civil Aviation (Airworthiness) Regulations, 2012 the CAAB shall consider the effect the alteration or major repair on environmental aspects in line with Part V (Aircraft Noise Certification) of the Airworthiness Regulations. The CAAB will review and confirm that the environmental aspects have been considered and addressed in the alteration or major repair. They may also need to discuss compliance with the Authority of the State of Design to confirm they have been addressed.

13.3 Examples of changes which may have an appreciable effect on a product's environmental characteristics are listed in **Appendix 3** of the advisory circular.

14. RETENTION OF ALTERATION AND REPAIR DATA AND RECORDS

14.1 Maintenance organizations are required by Regulation 31 of the Civil Aviation (Approved Maintenance Organizations) Regulations, 2012 to record details of all work carried out, and to provide the operator with a copy of each Maintenance Release Certificate (MRC), together with a copy of any specific maintenance data used for repairs and alterations/modifications carried out.

14.2 Likewise, operators are required to retain records of all alterations and repairs embodied on their aircraft, together with records of design approval and return-to-service approval. Retention of the records is required so that the alteration/modification and repair status of the aircraft may be readily established at any time. This may be necessary if an airworthiness deficiency is detected with an alteration/modification or repair requiring corrective measures or inspections and to ensure compatibility when making additional design changes to the aircraft.

14.3 Other regulatory requirements relating to alterations and repairs should also be complied with.

CIVIL AVIATION AUTHORITY OF BOTSWANA
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DIRECTOR
FLIGHT SAFETY

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For/**Civil Aviation Authority of Botswana**

Date: 17/12/2013

End of Advisory Circular

APPENDIX 1

ALTERATIONS (MODIFICATIONS) AND REPAIRS FORM
(CAAB FORM AIR 129)

INSTRUCTIONS

1. Use this form CAAB Form AIR 129 to apply for CAAB authorization to perform an alteration (modification) or major repair on an aircraft or aeronautical product in accordance with Regulation 40 of the Civil Aviation (Airworthiness) Regulations, 2012. The form should be submitted in accordance with Airworthiness Advisory Circular (AAC)-004, as amended.
2. Print or type all entries. Sections 1 through 9 should be completed by applicant. [*See AAC-004 Appendix 2 for guidance on completing this form*]

1. This application is for authorization of:	☐ Alteration (Modification)	☐ Major Repair

2. AIRCRAFT	Make	Model
	Serial Number	Nationality and Registration Mark
3. OWNER	Name [*As shown on certificate of registration*]	Address [*As shown on certificate of registration*]

4. UNIT IDENTIFICATION				**5. TYPE**	
Unit	Make	Model	Serial Number	Repair	Alteration
Airframe	---------- (*As described in item 1 above*) ----------			☐	☐
Powerplant				☐	☐
Propeller				☐	☐
Appliance	Type			☐	☐
	Manufacture				

6. BRIEF DESCRIPTION OF ALTERATION (MODIFICATION) OR MAJOR REPAIR

7. APPROVAL/REFERENCE NUMBER [*State reference number of AD, SB, STC or other approved document and approving authority*]

8. APPLICANT'S DETAILS	A. Full Name and Address	B. Signature	C. Date of Application

9. DETAILS OF ORGANIZATION PERFORMING WORK

A. Organization Name & Address	B. Kind of License/Organization	C. Certificate/License Number
	☐ Licensed (AME) ☐ A ☐ P or	[*For an AMO include the appropriate ratings issued for the major repair or alteration*]
	☐ Aviation Repair Specialist	
	☐ Approved Maintenance	
	☐ Manufacturer	

10.FOR CAAB USE ONLY

A. Authorization Number: **B / MA /** _____ **B.** Date of Authorization _____

C. Airworthiness Inspector Signature **D.** CAAB Office and Stamp

APPENDIX 2

Instructions for Completing an Application for Alteration or Major Repair Authorization

Item 1 – Applicant should complete the reason for submitting the form.

Item 2 – Aircraft. Information to complete the "make," "model," and "serial number" blocks will be found on the aircraft manufacturer's identification plate. The "Nationality and Registration Mark" is the same as shown on the aircraft's Certificate of Registration.

Item 3 – Owner. Enter the aircraft owner's complete name and address as shown on the Certificate of Aircraft Registration.

Item 4 – Unit identification. The information blocks under item 3 are used to identify the airframe, powerplant, propeller, or appliance repaired or altered. It is only necessary to complete the blocks for the unit repaired or altered.

Item 5 – Type. Enter a checkmark in the appropriate column to indicate if the unit was repaired or altered.

Item 6 – Brief Description of Alteration (Modification) or Major Repair. Enter a brief description or summary of the alteration/repair work to be performed. (*Example 1: Replacement of Collins Autopilot/weather radar TR-12E with King Autopilot. Example 2: Repair of 10 inch wide dent at (specify location on aircraft) following a bird strike*).

Item 7– Approval/Reference Number. State the reference/approval number(s) of the STC, SB, or other document showing approval of the alteration or major repair scheme, together with the approving authority (e.g. FAA, EASA, etc.).

Item 8 – Applicant's Details. Enter the applicant's complete name and address. The applicant should also sign the document and insert the current date. An applicant who is not the registered owner of the aircraft should provide a letter of authority from the aircraft owner.

Item 9 – Details of Organization/Person Performing Work. Enter details of the specialist that will perform the proposed modification or repair work. For foreign based organizations, evidence of CAAB approval should be attached to the application.

Item 10 – For CAAB use only. Authorization will be indicated Item 10 when the CAAB determines that the proposed alteration or major repair has been approved by the State responsible for the type design, and the application meets other requirements of the Civil Aviation Regulations.

Note: *CAAB Form AIR 129 is not authorized for use on other than Botswana-registered aircraft. If a foreign civil aviation authority requests the form, as a record of work performed, it may be provided.*

APPENDIX 3

Changes which may have an Appreciable Effect on Environmental Properties

1. **Examples**

The following gives examples of changes which might have an appreciable effect on a product's environmental characteristics (i.e. the effect might be greater than the no-acoustic change and no-emissions change criteria) and might therefore lead to a major change classification. The examples are not exhaustive and will not, in every case, result in an appreciable change to the product's environmental characteristics, and therefore, will not per-se and in every case result in a major change classification.

1.1 **NOISE**

A change that introduces either an increase in the noise certification level(s); or a reduction in the noise certification level(s) for which the applicant wishes to take credit. Examples of noise-related changes that might lead to a major change classification are:

1.1.1 *For jet and heavy (maximum take-off mass greater than 8618 kg) propeller-driven aeroplanes*:

(a) A change that might affect the aircraft's take-off performance including:

- a change to the maximum take-off mass;
- a change to V_2 ('take-off safety speed'); or
- a change to the lift augmentation devices, including their configuration under normal take-off operating conditions.

(b) A change that might affect the aircraft's landing performance including:

- a change to the maximum landing mass;
- a change to V_{REF} (reference landing speed); or
- a change to the lift augmentation devices, including their deployment under normal landing operating conditions.

(c) A change to the Centre of Gravity (CG) limits;

(d) A change that increases the aircraft's drag;

(e) A change that alters the external profile of the aircraft, including the installation or change of shape or size of any item on the external surface of the aircraft that might protrude into the airflow such as winglets and vortex generators; generally the installation of small antennas does not represent an acoustical change;

(f) A change of engine or, if fitted, propeller type;

(g) A change in engine thrust rating;

(h) A change to the engine rotating parts or stators, such as geometry, blade profile or blade number;

(i) A change to the aerodynamic flow lines through the engine;

(j) A change that affects the engine thermodynamic cycle, including a change to the engine's bypass ratio;

(k) A change to the engine nacelle, including a change to the acoustic liners;

(l) A change to the engine exhaust;

(m) A change to the engine bleed valves, including bleed valve scheduling;

(n) A change in the operation of engine power off-takes (e.g. the operation of the Environmental Control System (ECS) during a normal take-off or approach);

(o) A change to the Auxiliary Power Unit (APU), including associated operating limitations (e.g. a change that allows the APU to be operated during a normal approach when previously it was not allowed);

(p) A change to the propeller pitch and/or propeller speed during a normal take-off or approach;

(q) A change that causes a change to the angle at which air flows into the propeller.

1.1.2 *For light (maximum take-off mass 8618 kg or less) propeller-driven aeroplanes*:

(a) A change that might affect the aircraft's take-off performance including:

- a change to the maximum take-off mass;
- a change to the take-off distance;
- a change to the rate of climb; or
- a change to Vy (best rate of climb speed).

(b) A change that increases the aircraft's drag (e.g. the installation of external cargo pods, external fuel tanks, larger tyres to a fixed undercarriage, floats etc.);

(c) A change of engine or propeller type;

(d) A change in take-off power including a change in engine speed (tachometer 'red line') or, for piston engines, a change to the manifold pressure limitations;

(e) A change to the highest power in the normal operating range ('top of green arc');

(f) In the case of an aircraft where take-off power/engine speed is time limited, a change in the period over which take-off power/engine speed may be applied;

(g) A change to the engine inlet or exhaust including, if fitted, the inlet or exhaust muffler;

(h) A change in propeller diameter, tip shape, blade thickness or the number of blades;

(i) The installation of a variable or adjustable pitch propeller in place of a fixed pitch propeller and vice versa;

(j) A change that causes a change to the angle at which air flows into the propeller.

1.1.3 *For helicopters*:

(a) A change that might affect the take-off and/or landing performance, including a change in take-off mass and V_Y (best rate of climb speed);

(b) A change to V_{NE} (never-exceed airspeed) or to V_H (airspeed in level flight obtained using the torque corresponding to minimum engine installed, maximum continuous power available for sea level pressure, 25°C ambient conditions at the relevant maximum certificated mass);

(c) A change to the maximum take-off engine power or maximum continuous power;

(d) A change to the gearbox torque limits;

(e) A change of engine type;

(f) A change to the engine intake or exhaust;

(g) A change to the maximum normal operating rpm of the main or tail rotors;

(h) A change to the main or tail rotors, including a change in diameter, blade thickness or blade tip profile.

***NOTE**: The effect on the helicopter's noise characteristics of either carrying external loads or the installation of external equipment need not be considered*

1.2 EMISSIONS

A change that introduces an increase or decrease in the emissions certification levels. Examples of smoke and gaseous engine emission-related changes that might lead to a major change classification are:

(a) A change in engine thrust rating;

(b) A change to the aerodynamic flow lines through the engine;

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