CIVIL AVIATION AUTHORITY
OF VIETNAM

ADVISORY CIRCULAR
AC-04-007

GUIDANCE FOR AIRCRAFT MAJOR REPAIR & MODIFICATION

SECTION 1 POLICY & GENERAL INFORMATION

1.1 PURPOSE

A. This advisory circular provides guidance whereby field approval or disapproval of major modifications and repairs can be handled in an efficient and effective manner with minimum difficulty for both the CAAV-FSSD and the operator.

B. One important and specific purpose is to provide guidance whereby the CAAV can reasonably distinguish between—

1) Those major modifications and repairs which will be referred to the Aircraft Engineering Directorate (AED) of the State of Design/Manufacture for approval or disapproval; and

2) Those major modifications, which the CAAV may approve or disapprove. It also provides guidance on the types of preventive maintenance aspects requiring specific consideration by the CAAV-FSSD.

1.2 STATUS OF THIS AC

This AC is an original issuance.

1.3 BACKGROUND

The international standards and guidance regarding major repair or major modification very specific and detailed. This AC ensures that this guidance is applied properly in Viet Nam.

1.4 APPLICABILITY

The guidance provided in this advisory circular is applicable to Viet Nam-registered aircraft and the personnel and organizations that are authorized by the CAAV to perform repair and modication of those aircraft.

1.5 RELATED REGULATIONS

This advisory circular provides guidance regarding airworthiness reliability that is applicable to compliance with—

- Part 4, Continuing Airworthiness.
- Part 5, Approved Airworthiness Organizations

- Advisory Circulars are intended to priovide advice and guidance to illustrate a 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 an AC is referred to in a 'Note' below the regulation, the AC remains as guidance material,
- ACs should always be read in conjunction with the referenced regulations.

1.6 RELATED PUBLICATIONS

The following publications also contain pertinent technical background regarding reliability programs—

1) Civil Aviation Administration of Viet Nam (CAAV)

   ♦ Airworthiness Inspector Manual

2) International Civil Aviation Organization (ICAO)

   ♦ Document 9760, Airworthiness Manual

The CAAV Airworthiness Division can provide access to these reference documents.

1.7 DEFINITIONS & ACRONYMS

1.7.1 DEFINITIONS

The following definitions are used in this document—

1) **Maintenance release.** A document which contains a certification confirming that the maintenance work to which it relates has been completed in a satisfactory manner, either in accordance with the approved data and the procedures described in the maintenance organization's procedures manual or under an equivalent system acceptable to the Authority.

The person signing this release is indicating that all items that are required to be inspected have been inspected, the aircraft or component conforms to the applicable airworthiness standards and no condition exists which make the aircraft unsafe.

2) **Major modification**. In respect of an aeronautical product for which a Type Certificate has been issued, a change in the Type Design that has an appreciable effect, or other than a negligible effect, on the mass and balance limits, structural strength, powerplant operation, flight characteristics, reliability, operational characteristics, or other characteristics or qualities affecting the airworthiness or environmental characteristics of an aeronautical product.

3) **Major repair**. 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 othe qualitieis affecting airworthiness or environmental characteristics; or

   (b) That will be embodied in the product using non-standard practices

4) **Minor modification**. A modification other than a major modification.

5) **Minor repair.** A repair other than a major repair

6) **Modification**. A change to the type design which is not a repair.

7) **Repair**. The restoration of an aeronautical product to an airworthy condition as defined by the appropriate airworthiness requirements.

8) **State of Design**. The Contracting State which approved the original type certificate and any subsequent supplemental type certificates for an aircraft, or which approved the design of an aeronautical product or appliance.

9) **State of Manufacture**. The Contracting State, under whose authority an aircraft was assembled, approved for compliance with the type certificate and all extant supplemental type certificates, test flown and approved for operation. The state of manufacture may or may not also be the state of design.

10) **State of Registry**. The Contracting State on whose register the aircraft is entered.

1.7.2 ACRONYMS

The following acronyms are used in this document—

1) **AOC** – Air Operator Certificate
2) **AED** – Airworthiness Engineering Division
3) **AMO** – Approved Maintenance Organization
4) **MEL** – Minimum Equipment List
5) **PIC** – Pilot in command
6) **TSO** – Technical Standard Order

SECTION 2 MAJOR MODIFICATIONS

A. Major modifications consist of an modification that—

1) Might appreciably affect—
   (a) Structural strength;
   (b) Performance or flight characteristics;
   (c) Modification of systems;
   (d) Powerplant or propeller operation limitations;
   (e) Mass and balance (center of gravity) location.
2) Is not accomplished according to accepted practices or cannot be accomplished by elementary operations.

B. Typical major modifications include—

2.1 AIRFRAME MAJOR MODIFICATIONS

Modifications of the following parts/types, when not listed in the aircraft specifications, are generally classified as airframe major modifications:

1) Wings;
2) Empennage;
3) Fuselage;
4) Engine pylons;
5) Flight control system;
6) Landing gear;
7) Hull or floats;
8) Elements of an airframe including spars, ribs, fittings, shock absorbers, bracing, cowling, fairings and balance mass;
9) Rotor blades;
10) Changes to the empty mass or empty balance which result in an increase in the maximum certificated mass or center of gravity limits of the aircraft;
11) Changes to the basic design of the—
    (a) Fire Protection system

(b) Avionic flight control system

(c) Electrical power system

(d) Environmental control system

(e) Fuel system

(f) Pneumatic system

(g) Water and waste system

(h) Oxygen system

(i) Ice and rain protection system

(j) Auxiliary power unit;

(k) Changes to the wing or to fixed or movable control surfaces which affect flutter and vibration characteristics.

2.2 PROPULSION SYSTEM MAJOR MODIFICATIONS

The following modifications of a powerplant, when not listed in the engine specifications, are powerplant major modifications—

1) Conversion of an aircraft engine from one approved model to another, involving any changes in compression ratio, propeller reduction gear, impeller gear ratios, number of working stages, number of rotating airfoils, stators or the substitution of major engine parts which require extensive rework and testing of the engine;

2) Changes to the engine by replacing aircraft engine structural parts with parts not supplied by the original manufacturer or parts not specifically approved by the Certification Authority;

3) Installation of an accessory that is not approved for the engine;

4) Removal of accessories that are listed as required equipment on the aircraft or engine specification,

5) Installation of structural parts other than the type of parts approved for the installation; and

6) Conversions of any sort for the purpose of using fuel of a rating or grade other than that listed in the engine specifications.

2.3 PROPELLER MAJOR MODIFICATIONS

The following modifications of a propeller when not authorized in the propeller specifications are propeller major modifications—

1) Changes in blade design;

2) Changes in hub design;

3) Changes in the governor or control design;

4) Installation of a propeller governor or feathering system;

5) Installation of propeller de-icing system; and

6) Installation of parts not approved for the propeller

2.4 EQUIPMENT MAJOR MODIFICATIONS

A. Modifications of the basic design not made in accordance with Airworthiness Directives are equipment major modifications.

B. In addition, changes in the basic design of communication and navigation systems, flight management systems approved under type certification or approved specifications that have an effect on the performance of the equipment are also major modifications.

SECTION 3 MODIFICATIONS THAT REQUIRE ENGINEERING APPROVAL

A. Many modifications that are commonly called major modifications are in reality major design changes and require a Supplemental Type Certificate.

B. Major changes to the type design are those that might appreciably affect mass, balance, structural strength, reliability, operational characteristics, or other characteristics affecting the airworthiness of the product. modifications of this type require engineering approval and should be referred to the State of Design/Manufacture AED.

C. Typical major modifications in this category are listed below—

1) Increase in gross mass and/or changes in the center of gravity (cg) range;

2) Installation or relocation of equipment and systems or changes which may adversely affect structural integrity, flight or ground handling characteristics of the aircraft. For example, engines, engine pylons, auxiliary power units, propellers of a different make or model; pressurization direction of motion of systems; alternate static air or pressure systems; initial or prototype installation of an automatic flight control system which changes servo forces, servo rates or any flight control or performance characteristics; and the relocation or changes of throttle levers, flap controls and similar items;

3) Any change (modification) of movable control surfaces that may affect flight characteristics or performance or make any difference (plus or minus) in the mass distribution;

4) Change in control surface travel outside approved limits, control system mechanical advantage, location of control system component parts, or controls;

5) Changes in basic dimensions or external configuration of the aircraft, such as wing and empennage planform or incidence angles, canopy, cowlings, contour or radii or location of wing and tail fairings, engine pylons, etc.;

6) Changes to landing gear, such as internal parts of shock struts, length, geometry of members or brakes and brake systems and wheels;

7) Any change to engine pylons, cowling and/or baffling which may adversely affect the flow of cooling air and changes to manifolding;

8) Changes to primary structures that may adversely affect strength or flutter and vibration characteristics;

9) Changes to systems that may adversely affect aircraft airworthiness such as relocation of exterior fuel vents, use of hydraulic components, tube material and fittings not previously approved or use of new type fusible hydraulic plugs;

10) Changes to oil and fuel lines or systems which may adversely affect their operations, such as new type of hose and hose fittings, changes in fuel dump valves, new fuel cell sealants, new fuel or oil line materials and new fuel or oil system components;

11) Any change to the basic engine or propeller design controls or operating limitations and unapproved changes to engine adjustments and settings having an effect on power output;

12) Changes in a fixed fire extinguisher or detector system which may adversely affect the system effectiveness or reliability, such as relocation of discharge nozzle or detector units, use of new or different detector components in new circuit arrangements; deletion of detector units or discharge nozzles; change extinguishing agent or decrease in amount of extinguishing agent;

13) Changes which do not conform to the minimum standards established in a CAAV-FSSD approval under which a particular aircraft component or equipment is manufactured;

14) Modifications to approved type radio communications and navigational equipment which may adversely affect reliability or airworthiness, such as changes which deviate from the component operating limitations as prescribed by the manufacturer; extension of receiver frequency range above or below the manufacturer's extreme design limits; major changes to the basic design of the avionic systems; and changes which deviate from the design environmental performance;

15) Changes to aircraft structure or cabin interior of aircraft which may adversely affect evacuation of occupants in any manner; and

16) Changes in airplane flight manuals and/or manual information in the form of placards or markings.

D. Typical modifications that may require consultation with the AED of the State of Design/ Manufacture due to the nature of the change proposed by the operator are—

1) Substitution of materials, parts or processes on which insufficient information is available;

2) New plating applications;

3) New materials applications;

4) Ceramic coatings;

5) Use of synthetic resin glues;

6) New stripping or plating coatings;

7) New welding or brazing techniques;

8) Alternative means for complying with Airworthiness Directives or approved service bulletins;

9) Any other complex special processes which, if not properly performed could have an adverse effect on the integrity of the product; and

10) Any change to a required aircraft instrument system, flight management system or automatic flight control systems.

SECTION 4 MAJOR REPAIRS

A. Various types of repairs are classified as major. The CAAV will review this classification and advise industry maintenance personnel and aircraft owners and operators in this respect.

B. Major repairs are classified into two categories, those that—

1) Conform to data previously approved by a recognized civil aviation authority or the CAAV-FSSD; and

2) Require additional evaluation by the CAAV-FSSD.

C. Those in category B-2 must be investigated to the extent necessary to determine that they meet the requirements of the appropriate certification regulations.

D. Since action required of the CAAV regarding previously approved major repairs and those not previously approved differs, each classification should be dealt with separately.

E. Typical major repairs include—

4.1 AIRFRAME MAJOR REPAIRS

Repairs to the following parts of an airframe and repairs of the following types, involving the strengthening, reinforcing, splicing and manufacturing of primary structural members or their replacement, when replacement is by fabrication such as riveting, bonding or welding, are airframe major repairs—

1) Box beams;
2) Honeycomb panels;
3) Monocoque or semimonocoque wings or control surfaces;
4) Wing skins, stringers or chord members;
5) Spars;
6) Pressure bulkheads, doors, hatches and windows;
7) Spar flanges;
8) Members of truss-type beams;
9) Thin sheet webs of beams;
10) Keel and chine members of boat hulls or floats;
11) Corrugated sheet compression members that act as flange material of wings or tail surfaces;
12) Wing main ribs and compression members;
13) Engine pylons;
14) Engine mounts;
15) Fuselage longerons;
16) Members of the side truss, horizontal truss or bulkheads;
17) Main seat support braces and brackets;
18) Landing gear brace struts;
19) Axles;
20) Wheels;
21) Skis and ski pedestals;
22) Parts of the control system such as control columns, pedals, shafts, brackets or horns;
23) Repairs involving the substitution of material;
24) The repair of portions of skin sheets by making additional seams;
25) The splicing of skin sheets;
26) The repair of three or more adjacent wing or control surface ribs or the leading edge of wings and control surfaces between such adjacent ribs;
27) Repair of fabric covering involving an area greater than that required to repair two adjacent ribs;

28) Replacement of fabric on fabric covered parts such as wings, fuselages, stabilizers and control surfaces; and

29) Repairing of removable or integral fuel tanks and oil tanks.

4.2 POWERPLANT MAJOR REPAIRS

Repairs of the following parts of an engine and repairs of the following types are powerplant major repairs—

1) Removal, repair and replacement of—
   (a) Fan and shaft
   (b) Fan thrust bearing
   (c) Intermediate pressure and low pressure turbines
   (d) Intermediate or high pressure compressors
   (e) Cumbustor lever
2) Separation or disassembly of a crankcase or crankshaft of a reciprocating engine equipped with an integral supercharger;
3) Separation or disassembly of a crankcase or crankshaft of a reciprocating engine equipped with other than spur-type propeller reduction gearing;
4) Removal, repair or replacement of external gear box; and
5) Special repairs to structural engine parts by welding, plating, metallizing or other methods.

4.3 PROPELLER MAJOR REPAIRS

Repairs of the following types to a propeller are propeller major repairs—

1) Any repairs to or straightening of steel blades;
2) Repairing or machining of steel hubs;
3) Shortening of blades;
4) Repairs to wood or composition blades;
5) Repair of propeller governors;
6) Overhaul of controllable pitch propellers;
7) Repairs to deep dents, cuts, scars, nicks, etc., and straightening of aluminum blades; and
8) The repair or replacement of internal elements of blades.

4.4 EQUIPMENT MAJOR REPAIRS

Repairs of the following types to equipment are considered major repairs—

1) Repair and calibration of flight and navigation system instruments and equipment;
2) Complete disassembly of complex hydraulic and pneumatic power valves;
3) Overhaul of pressure type carburetors and pressure type fuel, oil and hydraulic pumps; and
4) Overhaul of fuel control systems.

4.5 PREVIOUSLY APPROVED MAJOR REPAIR

Approved repairs are those shown in approved maintenance manuals, typical repair manuals, manufacturer's approved repair data and other data approved by, or issued by the CAAV-FSSD or other Civil Aviation Organizations.

4.6 MAJOR REPAIR DATA APPROVAL (NOT PREVIOUSLY APPROVED)

A. Most repair data require approval by the CAAV, engineering and manufacturing or designated engineering representative when there is no conclusive evidence that drawings and the methods, techniques or materials used have been previously approved.

B. Data approval should be obtained for a major repair before the aircraft or component receiving such a repair can legally be released for return to service.

C. All action concerning approvals of major repair data should be expedited.

1) **CAAV-approved repairs.** On-the-spot approval of such data by the CAAV is desirable and should be granted when an Inspector is certain that the data presented meet the airworthiness requirements under which the aircraft was manufactured and is acceptable under the provisions of the Civil Air Regulations.

2) **Engineer-approved repairs.** Major repairs beyond the capabilities of the CAAV technical inspector to evaluate, such as those requiring stress analysis or possible incompatibility with other repairs or installations, should be referred to the State of Design/Manufacture AED for examination and approval.

The Remainder Of This Page Intentionally Left Blank

APPENDIX A
Sample Major Repair or Modification Record

The attached form (or a replacement form approved by the CAAV) shall be used as the official aircraft record for all major aircraft repair or modification. The appropriate form will be submitted to the CAAV after the major repair or modification.

1. Front Side of Form

MAJOR REPAIR OR MODIFICATION REPORTING FORM

INSTRUCTIONS
Print or type. Do not write in shaded areas, these are for CAAV use only. Submit original only to the Flight Safety Standards Department or CAAV Authorized Person. If additional space is required, use an attachment.

A. AIRCRAFT:

1. REGISTRATION MARK	2. AIRCRAFT MAKE/MODEL/SERIES	3. AIRCRAFT SERIAL NUMBER

B. REGISTERED OWNER:

1. NAME	4. MAILING ADDRESS
2. TELEPHONE	
3. FAX NUMBER	5. E-MAIL ADDRESS

C. UNIT IDENTIFICATION & TYPE OF MAINTENANCE ACTION

UNIT	MAKE	MODEL	SERIAL NUMBER	MAJOR REPAIR?	MAJOR MOD?
Airframe					
Powerplant					
Propeller					
Appliance	Type Manufacture				

D. CONFORMITY STATEMENT:

1. ORGANIZATION NAME/ADDRESS	2. TYPE OF LICENSE/ORGANIZATION	3. NUMBER &RATINGS
	a. ☐ AME License	
	b. ☐ AMO Certificate	
	c. ☐ Manufacturer	

E. CERTIFICATION: I certify that the repair and/or modification made to the unit(s) identified above and described on the reverse or attachments hereto have been made in accordance with the requirements of VAR Part 4 and that the information furnished herein is true and correct to the best of my knowledge.

Date	Signature of Authorized Individual

E. MAJOR REPAIR OR MODIFICATION APPROVAL BASIS:

1 ☐ APPROVAL BY EXAMINATION OF DATA ONLY – 1 AIRCRAFT ONLY The data identified herein complies with the applicable airworthiness requirements and is approved for the above described aircraft, subject to conformity inspection by a person authorized in VAR Part 4.	3 ☐ APPROVAL BY EXAMINATION OF THE DATA ONLY – DUPLICATION ON IDENTICAL AIRCRAFT. The modification identified herein complies with the applicable airworthiness requirements and is approved for duplication on identical aircraft make, model, and altered configuration by the original modifier.
2 ☐ APPROVAL BY PHYSICAL INSPECTION, DEMONSTRATION, TESTING, ETC., OF THE DATA AND AIRCRAFT – 1 AIRCRAFT ONLY The modification (or repair) identified herein complies with the applicable airworthiness requirements and is approved for the above described aircraft, subject to conformity inspection by a person authorized in VAR Part 4.	4 ☐ OTHER BASIS *(Provide details on reverse)*

F. APPROVAL FOR RETURN TO SERVICE: Pursuant to the authority given persons specified below, the unit(s) identified in item 4 was inspected in the manner prescribed by the Director of the Civil Aviation Authority and is

1. ☐ APPROVED 2. ☐ REJECTED

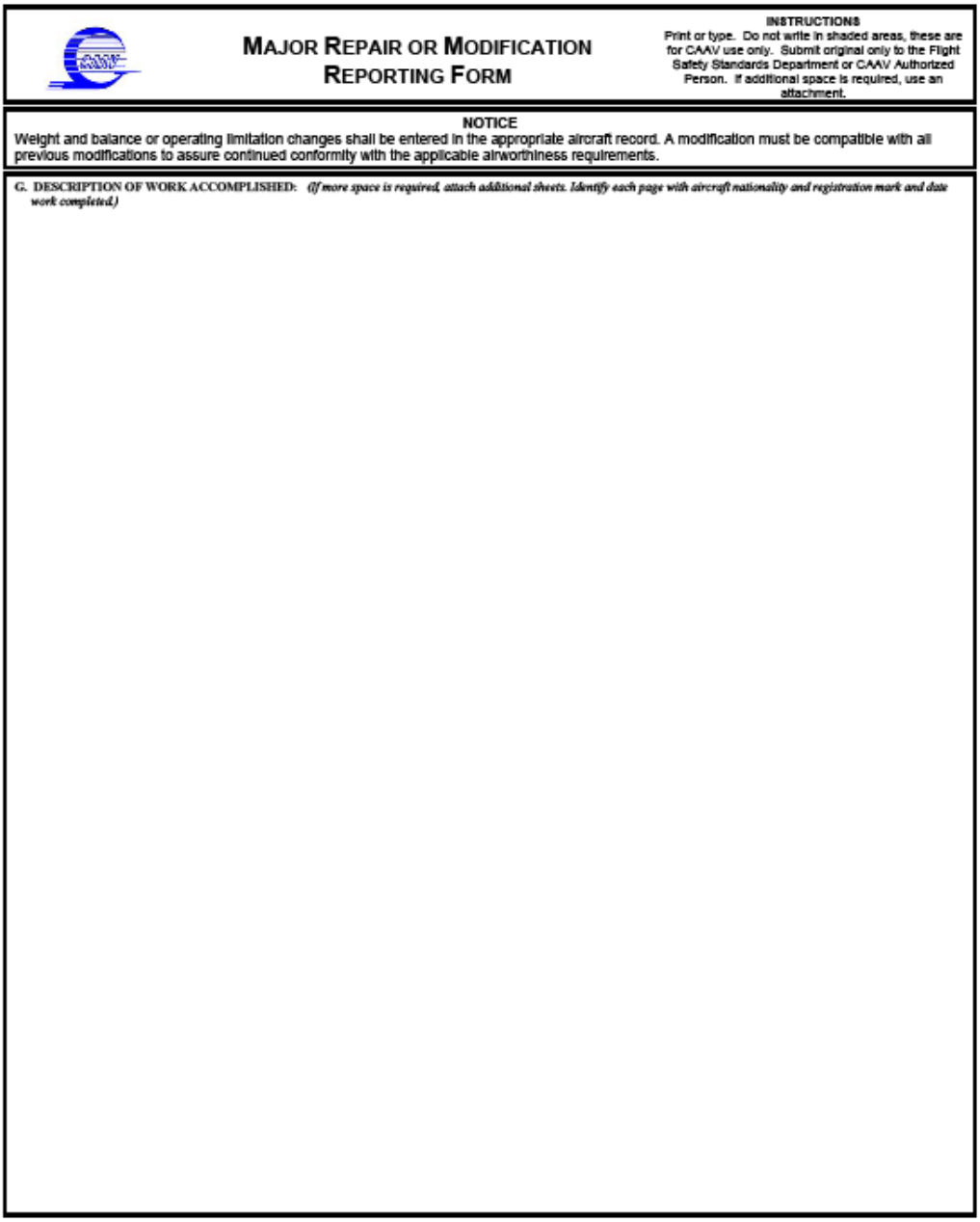
3 ☐ CAAV-FSSD INSPECTOR	4 ☐ APPROVED MAINTENANCE ORGANIZATION *(with appropriate ratings)*	5 ☐ DESIGNATED AIRWORTHINESS REPRESENTATIVE	6 ☐ DESIGNATED ENGINEERING REPRESENTIVE)	7 ☐ OTHER (specify)

8. DATE	9. CERTIFICATE/DESIGNATION NUMBER	10. SIGNATURE OF AUTHORIZED INDIVIDUAL

CAAV Form 523: Major Repair/Modification [0]2009 Page 1 of 2

2. Reverse Side of Form:

Use this side of the form to provide a complete description and any graphic presentation—



MAJOR REPAIR OR MODIFICATION REPORTING FORM

INSTRUCTIONS
Print or type. Do not write in shaded areas, these are for CAAV use only. Submit original only to the Flight Safety Standards Department or CAAV Authorized Person. If additional space is required, use an attachment.

NOTICE
Weight and balance or operating limitation changes shall be entered in the appropriate aircraft record. A modification must be compatible with all previous modifications to assure continued conformity with the applicable airworthiness requirements.

G. DESCRIPTION OF WORK ACCOMPLISHED: *(If more space is required, attach additional sheets. Identify each page with aircraft nationality and registration mark and date work completed.)*

CAAV Form 523: Major Repair/Modification [0]2009 Page 2 of 2

End of Advisory Circular

This Page Intentionally Left Blank