

CERTIFICATION ASPECTS OF CIVIL AIRCRAFT

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1. Introduction

Pursuant to the Convention on International Civil Aviation, in the interest of safety, an aircraft must be designed, constructed and operated in compliance with the appropriate airworthiness requirements of the State of Registry of the aircraft. Consequently, the aircraft is issued with a Certificate of Airworthiness declaring that the aircraft is fit to fly. The airworthiness requirements under which such a certificate is issued or rendered valid are equal to or above the minimum standards stipulated by the International Civil Aviation Organisation (ICAO), contained in Annex 8 for application by the National Airworthiness Authorities, the first edition of which was adopted by the Council on 1 March 1949. Each State is free to develop its own comprehensive and detailed code of airworthiness or to select, adopt or accept a comprehensive and detailed code established by another Contracting State. The Convention on International Civil Aviation provides that every aircraft of a Contracting State, engaged in international navigation, shall carry a Certificate of Registration and a Certificate of Airworthiness. It also provides that the Certificate of Airworthiness shall be issued or rendered valid by the State in which the aircraft is registered. Further, the State of Registry has the responsibility of ensuring that every aircraft on its register is maintained in an airworthy condition throughout its service life.

2. State responsibilities and regulatory system

In order to discharge its overall responsibilities under the Convention on International Civil Aviation, the States of Registry needs to enact basic legislation which will provide for the development and promulgation of civil air regulations and practices, including airworthiness regulations, consistent with its acceptance of the Annexes of ICAO. The essential elements to be covered by the Civil Aviation Authority (CAA) are: (a) aircraft type certification, (b) registration of aircraft, (c) issuance of Certificates of Airworthiness, (d) continuing airworthiness, (e) approval of aircraft maintenance

organizations, (f) certification of operators and (g) licensing of personnel.

Comprehensive airworthiness requirements are published in a number of national and multinational codes such as the Union of Soviet Socialist Republics Civil Airworthiness Requirements (AP), the United States Federal Aviation Regulations (FAR) and the Joint Airworthiness Requirements (JAR) or the current Certification Specifications (CS) of the European Aviation Safety Agency (EASA). The widely used airworthiness standards, as applicable to different categories of aircraft, are explained in paragraph 4.

The Director General of Civil Aviation (DGCA) is the Civil Aviation Authority or the State of Registry in India. There are no airworthiness codes published by the DGCA covering design of aircraft, engine and propeller; whereas the applicable airworthiness requirements as prescribed in CS-VLA, CS-VLR, CS-23/FAR-23, CS-25/FAR-25, CS-27/FAR-27, CS-29/FAR-29, CS-E/FAR-33 and CS-P/FAR-35 of European Union and/or United States are acceptable to the DGCA.

3. Procedures for type design

3.1 General

One of the primary responsibilities of the contracting States is to establish and carry out procedures for the type certification/approval of aircraft, engine, propellers, equipment, instruments, etc., designed or produced in the State as well as procedures for the validation of Type Certificates/Approvals issued by another State. Type Certificates are generally issued to cover aircraft and engines as whole entities and Type Approvals are issued to cover components.

3.2 Initial issue of type certificates and type approvals

3.2.1 Application

The Applicant for a Type Certificate (TC) must hold, or has applied for, a Design Organisation Approval issued by the CAA. The certification process begins when the organization responsible for the type design of a new aircraft or component design submits an application (accompanied by a general description and specifications of the aircraft or component, including a three-view drawing and available preliminary basic data) to the CAA. Aircraft and

components of new design, in general, must meet the airworthiness standards which were effective on the date of application and any special conditions imposed by the CAA, when the CAA finds that the airworthiness regulations do not contain adequate or appropriate safety standards because of novel or unusual design features. An application for type certification of a large aircraft (FAR-25/CS-25 & FAR-29/CS-29) is effective for 5 years and for any other type certification is effective for 3 years.

3.2.2 Issue

There are four major phases leading up to Type Certification.

- (1) The definition of and the agreement on the Type Certification Basis;
- (2) The definition of and the agreement on the proposed Means of Compliance;
- (3) The demonstration of compliance and the acceptance of the demonstration; and
- (4) The Final Phase (Final Report by the Certification Team, recommendation by the Certification Director for issuance of TC).

To obtain Type Certificate, an aircraft (e.g., transport category aircraft),

- shall meet the airworthiness standards viz. FAR-25 or CS-25; and
- the aircraft engine and propeller (if installed) shall meet the airworthiness standards viz. FAR-33/ CS-E and FAR-35/ CS-P.

Further, the following requirements shall be met to put the aircraft into operation,

- the noise and emission requirements as in FAR-36/CS-36 and FAR-34/CS-34;
- the operating requirements as in FAR-121 or JAR-OPS1.

The airworthiness standards that were complied with are identified clearly in the Type Certificate/Approval, and the associated Type Certificate Data Sheet, and become the regulatory basis for the certificate/approval. These standards normally continue to be applicable to individual aircraft/components built in accordance with the design.

3.2.3 Validity

A Type Certificate is effective until surrendered, suspended or revoked, or until a termination date is otherwise established by the CAA. Cases can be envisaged where the Type Certificate will pass (with its associated responsibilities) from the initial holder to another holder. Where this takes place within one State, the authority will need to be satisfied that all necessary background data, including the type design data and type certification data, have been transferred to the new holder and that it is competent to use the data as necessary for the continuing airworthiness of the aircraft type. If the new holder is in a different State, the two associated authorities will need to resolve any problems arising from different backgrounds and procedures for type certification in the two States. If the holder of the Type Certificate should cease to exist as an organization or fail to carry out its responsibilities satisfactorily, the authority that had issued the certificate would need to take appropriate action to ensure continuing airworthiness for the aircraft type. A Certificate of Airworthiness is invalid when the Type Certificate under which it is issued is suspended or revoked.

3.2.4 Flying Time for Function and Reliability Testing

All flying carried out with engines and associated systems not significantly different from the final Type Certificate standard may count towards 300 hours of airframe flight time. At least 150 of the 300 flying hours should be conducted on a dedicated production configured aircraft, regardless of whether the airframe/engine combination is subject to a new Type Certificate or is to be certificated as a change to an existing Type Certificate.

3.3 Supplemental type certificates

Supplemental Type Certificates (STC) should be issued for all major design changes to type-certificated products when the change is not so extensive as to require a new Type Certificate. They should not be issued to cover minor changes nor should they be issued to approve replacement parts unless the installation of such parts constitutes a major change to the type design. The methods for determining compliance with applicable requirements for issue of STC are usually the same as those used for basic type certification.

3.4 Design change requiring new type certificate/approval

When an aircraft or component is changed appreciably, it may require an application for the issue of a new Type Certificate/Approval. Some examples of such changes to a product are:

- (a) when the proposed change in design, configuration, powerplant limitations, speed limitations (engines), or mass is so extensive that a substantially complete investigation of compliance with the applicable regulations is required;
- (b) in the case of a normal, utility, aerobatic or transport category aircraft, the proposed change is:
 - (1) in the number of engines or rotors; or
 - (2) to engines using different principles or propulsion or to rotors using different principles of operation;
- (c) in the case of an aircraft engine, the proposed change is in the principle of operation; and
- (d) in the case of propellers, the proposed change is in the number of blades or the principle of pitch change operation.

4. Aircraft classification

4.1 Normal, Utility, Aerobatic Category Aircraft

- (a) The normal category is limited to airplanes that have a seating configuration, excluding pilot seats, of nine or less, a maximum certificated takeoff weight of 12,500 pounds or less, and intended for non-acrobatic operation.
- (b) The utility category is limited to airplanes that have a seating configuration, excluding pilot seats, of nine or less, a maximum certificated takeoff weight of 12,500 pounds or less, and intended for limited acrobatic operation.
- (c) The aerobatic category is limited to airplanes that have a seating configuration, excluding pilot seats, of nine or less, a maximum certificated takeoff weight of 12,500 pounds or less, and intended for use without restrictions, other than those shown to be necessary as a result of required flight tests.

4.2 Commuter Category Aircraft

The commuter category is limited to propeller-driven, multiengine airplanes that have a seating configuration, excluding pilot seats, of

19 or less, and a maximum certificated takeoff weight of 19,000 pounds or less.

The design of the above four categories of airplane, described in paragraph 4.1 to 4.2, shall conform to FAR-23/ JAR-23/ CS-23 airworthiness standards.

4.3 Transport Category Aircraft

The United States Code of Federal Regulation vide, FAR 121.2 (f), New Type Certification Requirements, stipulates that, "No person may operate an airplane for which the application for a type certificate was filed after March 29, 1995, in 14 CFR part 121 operations unless that airplane is type certificated under part 25 of this chapter". Therefore, the design of transport category airplane shall conform to FAR-25/ JAR-25/ CS-25 airworthiness standards.

4.4 Normal Category Rotorcraft

The normal category is limited to single or multiengine (limited to Category A) rotorcraft (helicopters) that have a seating capacity of nine or less passenger with maximum weights of 7,000 pounds or less. The design of this helicopter shall conform to FAR-27/ JAR-27/ CS-27 airworthiness standards.

4.5 Transport Category Rotorcraft

- (i) A multiengine rotorcraft with a maximum weight greater than 20,000 pounds and 10 or more passenger seats meeting Category A operational requirements.
- (ii) A multiengine rotorcraft with a maximum weight of 20,000 pounds or less and nine or less passenger seats meeting Category B operational requirements.

The design of such rotorcraft shall conform to FAR-29/ JAR-29/ CS-29 airworthiness standards.

4.6 Very Light Aeroplanes

Airplanes with a single engine (spark or compression ignition) having not more than two seats, with a maximum certificated take-off weight of not more than 750 kg and a stalling speed in the landing configuration of not more than 45 knots (CAS) approved for day-VFR operations only. The design of such aeroplanes shall conform to JAR-VLA/ CS-VLA airworthiness standards.

4.7 Very Light Rotorcraft

A rotorcraft (helicopters) not powered by turbine and/or rocket engines with maximum certified take-off weights not exceeding 600 kg and to carry not more than two occupants, approved for day-VFR operations only. The design of such rotorcraft shall conform to JAR-VLR/ CS-VLR airworthiness standards.

5. Continuing airworthiness

Continuing airworthiness covers all of the processes ensuring that, at any time in their operating life, all aircraft comply with the airworthiness requirements in force and are in a condition for safe operation. Annex 8 of ICAO, requires that the transmittal of information relating to the continuing airworthiness of the aircraft by the “organization responsible for the type design of that aircraft”. In some States, this organization will be the holder of the Type Certificate for the aircraft type; in others, it will be the holder of an equivalent document certifying approval of the type design by the certifying authority.

To ensure continuing airworthiness of the aircraft that are in service, the responsibility of the TC holder includes:

- (a) preparation of the specifications, methods, procedures and tasks necessary to maintain the aircraft and publication of this information for use by an operator;
- (b) the collection of defects and other significant maintenance and operational information from the operator;
- (c) the analysis of defect, accident and other maintenance and operational information and the transmittal of recommended or mandatory action to the operator and to the State of Registry;

Transmittal of this information to such an organization implies that:

- (a) for aircraft over 5,700 kg maximum certificated takeoff mass engaged in international civil aviation, an organization holding the type certificate (or equivalent document) will exist throughout the operational life of the aircraft type; and
- (b) the holder of the type certificate (or equivalent document) will be in possession of the type design and type certification data and have the competence to use that data as necessary for the continuing airworthiness of the aircraft.

6. Reference:

- a. Annex 8 to the Convention on International Civil Aviation, "Airworthiness of Aircraft", Tenth Edition, April 2005.
- b. ICAO Doc. 9760/AN976, "Airworthiness Manual", First Edition – 2001.
- c. CAR 21, "Certification Procedures for Aircraft and Related Products and Parts", Revision 2, dated 9th June 2006.
- d. Title 14, Code of Federal Regulations, FAR-21, 23, 25, 27, 29, 33, 34, 35, 36, 121 and 135.
- e. Certification Specifications of European Aviation Safety Agency, Part 21, CS-23, CS-25, CS-27, CS-29, CS-E, CS-34, CS-P, CS-36, CS-VLA, CS-VLR, JAR-OPS1 and JAR-OPS3.



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