

Appendix B

The Approval Process

B.1 Introduction

In the Federal Aviation Act of 1958, a complex multistep approval/certification process was established for the FAA to follow to ensure that civil aircraft meet minimum safety requirements. These regulations are found in 14 Code of Federal Regulations (CFR), which comprise the Federal Aviation Regulations (FARs). 14 CFR Parts are commonly referred to as FAR Parts.

The regulatory requirements that civil aircraft must meet depend on the type of aircraft involved (i.e., light airplanes, large multipassenger airplanes, helicopters, etc.) and the aircraft's intended use (i.e., private, crop dusting, airline, external load-bearing helicopters, etc.). A detailed description of the approval steps and procedures is beyond the scope and needs of this Handbook. However, a general description is given with appropriate details relevant to approval steps and procedures requiring flammability testing.

The basic premise of the regulations is that each aircraft must be approved. Except for "public aircraft" (i.e., those operated by the federal, state, or local government), all civil aircraft must be approved by the FAA before they can be placed into any service. To acquire the necessary approvals, it must have been demonstrated to the FAA via the multistep approval process that the aircraft complies with appropriate regulatory requirements.

The FAA is not setup nor intended to have responsibility for carrying out the various steps in the approval process. The FAA's function is essentially to review and approve designs, test and production hardware, test plans, and to witness tests and approve test data. The primary responsibility for carrying out the necessary demonstrations of compliance lies with aircraft manufacturers and operators. Manufacturers perform some of the approval steps and aircraft operators perform the others.

B.2 Approval Steps Manufacturers

The manufacturer of each aircraft produced must receive FAA approval for that aircraft before it can be operated by its owner/operator. The regulatory requirements are covered in the FAR Parts dealing with Airworthiness Standards. The procedures are defined in FAR Part 21, Certification Procedures for Products and Parts.

Manufacturers are responsible for carrying out and receiving FAA approval of the several steps involved with the design and manufacture of aircraft.

B.2.1 Certification Requirements

Airworthiness Standards contain performance requirements for the certification of aircraft. The FAR Parts dealing with Airworthiness Standards are

- FAR Part 23, Airworthiness Standards: Normal Utility and Acrobatic Category Airplanes
- FAR Part 25, Airworthiness Standards: Transport Category Airplanes
- FAR Part 27, Airworthiness Standards: Normal Category Rotorcraft
- FAR Part 29, Airworthiness Standards: Transport Category Rotorcraft
- FAR Part 33, Airworthiness Standards: Aircraft Engines
- FAR Part 35, Airworthiness Standards: Propellers

Airworthiness Standards are amended from time to time to modify (upgrade, clarify, etc.) the requirements. The regulatory requirements that a specific aircraft must comply with are established by the amendment level of the applicable FAR Part that applies to that aircraft, plus any special conditions that may be levied by the FAA on that aircraft for its certification. These requirements are known as the "regulations incorporated by reference," which are identified on the aircraft's Type Certificate data sheet (see section B.2.2.1).

B.2.2 Certification Procedures

The basic item that the FAA approves is the aircraft. Aircraft parts are not “approved” in the same sense, since a review of aircraft components for compliance to a set of requirements is only done in conjunction with the approval of an aircraft. It is possible to have test data generated by testing a part “approved” (as by a Designated Engineering Representative [DER] using an 8110-3 form [see figure B-1]) but such “approval” alone does not approve the use of the part itself.

U.S. DEPARTMENT OF TRANSPORTATION FEDERAL AVIATION ADMINISTRATION			DATE
STATEMENT OF COMPLIANCE WITH THE FEDERAL AVIATION REGULATIONS			
AIRCRAFT OR AIRCRAFT COMPONENT IDENTIFICATION			
MAKE	MODEL NO.	TYPE (Airplane, Radio, Helicopter, etc.)	NAME OF APPLICANT
LIST OF DATA			
IDENTIFICATION	TITLE		
PURPOSE OF DATA			
APPLICABLE REQUIREMENTS (List specific sections)			
<p>CERTIFICATION - Under authority vested by direction of the Administrator and in accordance with conditions and limitations of appointment under Part 183 of the Federal Aviation Regulations, data listed above and on attached sheets numbered _____ have been examined in accordance with established procedures and found to comply with applicable requirements of the Federal Aviation Regulations.</p> <p>I (We) Therefore <input type="checkbox"/> Recommend approval of these data <input type="checkbox"/> Approve these data</p>			
SIGNATURE(S) OF DESIGNATED ENGINEERING REPRESENTATIVE(S)	DESIGNATION NUMBERS(S)	CLASSIFICATION(S)	

FAA Form 8110-3 (11-70) SUPERSEDES PREVIOUS EDITION

Figure B-1. FAA Form 8110-3 (Statement of Compliance)

FAR Part 21, Certification Procedures for Products and Parts, contains the procedures required for manufacturers to receive FAA approval of aircraft or aircraft parts.

The approval process for aircraft and aircraft parts involves three separate sequential steps, each of which requires FAA approval:

1. Approval of design of aircraft
2. Approval of quality control of production of aircraft
3. Approval of each aircraft produced

B.2.2.1 Certification of Design

Approval of the design of the aircraft is the first step in the total multistep approval process. This requires that the manufacturer demonstrate to the FAA that the design of the aircraft meets the relevant Airworthiness Standards.

It is important to recognize that FAA approval of the design of an aircraft does not by itself constitute approval of either the production of that aircraft nor the service use of manufactured duplicates of that aircraft. The FAA must approve production and service use of aircraft in separate steps.

FAA approval of a design is the responsibility of the Aircraft Certification Offices (ACOs). No other section of the FAA has the authority to issue design approval.

The ACOs do not have adequate manpower to carry out all the reviews and inspections necessary for design approval of aircraft. The ACOs have been authorized by statute to delegate certain inspection and certification responsibilities to DERs who are properly qualified private persons not employed by the FAA. DERs may be employees of manufacturers involved with aircraft (material suppliers, holders of Production Certificates, Technical Standard Order [TSO] Authorizations, Part Manufacturer Approvals [PMAs], etc.). In determining whether an aircraft complies with FAA regulations, DERs are guided by the same requirements, instructions, and procedures as ACO personnel.

Each DER authorization is typically limited to a specific technical area that reflects that person's expertise, DERs who are employees of manufacturers are, in addition, typically only authorized to approve designs involving that manufacturer's products. Design approvals by a DER that are outside his or her normal authorization may only be authorized by the cognizant ACO on a case-by-case basis.

B.2.2.1.1 Type Certificates

A Type Certificate (see figure B-2) is issued to an aircraft model that meets all the applicable Airworthiness Standards and special conditions for that model. The model's Type Design refers to all its individual parts and systems. The Type Design consists of the drawings and specifications necessary to define the configuration and the design features of the aircraft model that are needed to show compliance with applicable Airworthiness Standards and special conditions.

FAA approval of the Type Design requires that the applicant carry out all the tests necessary on conformed prototype individual parts (see section B.2.1.4.1) and systems, as well as flight tests on a confirmed prototype of the aircraft itself.

After the FAA has approved the Type Design, it issues a Type Certificate (TC) for the design of the aircraft model.

B.2.2.1.2 Amended Type Certificates

If a holder of the Type Certificate covering an aircraft model wishes to make a major change in the Type Design (not great enough to require a new Type Certificate) of the aircraft, an Amended Type Certificate covering the revised Type Design is required.

The United States of America
Department of Transportation
Federal Aviation Administration

Type Certificate

Number A20WE

This certificate issued to **THE BOEING COMPANY**
certifies that the type design for the following product with the operating limitations and conditions therefor as specified in the Federal Aviation Regulations and the Type Certificate Data Sheet, meets the airworthiness requirements of Part 25 of the Federal Aviation Regulations. (See Page 2 for Aircraft Noise Requirements.)

Model 747-100 Series

This certificate, and the Type Certificate Data Sheet which is a part hereof, shall remain in effect until surrendered, suspended, revoked, or a termination date is otherwise established by the Administrator of the Federal Aviation Administration. This certificate consists of two pages.

Date of application: 22 April 1966 .

Date of issuance: 30 December 1969

By direction of the Administrator:

(Signature) Robert H. Stanton

(Title) Chief, Aircraft Engineering Division

This certificate may be transferred if endorsed as provided on the reverse hereof.

Any alteration of this certificate and/or the Type Certificate Data Sheet is punishable by a fine of not exceeding \$1,000, or imprisonment not exceeding 3 years, or both.

FAA FORM 8110-9 (7-67) SUPERSEDES FAA FORM 331

Figure B-2. Federal Aviation Administration Type Certificate

The applicant for an Amended Type Certificate must show that the aircraft continues to comply with the regulations incorporated by reference plus any additional requirements such as amendments to the Airworthiness Standards and/or special conditions that were not included in the original Type Design.

The procedure for obtaining an Amended Type Certificate is basically the same as for obtaining Type Certificates.

B.2.2.1.3 Supplemental Type Certificates

If a party wishes to make a major change in the Type Design of an aircraft model (not great enough to require a new Type Certificate), and the party is not the holder of the Type Certificate for that aircraft model, approval of the change requires a Supplemental Type Certificate (STC). A holder of a Type Certificate who wishes to make a change in the Type Design that is less than that involving the derivative aircraft may also apply for a STC.

STCs, in practice, are used for specific design features of the aircraft and do not, as a rule, involve modifications to other, unaffected design features of the aircraft.

B.2.2.1.4 Individual Aircraft Parts

Individual aircraft parts are not “approved” by the FAA; only the aircraft on which the part is used is approved.

To obtain approval for the use of a part on an aircraft, the applicant must comply with the Type Design of the aircraft on which they are to be installed. The applicant must apply to an FAA ACO for approval of the design of the part. The application must include a complete formal description (e.g., drawing or drawings) of the design and the aircraft on which the part is to be installed. The design must be sufficiently definitive and unambiguous to define the item and the requirements that it must satisfy.

B.2.2.1.4.1 Conformity Inspection

If testing of the part is required, the applicant must provide a fabricated prototype of the part along with an FAA 8130-9 form, Statement of Conformity (see figure B-3), stating that the prototype conforms with the design (i.e., was fabricated using the materials and processes prescribed in the formal description of the design). An FAA Manufacturing Inspector or his or her designee must then examine the prototype (and any required accompanying evidence) to determine whether or not the demonstration of its conformity is satisfactory. If satisfactory, the Manufacturing Inspector (or his or her designee) will effect an FAA 8130-3 form, Conformity Certification (see figure B-4), stating that the prototype is in conformity.

B.2.2.1.4.2 Test Plan Preparation

Any required tests must be performed on a prototype of the part to demonstrate that it complies with applicable regulations. The applicant must prepare a test plan that includes the following information:

- a. title, list of active pages, and revision record;
- b. the exact part usage, including aircraft model, and FAR flammability requirements, including the amendment level;
- c. the test procedure and the ~~FAA-approved~~ test facility to be used (the test date shall be coordinated with the FAA ACO or its designee for test witnessing);
- d. detailed and complete identification of material(s) used for part construction (a copy of the conformity inspection approval may be included; see section B.2.2.1.4.1); and
- e. an isometric sketch of the part with all individual test constructions/panels numerically identified, if the part to be certified requires that more than one construction be tested, such as a galley.

In order to facilitate completing a test report (see section B.2.2.1.4.3) upon completion of testing, data sheets for each test and each construction may be provided. The data sheet must be completely filled out with the exception of the test results. When the test results are entered and signed by the FAA witness or FAA designee (DER), the test plan may be used as the test report.

UNITED STATES OF AMERICA DEPARTMENT OF TRANSPORTATION FEDERAL AVIATION ADMINISTRATION STATEMENT OF CONFORMITY			
SECTION I - AIRCRAFT			
1. MAKE		2. MODEL	
3. SERIAL NO.		4. REGISTRATION NO.	
SECTION II - ENGINE			
1. MAKE		2. MODEL	
3. SERIAL NO.			
SECTION III - PROPELLER			
1. MAKE		2. HUB MODEL	
3. BLADE MODEL		4. HUB SERIAL NO.	
5. BLADE SERIAL NOS.			
SECTION IV - CERTIFICATION			
I hereby certify that:			
<input type="checkbox"/> A. I have complied with Section 21.33(a).			
<input type="checkbox"/> B. The aircraft described above, produced under type certificate only (FAR 21 Subpart F), conforms to its type certificate, is in a condition for safe operation, and was flight checked on _____ (Date)			
<input type="checkbox"/> C. The engine or propeller described above, presented herewith for type certification, conforms to the type design therefor.			
<input type="checkbox"/> D. The engine or propeller described above produced under type certificate only (FAR 21 Subpart F), conforms to its type certificate and is in a condition for safe operation. The engine or, if applicable, the variable pitch propeller was subjected by the manufacturer to a final operational check on _____ (Date)			
Deviations:			
SIGNATURE OF CERTIFIER		TITLE	
ORGANIZATION			DATE

FAA Form 8130-9 (9-78) USE PREVIOUS EDITION

Figure B-3. Statement of Conformity

B.2.2.1.4.3 Test Report

If the results of the test show the prototype to be in compliance, a test report identifying the part and presenting the data must be prepared. If the test plan is completed in accordance with B.2.2.1.4.2, the test plan may be modified to become a test report by completing the test data sections on the data sheets provided. The ACO will then approve the part (usually as part of a Type Certificate or an STC activity), or its DER designee will effect an FAA 8110-3 form, Statement of Compliance with the Federal Aviation Regulations (see figure B-1), which indicates approval that the design of the item satisfies the specific requirement(s) of the regulations that the test covered. The ACO itself does not issue a 8110-3 form; only DERs do that.

B.2.2.1.5 Technical Standard Orders

A TSO is a minimum performance standard for specified articles (i.e., materials, parts, processes, or appliances) used on civil aircraft. The performance standards stated in the TSO reflect some (but not necessarily all) of the requirements for that article stated in the Airworthiness Standards.

A TSO authorization is an FAA acknowledgment that the design of the article meets the specified minimum performance standard in the TSO, and that the TSO holder may produce and mark the authorized article with the TSO designation.

It is important to recognize, however, that since amendments to Airworthiness Standards and to TSOs are made independently by the FAA, there may be situations when TSO requirements and Airworthiness Standards are not the same. In such a case, approval of the article may involve requirements beyond those of the TSO itself.

TSOs involving flammability include the following:

TSO C10a	Life Rafts (nonreversible)
TSO C13a	Life Preservers
TSO C13d	Life Preservers
TSO C17a	Fire-Resistant Aircraft Sheet and Structural Material
TSO C20	Combustion Heaters
TSO C22f	Safety Belts
TSO C25a	Aircraft Seats and Berths
TSO C30b	Aircraft Position Lights
TSO C31d	High-Frequency (HF) Radio Communications Transmitting Equipment
TSO C32d	High-Frequency (HF) Radio Communications Transmitting Equipment
TSO C34c	ILS Glide Slope Receiving Equipment
TSO C36e	ILS Localizer Receiving Equipment
TSO C37c	VHF Radio Communications Transmitting Equipment
TSO C38c	VHF Radio Communications Receiving Equipment
TSO C39b	Aircraft Seats and Berths
TSO C40c	VOR Radio Receiving Equipment
TSO C42	Propeller Feathering Hose Assemblies
TSO C51a	Aircraft Flight Recorder
TSO C53a	Fuel and Engine Oil System Hose Assemblies
TSO C57a	Aircraft Headsets and Speakers
TSO C58a	Aircraft Microphones
TSO C60b	Airborne LORAN-A and LORAN-C Receiving Equipment
TSO C63c	Airborne Weather and Ground Mapping Pulsed Radars
TSO C65a	Airborne Doppler Radar Ground Speed and/or Drift Angle Measuring Equipment
TSO C66b	Distance Measuring Equipment (DME)
TSO C68a	Airborne Automatic Dead Reckoning Computer Equipment
TSO C69b	Emergency Evacuation Slides, Ramps, and Slide/Raft Combinations
TSO C70a	Liferafts (Reversible and Nonreversible)
TSO C72c	Individual Flotation Devices

TSO C75	Hydraulic Hose Assemblies
TSO C77a	Gas Turbine Auxiliary Power Units
TSO C78	Crewmember Demand Oxygen Mask
TSO C85	Survivor Locator Lights
TSO C90b	Cargo Pallets, Nets, and Containers
TSO C94a	Omega Receiving Equipment
TSO C99	Protective Breathing Equipment

B.2.2.1.6 Parts Manufacturer Approval (PMA)

A PMA covers FAA approval for the production of certain materials, parts, processes, and appliances. A PMA application requires that the applicant submit for FAA approval the identity of the aircraft on which the part is to be installed, sufficient information defining the design of the part, and FAA approved test data showing that the design of the part complies with all Airworthiness Standards and special conditions applicable to the aircraft on which the part is to be installed.

B.2.2.2 Certification of Production Quality Control

FAA approval of production requires essentially the approval of the manufacturer's production quality control system. The mechanisms of approval vary depending on whether or not the manufacturer holds a Production Certificate, TSO authorization, or PMA. The details are not important for the purposes of this Handbook.

The purpose of the quality control system is to ensure consistent satisfactory production of all items involving FAA-approved designs.

In a quality control system, the manufacturer must provide for systematic monitoring of materials and processing to ensure that production goods meet their individual design requirements. The procedures used, including the frequency of inspections, must be documented and presented to the FAA for approval. Any changes in the quality control system must also be submitted to the FAA for approval.

FAA approval of a manufacturer's production quality control system is the responsibility of the Manufacturing Inspection Offices of the Manufacturing Inspection Branch. No other section of the FAA, including the Aircraft Certification Division, has the authority to approve a production quality control system.

The Manufacturing Inspection Offices, like the ACOs, do not have adequate manpower to carry out all the reviews and inspections necessary for approval and monitoring of production quality control systems. The Manufacturing Inspection Offices have been authorized by statute to delegate certain inspection and monitoring responsibilities to Designated Manufacturing Inspection Representatives (DMIRs) who are properly qualified private persons. DMIRs may be employees of manufacturers involved with aircraft (material suppliers, holders of Production Certificates, TSO authorizations, PMAs, etc.). In determining whether or not an aircraft or aircraft part complies with FAA regulations, DMIRs are guided by the same requirements, instructions, and procedures as Manufacturing Inspection Office personnel.

B.2.2.3 Certification of Individual Aircraft

Each individual aircraft must receive FAA approval before it can be placed into any service. If there are minor design differences between the actual produced aircraft and the Type Design used for the aircraft's Type Certificate, the ACO or its designee(s) must approve the design modifications.

The approval of the aircraft itself takes the form of an Airworthiness Certificate (FAA 8100-2 form), as shown in figure B-5, which signifies that the aircraft was manufactured according to the engineering drawings defining it and, therefore, complies with the applicable Airworthiness Standards and all special conditions that may apply to that aircraft.

UNITED STATES OF AMERICA DEPARTMENT OF TRANSPORTATION—FEDERAL AVIATION ADMINISTRATION STANDARD AIRWORTHINESS CERTIFICATE			
1 NATIONALITY AND REGISTRATION MARKS	2 MANUFACTURER AND MODEL	3 AIRCRAFT SERIAL NUMBER	4 CATEGORY
5 AUTHORITY AND BASIS FOR ISSUANCE This airworthiness certificate is issued pursuant to the Federal Aviation Act of 1958 and certifies that, as of the date of issuance, the aircraft to which issued has been inspected and found to conform to the type certificate therefor, to be in condition for safe operation, and has been shown to meet the requirements of the applicable comprehensive and detailed airworthiness code as provided by Annex 8 to the Convention on International Civil Aviation, except as noted herein. Exceptions:			
6 TERMS AND CONDITIONS Unless sooner surrendered, suspended, revoked, or a termination date is otherwise established by the Administrator, this airworthiness certificate is effective as long as the maintenance, preventative maintenance, and alterations are performed in accordance with Parts 23, 25, 43, and 91 of the Federal Aviation Regulations, as appropriate, and the aircraft is registered in the United States.			
DATE OF ISSUANCE	FAA REPRESENTATIVE	DESIGNATION NUMBER	
Any alteration, reproduction, or misuse of this certificate may be punishable by a fine not exceeding \$1,000, or imprisonment not exceeding 3 years, or both. THIS CERTIFICATE MUST BE DISPLAYED IN THE AIRCRAFT IN ACCORDANCE WITH APPLICABLE FEDERAL AVIATION REGULATIONS.			
FAA Form 8100-2 (8-82)			GPO 570-189

Figure B-5. Standard Airworthiness Certificate

FAA approval of an aircraft (i.e., the issuance of an Airworthiness Certificate to that aircraft) is the responsibility of the Manufacturing Inspection Offices of the Manufacturing Inspection Division. The approval may be delegated to a specific DMIR.

It is important to recognize that the production of each item used on an aircraft must generally be carried out within an FAA-approved quality control system; otherwise, an Airworthiness Certificate cannot be issued for that aircraft. For example, a transport category (FAR 25) airframe manufacturer who holds a Production Certificate may subcontract the fabrication of a part or purchase a part at the request of a customer for installation on that customer's airplane or install a part supplied by a customer on that customer's airplane. In such cases, the holder of the Production Certificate is responsible to the FAA for the conformity of the manufactured end item (i.e., for the quality control system used by whoever actually produces the item) unless the actual manufacturer of the item is otherwise covered by some FAA approval of production of that end item, such as a TSO or a PMA.

B.3 Approval Steps—Operators

Operators are responsible for carrying out and receiving FAA approval of the several steps involved with the maintenance and operation of the aircraft. These steps begin after the operator receives an aircraft from a manufacturer that has an Airworthiness Certificate.

The operators must obtain approvals under FARs covering Certification and Operations, viz.,

FAR Part 91 General Operating and Flight Rules

FAR Part 121 Certification and Operations: Domestic, Flag, and Supplemental Air Carriers, and Commercial Operators of Large Aircraft

FAR Part 125 Certification and Operations: Airplanes Having a Seating Capacity of 20 or More Passengers or a Maximum Payload Capacity of 6,000 Pounds or More

FAR Part 127 Certification and Operations: Scheduled Air Carriers with Helicopters

FAR Part 129 Operations and Foreign Air Carriers

FAR Part 133 Rotocraft, External-Load Operations

FAR Part 135 Air Taxi Operations and Commercial Operators

The operation of airlines is covered in FAR Part 121 Certification and Operations: Domestic, Flag, and Supplemental Air Carriers, and Commercial Operators of Large Aircraft. The FAA sometimes amends FAR 121 to add requirements to airplanes operated by the airlines that are in addition to the Part 25 Airworthiness Standards that are applicable to those airplanes. The additional requirements sometimes force airlines to retrofit airplanes and/or to request from airplane manufacturers that newly manufactured airplanes meet the upgraded standards.

The Flight Standards Branch of the FAA is responsible for overseeing and approving the activities of aircraft operators. The activities are divided between those dealing with aircraft maintenance and those dealing with aircraft operations. For the purposes of this Handbook, only aircraft maintenance activities are relevant. The approval procedures essentially duplicate those in the Airworthiness Standards.