Appendix A
FAA Regulations

A.1 A Brief History of Federal Agencies Regulating Aviation

The Federal Aviation Administration (FAA) has had its present name and place in the Federal establishment since April 1, 1967, the day the Department of Transportation (DOT) began operations. It has existed, however, in recognizably similar forms since 1926 when Congress enacted the Air Commerce Act, establishing an Aeronautics Branch within the Department of Commerce. Passed at the request of the aviation industry, which believed the airplane could not reach its full commercial potential without Federal safety regulation, the act charged the Secretary of Commerce with fostering air commerce, issuing and enforcing air traffic rules, licensing pilots, certificating aircraft, establishing airways, and operating and maintaining aids to air navigation.

Over the next decade, the Department of Commerce fulfilled its civil aviation responsibilities by concentrating on airway development, safety rulemaking, and pilot and aircraft certification. In 1936 a major shift occurred: Commerce assumed responsibility for controlling enroute air traffic. Air traffic control (ATC) eventually became, in terms of manpower and facilities employed, the Federal Government's most demanding civil aviation responsibility.

In 1938, with the enactment of the Civil Aeronautics Act, the Federal civil aviation role passed from Commerce to a new independent agency, the Civil Aeronautics Authority. That legislation expanded the Federal civil aviation role by giving the Authority the power to issue air carrier route certificates and regulate airline fares. In 1940, President Franklin Roosevelt split the Authority into two agencies, the Civil Aeronautics Board (CAB) and the Civil Aeronautics Administration (CAA). The CAA, lodged in the Department of Commerce, was responsible for ATC, airman and aircraft certification, safety enforcement, and airways development. In 1946, Congress added to these responsibilities a Federal aid airport program.

The Federal Aviation Act of 1958, whose passage had been spurred by a series of midair collisions, transferred the CAA's functions to a new independent body, the Federal Aviation Agency. This act was significant in two other respects. It took safety rulemaking from the CAB and entrusted it to the Federal Aviation Agency. More importantly, it gave the Federal Aviation Agency the sole responsibility for developing and maintaining a common civil-military system of air navigation and ATC, a responsibility that the CAA had shared with others.

In 1967, the Federal Aviation Agency was renamed the Federal Aviation Administration and placed in the newly created DOT. The creation of the DOT reflected a growing awareness in Congress, the executive branch, and the transportation industry that integrated and balanced transportation systems were required to meet the nation's transportation needs and that such systems could best be achieved by a single department.

Meanwhile, the FAA was assuming responsibilities not originally contemplated by the Federal Aviation Act. In 1968, Congress vested in the FAA Administrator the power to prescribe aircraft noise standards. The hijacking epidemic of the 1960s also involved the agency in a new area, aviation security. Finally, in 1970, the Airport and Airway Development Act authorized the FAA Administrator to establish minimum safety standards for airports and issue operating certificates to air carrier airports meeting those standards.

In the 1970s, the FAA and other Federal employees joined the ranks of organized labor. The Federal union movement began in 1962 when President John F. Kennedy granted by executive order the right of Federal employees to join unions and engage in collective bargaining. In 1968, a group of New York-based controllers formed the Professional Air Traffic Controllers Organization (PATCO), a professional society that eventually became a labor union. FAA-PATCO relations fell into three distinct periods: the early, strife-marked period that culminated in a 1970 "sickout" in which 3,000 controllers participated; a period of relative labor peace that saw controllers gain valuable wage and retirement benefits; and another period of strife, beginning in 1980, that led to 12,300 PATCO members going on strike in August 1981, the firing of the strikers, and the decertification of PATCO. Despite the loss of most of its controller workforce, the FAA kept the airways open and brought the ATC system close to its 1981 capacity within 2 years.

Airspace system capacity, however, was a long-term problem. Congress had created the FAA to meet the airspace challenges of the jet age. A large part of the FAA's response was the third-generation ATC system, a semiautomated radar- and computer-based system. That system was capitalized by user taxes from a trust fund created by the Airport and Airway Revenue Act of 1970. Despite the steady infusion of trust fund capital, the third-generation ATC system showed signs of wear by the early 1980s. Air traffic had surged dramatically, testing the limits of the system's capacity.

Traffic growth had been fed in part by the competitive environment created by the Airline Deregulation Act of 1978, which introduced fare and route competition in the air passenger industry and permitted unrestricted entry by new domestic carriers. Accordingly, in December 1981, the FAA unveiled the National Airspace System Plan, a blueprint for a state-of-the-art traffic control and air navigation system to accommodate projected growth in air travel over the next 20 years.

A.2 Organization of the FAA

The FAA is currently part of the DOT and is under the leadership of an Administrator who reports to the Secretary of Transportation.

The organizational structure of the FAA has undergone numerous changes over the years. Regardless of changes at the top levels of FAA headquarters and field offices, the "firing line" levels at or near the bottom, where the ultimate action takes place, have usually been relatively unaffected. Future reorganizations most likely will have little, if any, effect on day-to-day work functions of the local FAA offices. This famliarization with the FAA organization will, therefore, be based upon that assumption.

A.2.1 Headquarters

The top levels at FAA headquarters for design certification, production certification, and airworthiness certification begin with the Executive Director of Regulatory Standards and Compliance, under whom is the Associate Administrator for Regulation and Certification. Among the offices under the Associate Administrator is the Aircraft Certification Service, which has the responsibility for overseeing the Aircraft Certification Directorates, and the Washington Headquarters operations related to design, production, and airworthiness certification. The Aircraft Manufacturing Division of the Aircraft Certification Service has total responsibility for national policy and regulations governing production of aircraft and replacement parts (quality assurance) and the requirements for issuance of airworthiness certificates and export approvals. The engineering functions for aircraft and engine design certification policy and regulations are divided among four field offices, called Directorates. The Aircraft Engineering Division of the Aircraft Certification Service is responsible for national policy that affects all four of the Directorates and for policy and regulations for unique aircraft not otherwise covered by an aircraft category.

A.2.2 Directorates/Aircraft Certification Division

The headquarters of the Aircraft Certification Directorates/Divisions (ACDs) and the categories for which they are responsible are as follows:

a. For transport category airplanes (Federal Aviation Regulation [FAR] Part 25), the Directorate headquarters is in Seattle, Washington.

b. For small airplanes (FAR Part 23), the Directorate headquarters is in Kansas City, Missouri.

c. For rotorcraft of all categories (FAR Parts 27 and 29), the Directorate headquarters is in Fort Worth, Texas.

d. For engines and propellers (FAR Part 33 and 35), the Directorate headquarters is in Boston, Massachusetts.

The ACD is also responsible for implementing certification programs (type, production, and airworthiness) within the geographic boundaries of the Directorate, subject to the policy guidance of the ACD in the Directorate responsible for the product involved. For example, the transport category Directorate is responsible for accomplishing all of the work required for type certification of an engine whose manufacture is located in Seattle, but the engine/propeller Directorate headquartered in Boston is responsible for policy guidance and regulatory interpretations, if required.

Each Directorate/Division is responsible for development, coordination, and issuance of documents related to the assigned category, including

a. Airworthiness Directives (ADs)
b. Regulatory Changes
c. New Regulations
d. Advisory Circulars (ACs)
e. FAA Internal Directives (Orders, Notices, etc.)

NOTE: The authority outlined above does not include changes to procedural regulations, such as FAR Part 21, that would affect all Directorates. Such changes are the responsibility of the Engineering Division in FAA Washington Headquarters.

A.2.3 Directorates/Aircraft Certification Offices

The day-to-day work functions within the geographic area for which each Directorate is responsible are carried out by Aircraft Certification Offices (ACOs), whose managers report to the Directorate Aircraft Certification Division. ACOs consist of branches and sections covering the various engineering specialities related to design certification of aircraft, aircraft engines, propellers, and replacement parts for those products. ACO design certification programs encompass all categories of products whose manufacturers are located within the ACO geographic area of responsibility. Policy guidance for ACO design approval projects is provided by the Inspection Branch responsible for monitoring the manufacturing (quality assurance) and airworthiness certification programs with policy guidance from the Manufacturing Division at FAA headquarters.

A.2.4 Directorates/Manufacturing Inspection District Offices

The managers of the Manufacturing Inspection District Offices (MIDOs) report to the manager of the ACO, except for technical policy guidance when reporting may be to the Aircraft Certification Division at the option of the ACO manager. The MIDO's primary functions are not related to any specific product category, as in engineering, since such functions are generally similar regardless of the type of product involved. The MIDO responsibilities include

a. Evaluation of production quality assurance systems for compliance with the FAR, leading to issuance of production approvals.

b. Surveillance of approved production facilities.

c. Providing support to FAA engineering in design approval programs through conformity inspections of prototype/first article products and witnessing tests as requested by engineering.

d. Issuance of airworthiness certificates for new aircraft.

e. Issuance of export approvals for new aircraft, aircraft engines, propellers, or their major components.

f. Enforcement of the FAR applicable to production approvals.

The MIDO manager may assign Principal Inspectors (PIs) for major production approval holders. The PI is responsible for oversight of his or her assigned manufacturer, and for ensuring the timely accomplishment of the MIDO functions that apply.

A.2.5 The FAA William J. Hughes Technical Center

The FAA William J. Hughes Technical Center is located at the Atlantic City International Airport in New Jersey. It serves as the national test center for FAA research and development programs in air traffic control, communications, navigation, airports, and aircraft safety. Work involves the long-range development of new systems and concepts, development of new equipment and techniques to be placed in service in the near future, and in-service modifications to existing systems and procedures.

Most of the ongoing technical projects are assigned by FAA headquarters. Some testing takes place at other locations where the environment is more suitable, and some work is contracted to private industry and universities.

Center test pilots operate a fleet of specially instrumented aircraft that range in size from small airplanes to helicopters and large transports.

Major test facilities include

- Air Traffic Simulation Facility
- Air Traffic Laboratories
- Radar Test Laboratories
- Navigation Facilities
- Tracking Range
- Aircraft Safety Area

The Aircraft Safety Area contains special facilities for fire and accident tests on aircraft, components, and engines. They include a catapult, wind tunnel, chemistry laboratory, engine test cells, and a full-scale fire test facility, the largest of its kind in the world.

A.2.6 Civil Aeromedical Institute

The Civil Aeromedical Institute (CAMI) is located at the Mike Monroney Aeronautical Center at the Oklahoma City Airport in Oklahoma. It conducts medical research projects applicable to the mission of the FAA. The CAMI develops, maintains, and manages a system for the medical examination and certification of U.S. civil airmen and develops, maintains, and administers aviation medical education programs to meet the needs of the FAA. It also participates in the investigation of aircraft accidents regarding survivability factors and biomedical and psychological causes of accidents, such as disease and substance abuse.

A.3 Enabling Legislation and Procedures for the FAA

The top level public law that governs the activities of the FAA is the Federal Aviation Act of 1958, as amended. All FAA operating procedures must be in accordance with the Federal Aviation Act. The Act may be amended by Congress, however, if a compelling need for such an amendment exists.

Most of the FAA operations are covered under Title VI, "Safety Regulation of Civil Aeronautics." Section 601 of this Title gives the FAA Administrator the power and duty to prescribe and revise minimum standards and rules and regulations governing, among other things, "the design, material, workmanship, construction, and performance of aircraft, aircraft engines, and propellers as may be required in the interest of safety." Therein lies the basis for the FARs.

A.3.1 Federal Aviation Regulations

FARs are issued by the FAA to implement the provisions of the Federal Aviation Act, which gives only the basic objectives with little detail. Compliance with the FARs is mandatory to obtain the kind of certificates or approvals to which the particular FAR applies. Once a certificate or approval is issued for a purpose that requires ongoing compliance, such as a Production Certificate, noncompliance with or violation of the terms of, the approval would result in civil penalty or administrative enforcement action, or if the infraction is of a serious nature, the certificate or approval could be suspended or revoked.

A.3.1.1 Petitions for Rulemaking

The procedures to be followed in presenting Petitions for Rulemaking are detailed in FAR Part 11. The basic requirements that must be met in a petition are that the petition must explain the interests of the petitioner in the action sought, and contain information, views, or arguments as to why granting the request would be in the public interest.

If the FAA determines that the basic requirements for a petition have been met, a summary of the petition is published in the Federal Register and public comments are invited. To be considered, comments must be submitted to the FAA within a time period specified in the published summary (usually 60 days). If the FAA finds that the petition is not acceptable after considering the public comments, it is returned to the petitioner, who may then resubmit the petition with additional information. If, however, the FAA determines, after consideration of its own analysis of the petition and of all public comments received in response to the summary, that the petition has merit, the FAA institutes rulemaking procedures.

A.3.1.1.2 Notices of Proposed Rulemaking

When the FAA initiates rulemaking, a part of the rulemaking action is publication of the proposed new or amended regulation in the Federal Register as a Notice of Proposed Rulemaking (NPRM), with public comments invited. To be considered, comments must be submitted to the FAA within a time period specified in the published NPRM. Each comment received must be analyzed by the FAA and may be either accepted or rejected, depending on whether the commenter has provided justification and substantiation of his/her views. Comments that state simply "for" or "against" without support information are generally not given consideration. The substance of comments that are accepted would be incorporated into the proposed regulation.

After all actions related to the NPRM and comments received are completed, and the proposed rule has completed the interagency coordination process, the final rule may be approved by the FAA Administrator or his or her designee.

Because of the extensive coordination required for rulemaking actions, including the DOT and the Office of Management and Budget, the time elapsed between initiation of the action and adoption of the final rule may be a year or more, depending on whether the proposed rule is imposing or relieving a burden to the public and whether the proposal is controversial in nature. The only exception to the long time element is in the case of ADs, which may be processed quickly under emergency procedures.

A.3.1.2 Exemptions from FARS

Anyone may petition the FAA for an exemption from a regulation following procedures set forth in FAR Part 11, which are similar to those for petition for rulemaking. The primary difference between a petition for exemption and a petition for rulemaking is that the petitioner for an exemption must include reasons why safety would not be adversely affected if the exemption is granted or must explain the action to be taken by the petitioner to provide a level of safety equal to that provided by the rule from which the exemption is sought.

The processing of a petition for exemption is also similar to that for a petition for rulemaking, except that full interagency coordination is generally not necessary or accomplished more quickly. The final action on a petition for exemption may usually be determined within 60 to 90 days or, if the petitioner shows good cause, sooner.

The final action on a petition for an exemption may be either a grant if the petitioner has shown good cause or a denial if he/she has not. In the case of a denial, the petition may be resubmitted if the petitioner has new information that would provide better substantiation.

The scope of exemptions varies considerably—an exemption may be valid only for one person on a short-term basis or may apply to an organization or a group and be effective for several years. Exemptions are not normally granted on a permanent basis, but in cases where the need is ongoing for many years, the original petitioner may request renewal when the exemption expires, provided the need for the renewal is adequately substantiated.

An exception to the usual requirement that exemptions expire on a given date unless renewed is the case of an exemption granted from a regulation in the airworthiness standards of FAR Parts 23 and 25. Such exemptions may be permanent, and since they constitute a deviation from published airworthiness standards, they must be listed on the Standard Airworthiness Certificates issued for the aircraft affected by the exemption to satisfy the requirements of the International Civil Aviation Organization (ICAO).

A.3.2 Airworthiness Directives (ADs)

ADs are issued by the FAA when an unsafe condition exists in a product, and that condition is likely to exist in other products of the same type design. The need for an AD may be identified as a result of an accident, maintenance problems, routine inspections, etc. The primary criteria upon which the FAA bases decisions for AD action are that an unsafe condition was found and that the same condition is likely to exist in other aircraft.

The corrective action prescribed by the AD, such as an inspection, a repair, or a modification, may be detailed in the AD itself or may be contained in another document, such as a manufacturer's Service Bulletin, which is referenced in the AD.

ADs have the same authority as a FAR and, as such, compliance with ADs is mandatory. Noncompliance with an AD that, for example, applies to an aircraft would be in violation of the terms of issuance of the airworthiness certificate, resulting in its invalidation—in effect, grounding the aircraft. The same effect would result if an engine, propeller, or appliance with an unincorporated AD was installed on an aircraft.

The procedures for processing ADs generally follow those previously discussed under the development of FARs, beginning with publication of the draft AD in the Federal Register as an NPRM, with public comments invited, except when the situation requires urgent action to preserve safety, an emergency AD may be issued immediately without the full rulemaking process.

The FAA Directorate for the product involved, usually in conjunction with the local ACO, is responsible for drafting the AD and coordinating the rulemaking process. The text of the AD and the corrective action is usually a joint effort between the manufacturer and FAA engineering. Input and comments are also considered from other segments of the FAA and from individuals or organizations representing aircraft operators.

A.3.3 Technical Standard Orders

Under the Civil Aeronautics Act of 1938, the Administrator of Civil Aeronautics was authorized to adopt the Technical Standard Order (TSO) system to establish minimum performance standards and specifications of aircraft materials, parts, processes, and appliances that are used on civil aircraft.

TSOs are covered in FAR Part 21, "Certification Procedures for Products and Parts," as Subpart O, "Technical Standard Order Authorizations." The TSO requirements cover most, but not necessarily all, of the requirements on that item in the FARs.

A TSO Authorization is an FAA design and production approval issued to the manufacturer of an article that has been found to meet a specific TSO.

A Letter of TSO Design Approval is an FAA design approval for a foreign-manufactured article, which has been found to meet a specific TSO in accordance with specified procedures.

A.3.4 Congressional Actions

In a number of cases involving controversial issues, Congress passed amendments to the Act that mandates FAA action, even though the Act may already provide for such action. Notable examples of this are all sections in Title VI, amended to require Emergency Locator Transmitters in certain aircraft, to establish Noise Abatement requirements, and most recently, to establish requirements for Mode C transponders in aircraft operating in controlled airspace.

A.3.5 Directives that Implement FARs

Directives that implement FARs are issued to provide guidance or an acceptable means of compliance with specific FARs. Such directives are not normally mandatory on an applicant for an FAA certificate or approval. If compliance with their provisions would result in a burden on, or adversely affect a segment of the aviation community, a draft must be published in the Federal Register for public review and comment, which must be considered before the directive can be issued. This requirement applies to all directives issued by any U.S. Government agency, including those whose purpose is to govern internal operations but, in so doing, may have an adverse effect on the public.

A.3.5.1 Advisory Circulars (ACs)

The FAA issues ACs to inform the aviation public in a systematic way of nonregulatory material of interest. Unless incorporated into a regulation by reference, the contents of an AC are not binding on the public. Among other things, ACs are used to show a method acceptable to the FAA, but which may not be the only method, for complying with a related FAR.

ACs are available to the public through several means. Some are free, depending on content and number of pages, and may be obtained from the DOT, Washington, D.C., or from Government Printing Office bookstores located in many major cities. Anyone may also ask to see ACs at any ACD, ACO, or MIDO.

ACs are developed by the FAA office having primary responsibility for the subject of the AC. For example, ACs concerning FAR Part 25 Airworthiness Standards for transport category aircraft are developed by the Transport Airplane Directorate. ACs that are to provide information or guidance concerning FAR Part 21, which applies to all Directorates, would most likely be developed by FAA headquarters.

The approval process for ACs varies, depending on the subject matter. An AC that only provides information of interest to the public, or a service or guidance of a helpful nature, may be coordinated within the FAA and issued without publication in the Federal Register. On the other hand, an AC that announces policy on a controversial subject, or provides an acceptable means of compliance with a FAR, would normally be published in the Federal Register for public comment before the AC is issued.

A.3.5.2 Internal Directives

Internal directives govern the internal operations of the FAA and generally are for use by FAA personnel only. Some provide guidance and instructions to field office personnel for functions that may affect the public, in which case someone affected by the directive may ask to see it or may obtain a copy. Under normal conditions, however, guidance that impacts the public is issued as an AC. Some internal directives may contain classified information that is not available to the public.

A.3.5.2.1 Orders

Orders are the highest level of internal directives, covering a wide range of subjects from establishing the functions and responsibilities of all FAA offices—both headquarters and field—to providing permanent guidance and instruction to field offices and FAA personnel. Orders are normally developed and coordinated within the FAA and are not released for public comment prior to publication.

Orders that do not contain classified information may be made available to the public, particularly those governing the activities of the field offices.

Orders may be single page documents or complete texts of instruction material, issued as “handbooks.” Examples of FAA Orders are the Designated Engineering Representative (DER) Handbook (Order 8110.37) and the Type Certification Handbook (Order 8110.4). The Order number is in accordance with the FAA subject classification system—8110 is Engineering—and all forms of reports related to the subject also have the same number, e.g., the DER Certificate of Authority, FAA Form 8110-25, and the Statement of Compliance, FAA Form 8110-3.

A.3.5.2.2 Notices

Notices have the same authority within the FAA as Orders; however, Notices are temporary, usually expiring in less than 1 year. The processing of a Notice may generally be completed more quickly than an Order, but if the material in the Notice is to be effective for more than 1 year, it must be reprocessed as an Order prior to the expiration of the Notice.

Notices may be used to transmit other official data, provide information or guidance intended for “one-time-only” use, or provide instructions of an “emergency” nature to field offices. Such “emergency” Notices may be issued as telegrams called GENOTs (General Notices).

A.3.5.2.3 Memorandums

Memorandums are sometimes used to provide guidance or interpretations when the “audience” is very limited—such as to one field office. Memorandums are also issued by the FAA General Counsel to provide legal interpretations of FARs in controversial cases and are official policy documents. Regardless of the purpose of Memorandums, if the information concerns FAA policy that should be distributed agency-wide, the Memorandum is eventually issued as an AC, Order, or incorporated into existing ACs or internal directives.

A.4 Documentary Sources for Flammability Requirements

Documentation specifying flammability requirements and test procedures fall primarily in Civil Air Regulation (CAR) Parts, FAR Parts, TSOs, and ACs.

A.4.1 Civil Air Regulations Parts

CARs that relate to certification flammability requirements and fire testing are—

CAR Part 3	Airplane Airworthiness; Normal Utility and Acrobatic Airplanes
CAR Part 4b	Airplane Airworthiness; Transport Category
CAR Part 6	Rotorcraft Airworthiness; Normal Category
CAR Part 7	Rotorcraft Airworthiness; Transport Category

These CAR Parts will still be addressed because the current fleet contains models that were certified to CARs (e.g., the Boeing 707 and 727-100, the Douglas DC- series through the DC-9, and the Lockheed Electra).

Approved test methods to be used in demonstrating compliance with these CAR requirements were published in Safety Regulation Release (SRR) No. 259 in 1947. Flight Standards Service Release (FSSR) No. 453 superseded SRR No. 259 in 1961, pending incorporation of appropriate test procedures in Civil Aeronautics Manuals.

The SRR and FSSR contained a fireproof test, two different types of fire-resistant tests, and flame-resistant and flash-resistant tests, both of which involved a Bunsen burner and a horizontal test specimen.

Although the FSSR was canceled by AC 00-20 on September 7, 1966, it was never completely replaced by an AC. It is still used for CAR certified airplanes.

A.4.2 FAR Parts

The CARs were reorganized and reissued without additional requirements as FARs in 1965, when the Civil Aeronautics Agency was made a part of the DOT as the FAA. FARs that relate to certification flammability requirements and fire testing are:

FAR Part 1	Definitions
FAR Part 21	Certification Procedures for Products and Parts
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 37	Technical Standard Order Authorizations
FAR Part 91	General Operating and Flight Rules
FAR Part 121	Certification and Operations: Domestic, Flag, and Su

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 **STATEMENT OF COMPLIANCE WITH THE FEDERAL AVIATION REGULATIONS**	DATE

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)*

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.

I (We) Therefore
- ☐ Recommend approval of these data
- ☐ Approve these data

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.

Not Subject to OMB Clearance

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:

☐ A. I have complied with Section 21.33(a).

☐ 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)

☐ C. The engine or propeller described above, presented herewith for type certification, conforms to the type design therefor.

☐ 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

AUTHORIZED RELEASE CERTIFICATE APPROVAL TAG

1. Country	2. ☐ Conformity ☐ Airworthiness	3. Certificate Ref No.
UNITED STATES	AUTHORIZED RELEASE CERTIFICATE APPROVAL TAG	
4. Organization		5. Work Order/Contract/Invoice

6. Item	7. Description	8. Part No.	9. Eligibility*	10. Qty.	11. Serial/Batch No.	12. Status/Work

13. Remarks

14. New Parts:
Certifies that the part(s) identified above except as otherwise specified in block 13 was (were) manufactured/inspected in accordance with the airworthiness regulations of the stated country and/or in the case of parts to be exported with the approved design data and with the notified special requirements of the importing country.

15. Used Parts:
Certifies that the work specified above except as otherwise specified in block 13 was carried out in accordance with the airworthiness regulations of the stated country and the notified special requirements of the importing country and in respect to that work, the part(s) is (are) in condition for safe operation and considered ready for release to service. (over)

16. Signature

17. Name (typed or printed)

18. Date

19. Issued by or on behalf of the Federal Aviation Administration.

FAA Form 8130-3 (9-83)

* Cross-check eligibility for more details with parts catalog

Figure B-4. Authorized Release Certificate Approval Tag

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.

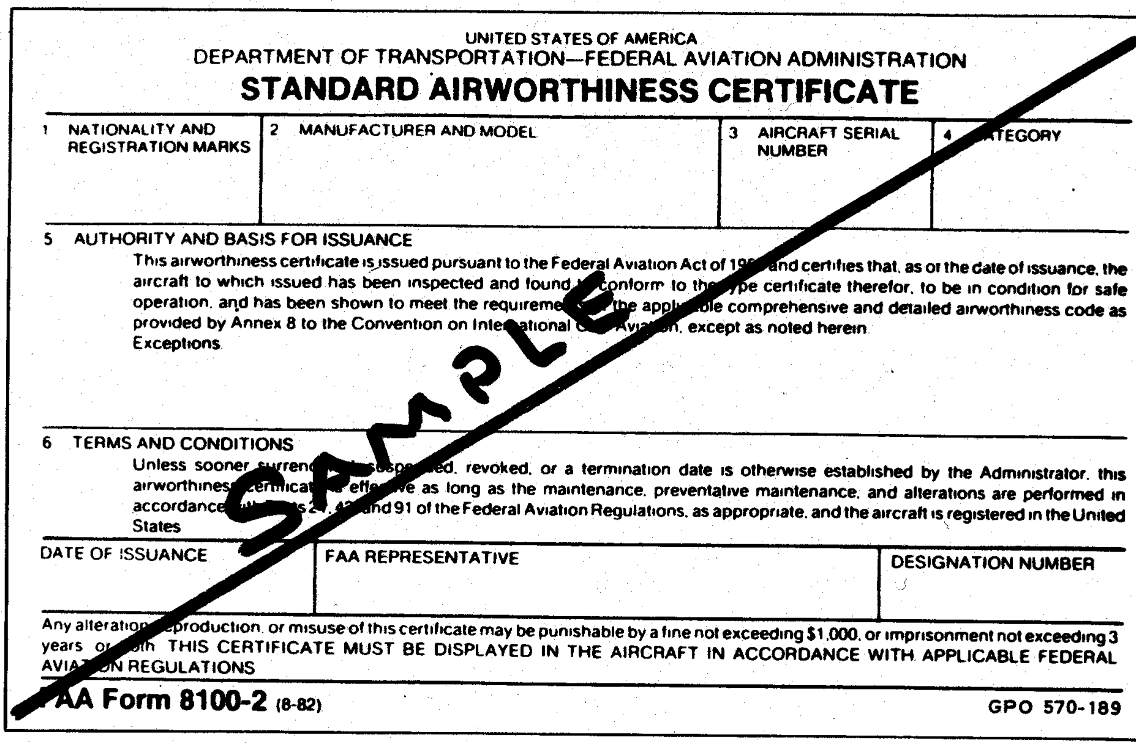
FAA approval of a manufacturer's production quality control system is the responsibility of the Manufacturing Inspection Offices of the Manufacturing Inspection Branch. No other section of the FAA, including the Aircraft Certification Division, has the authority to approve a production quality control 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 19 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

SAMPLE

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 21, 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 sub-contract 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.

Appendix C
Materials Used in Aircraft

C.1 Introduction

Materials used in aircraft are roughly the same regardless of the type of aircraft involved (normal and transport category airplanes and/or rotorcraft). The various Federal Aviation Regulations (FARs) refer mostly to FAR 25 for flammability requirements. For simplicity, this discussion will, therefore, refer only to FAR Part 25.

C.2 Aircraft Seats

Aircraft seats use a wide variety of nonmetallic materials in the constructions of the components that make up a complete seat. These components can be grouped into five basic areas (see figure C-1): foam cushions, upholsteries, fire blockers, plastic moldings, and structure. All nonmetallic seat parts must meet FAR 25.853(b). The cushions, which includes the foam, upholstery, and fire blocker (if used), must also meet FAR 25.853(c).

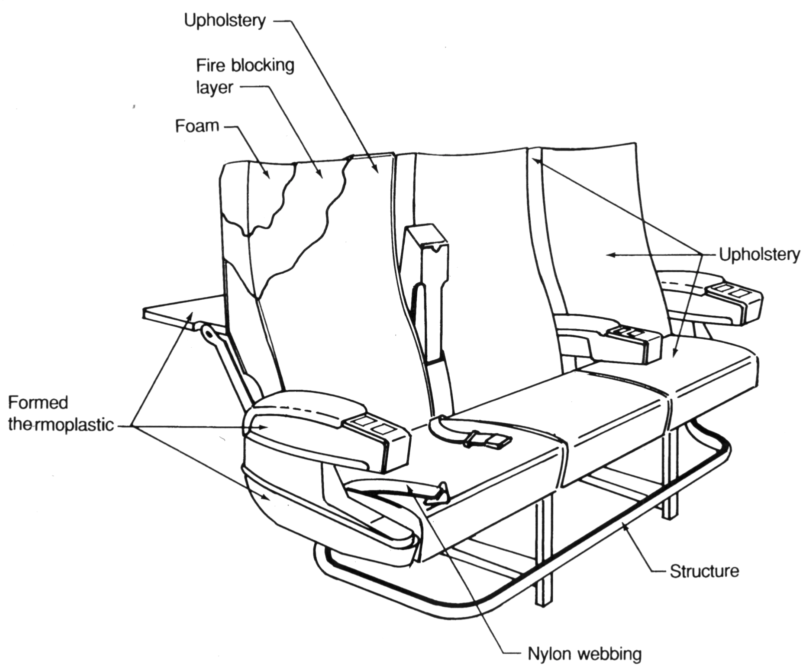


Figure C-1. Typical Seat Installation

C.2.1 Foam Cushions

Selection of foams for seats is based on requirements such as wear, comfort, flotation, flammability, and others. To meet these requirements, many different foams of various densities are used. The foam in the cushions is either molded to the final shape or cut from existing foam stock and bonded together with adhesives. Open cell urethane foams are most commonly used with densities as low as 1.98/ft^3. If the cushion is to serve as a flotation device in emergency situations, the foam must be closed cell; polyethylene foams are often used for this. Neoprene, silicone, and modified urethane foams can be used for cushions to meet FAR 25.853(c) without a fire-blocking textile. They may also be used as fire blockers over conventional foams. The densities of these foams have a range of 3 to 4 lb/ft^3.

C.2.2 Upholsteries

Typical dress cover fabrics include wool, wool/nylon blends, leather, fire-retarded (FR) polyester, FR nylon, and vinyl. Wool blends with an FR treatment, typically a zirconium type, are by far the most common type of upholstery in use and have proven to be one of the most reliable in passing FAR 25.853(b) and FAR 25.853(c). Many nondecorative fabrics are also used in seat installations; FR cotton muslin is used as a slip cover to allow easier installation of the dress cover.

C.2.3 Fire-Blocking Textiles

The use of fire-blocking textiles was required by FAR 121, Amendment 184, which required that seat cushions comply with FAR 25.853(c). To meet this regulation, textiles made of synthetic fibers, such as polybenzimidazole (PBI), aromatic polyamides, and glass, are woven or felted and used to encapsulate the foam. The weight of the fire-blocking textile required depends primarily on the foam construction and type with lower density foams normally requiring heavier fire-blocking layers.

C.2.4 Plastic Molding

Aircraft seats employ a wide variety of plastic moldings for items such as decorative closeouts, trim strips, food trays, and arm rests. Polycarbonate, acrylonitrile-butadiene-styrene (ABS), and decorative vinyls are commonly used for these purposes.

C.2.5 Structure

Most seat structures are made of aluminum; however, some manufacturers have introduced carbon composite structures to reduce weight.

C.3 Insulating Materials

The entire pressurized section of the aircraft is completely lined with thermal/acoustical insulation, which is by far the largest volume of nonmetallic material in an aircraft. The acoustical requirements for the insulation are more demanding than the thermal requirements. The insulation blanket construction used consists of a batting surrounded by a protective cover; however, in some applications, where the insulating material consists of foams or felts, a separate cover is not used. Insulation batting and covers are required to meet FAR 25.853(b).

C.3.1 Batting

Most of the thermal/acoustical insulation used is fibrous glass batting that is 0.42 to 0.6 lb/ft^3 in density and held together with a water-repellent treated phenolic binder. The diameter of the glass fiber is very small, approximately 0.0006 inch for acoustical reasons. The material easily meets FAR 25.853(a) and FAR 25.855(a). In other insulation applications (e.g., used for air ducting), foams (e.g., urethane and polyimide) and felts (e.g., aromatic polyamides) are extensively used. In higher temperature areas, fibrous glass batting with a silicone binder (for temperatures up to 700°F) and ceramic batting (for temperatures up to 2,000°F) are used. Areas of application include engine pylons, nacelles, power units, and engine bleed air ducting.

C.3.2 Insulation Covers

The main reasons for covering insulation batting are to hold it in place and to keep out contaminants such as dust and fluids, especially water. Very thin plastic films (0.5 to 2 mils) of polyester or polyvinyl fluoride reinforced with nylon yarn are used extensively due to their light weight and good tear resistance. In areas that are subject to abuse, lightweight, abrasion-resistant coated fabrics such as vinyl-coated nylon and vinyl-coated fiberglass are used. Areas subject to higher temperature require the use of silicone-coated fiberglass, metallized fiberglass, or ceramic covers.

C.3.3 Insulation Installation

Insulation is installed using a variety of attachments, including hook and loop tape (Velcro), nylon fasteners, snaps, and splicing tapes.

C.4 Interior Panel Structures

Although a few monolithic laminate panels are used, most panels used in airplane interiors are sandwich structures. This type of construction is preferred for its high strength and stiffness to weight ratio. These panels are made basically of face sheets, adhesives, core, and decorative coverings, with small variations that depend on the requirements for the individual application. Typical panels are shown in figure C-2. These panels are used for ceilings, galleys, lavatories, sidewalls, baggage racks, floors, partitions, and closets. All panels used for these applications must meet FAR 25.853(a) and (a-1).

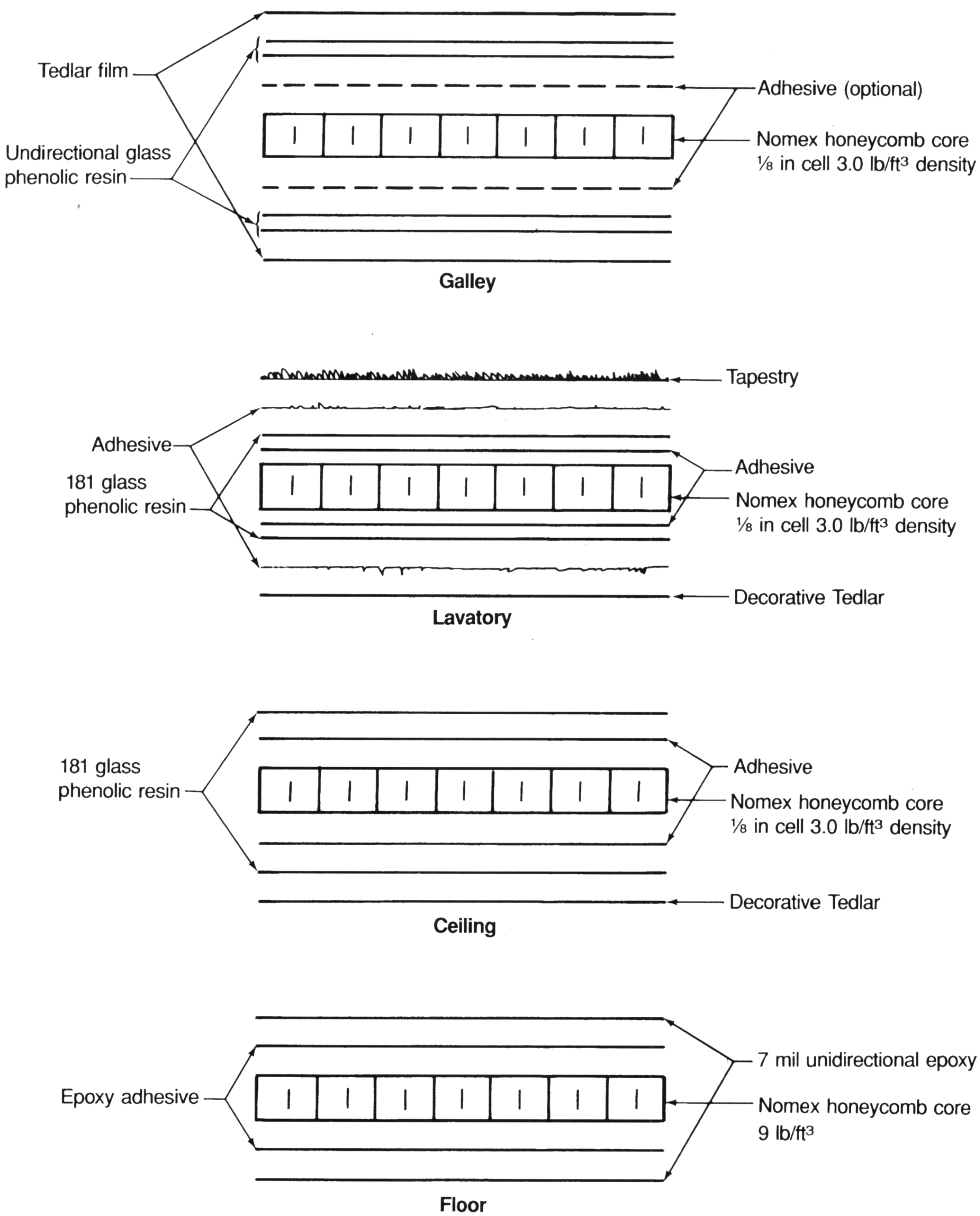


Figure C-2. Typical Panel Installation

C.4.1 Face Sheets

All panel faces consist of a resin system and a fiber reinforcement.

C.4.1.1 Fiber Reinforcement

The fiber reinforcement can either be unidirectional or woven. Fiberglass, aromatic polyamides, and graphite/carbon are used due to their high strength to weight ratio and good fire resistance. Fiberglass is the most common due to its low cost. Aromatic polyamides and carbon fibers are much higher in cost but their very high strength to weight ratio make them attractive in many applications.

C.4.1.2 Resin System

Epoxy resin systems were widely used in the middle 1960s. Later, beginning in the 1970s, phenolic resin systems began to replace epoxies because of their superior fire resistance and low smoke emissions, despite that phenolics generally are lower in strength. Today, the most prevalent resin systems are phenolic. Epoxy is still used in certain applications where strength considerations are important and/or where competing phenolic systems are not available.

C.4.2 Core

The core in a sandwich panel is most often a honeycomb structure to achieve the best physical properties at the minimum weight. Aluminum honeycomb has been used in cabin interiors; however, the most common type honeycomb is an aramid-based paper coated with a phenolic resin to stabilize the paper. Aramid honeycomb ranges in density from 1.5 pounds per cubic foot for lightweight ceiling panels to 9 pounds per cubic foot for floor panels; cell sizes range from 1/8 inch to 3/4 inch. Aramid honeycomb provides good fire resistance and can easily meet FAR 25.853(a) without face sheets. Other types of core materials that have been used include polyurethane, polyvinyl chloride, polyimide foams (to reinforce edges and fastener points), and balsa wood (for floor panels in passenger cabins and cargo holds).

C.4.3 Adhesives for Bonding Face Sheets to Core

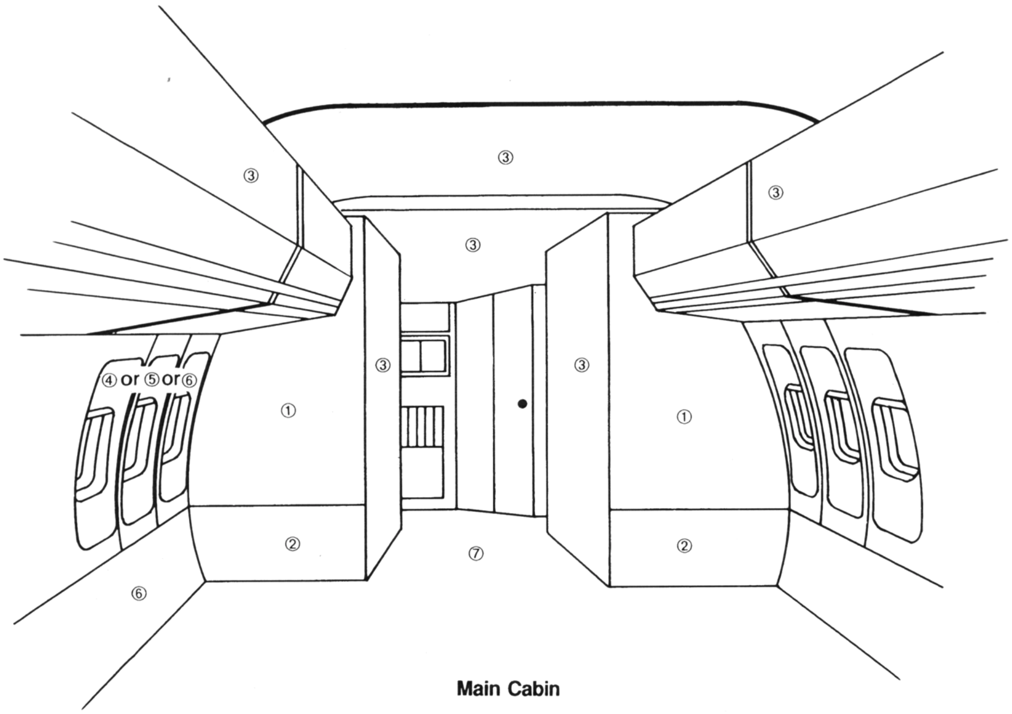
Epoxy and modified phenolic film adhesives are used to bond face sheets to the core. Some face sheets employ a modified resin to allow bonding directly to the core and do not require a separate adhesive film.

C.4.4 Decorative Coverings for Panels

All interior panels have a decorative covering on surfaces that are visible to passengers. Decorative plastics, paint, wainscoting, and tapestries all serve both aesthetic and functional purposes. See figure C-3 for a description of decorative coverings used in a typical main cabin of an aircraft.

C.4.4.1 Plastic Laminates

Most surfaces that are in direct contact with passengers and crews or surfaces that require a lightweight cover have decorative plastic laminates. Galley and lavatory surfaces that face the aisle, ceilings, baggage racks, lavatory interiors, and door liners are typical applications for decorative plastic laminates. In high use areas, vinyls have been applied because of their good abrasion resistance. Surfaces that expect less abuse employ polyvinyl fluoride (PVF) or PVF/vinyl combinations. These materials have good cleanability and colorfastness. Many of the new decorative Tedlar laminates exhibit very low heat release, making them ideal for many interior surfaces that are required to meet FAR 25.853(a-1).



Main Cabin

① Panel construction with tapestry cover.
② Panel construction with wainscot cover.
③ Panel construction with decorative plastic laminate.
④ Formed thermoplastic or laminate.
⑤ Formed aluminum with decorative plastic laminate.
⑥ Composite laminate with wainscot cover.
⑦ Panel construction with carpet cover.

Figure C-3. Typical Main Cabin

C.4.4.2 Decorative Textiles

Surfaces that face the passengers on galleys, lavatories, closets, and partitions are typically covered with decorative textiles. Plush, hand-tufted, 100 percent wool face tapestries are often used on upper panel surfaces. Lightweight carpeting or a grospoint construction is common on lower panel surfaces. A variety of materials and methods are used to make tapestries. The lower surface textile, wainscoting, is usually fabricated of treated wool or nylon with a very lightweight backing or no backing. With the new heat release regulation, most of the previously used tapestries and wainscoting can no longer be applied. Tapestry and wainscoting fabrics made from synthetics and wool/synthetic combinations are produced in order to meet the heat release requirements.

C.4.4.3 Paint

Interior polyurethane and water-based paints are used primarily on surfaces that see little abuse, such as those behind the pilots. Paint is also used on many small parts throughout an aircraft.

C.5 Floor Coverings

The type of floor covering used depends on the location in the aircraft. All floor coverings must meet FAR 25.853(b). Carpet covers most of the cabin floor, including the aisle and under the seats. Most aircraft have wool- or nylon-face yarns with polyester, polypropylene, cotton, or fiberglass backing yarns and a fire-retardant back coating. Wool-face yarns are treated with a fire retardant. Nylon carpets must have a highly fire-retardant back coating for fire resistance. Carpet underlays of felt are used in some aircraft for noise suppression. Areas where fluid spills are likely, such as galleys and lavatories, use plastic floor coverings typically made of vinyl with a reinforcing fabric backing and an antislip surface.

C.6 Draperies

Draperies are used to close off sections of the aircraft such as galleys and to separate the classes of passenger service. Drapery fabrics are usually wool or polyester fabric that has been treated with a flame retardant.

C.7 Nonmetallic Air Ducting

Due to the relative compactness of an aircraft, much of the conditioned air ducting has to be routed around many different parts. This results in some very complex shapes. Nonmetallic ducting is used to create these complex parts because it is much less expensive to fabricate than aluminum ducting. There are three basic types of nonmetallic duct constructions: fiber-reinforced resin, thermoplastic, and rigid foam. All conditioned air ducting must meet FAR 25.853(b).

C.7.1 Fiber Reinforced

Fiber-reinforced resins consist of woven fiberglass with polyester, epoxy, or phenolic resin systems. Some aromatic polyamide/epoxy is also used. Ducts made from these materials are usually coated after curing on the outside with a polyester or epoxy resin to seal against leaks. Fiberglass impregnated with silicone rubber is the industry standard for duct boots because of flexibility, strength, low air permeability, and good fire resistance.

C.7.2 Thermoplastic

Thermoplastic ducting is typically made of vacuum-formed polycarbonate or polyetherimide. Thermoplastic ducts are not as strong as fiber-reinforced resin; however, thermoplastic ducts are much less costly to fabricate.

C.7.3 Foam

Polyimide or polyisocyanurate foam ducts are used for larger ducts with complex shapes and have the advantage of not requiring additional insulation. Foam ducts are popular for their low weight.

C.8 Linings (Nonpanel)

Linings are used where strength and flexibility are required to provide a contoured shape; in addition, linings provide an aesthetically pleasing surface and protect the assemblies behind the liner. Areas such as the exit door, flight deck, cabin sidewalls, door frames, and cargo holds utilize liners fabricated of reinforced resins or thermoplastics. Decorative sidewall liners made of formed aluminum are used in some aircraft. Depending on the application, the liners must meet FAR 25.853(a), (a-1), or (b) or FAR 25.855(a) or (a-1) or a combination.

C.8.1 Reinforced Resin

Linings that are subjected to passenger and food cart traffic are typically manufactured from plies of fabric-reinforced resin. Their flexibility, impact resistance, high strength, and low weight make them ideal for lower sidewall kick panels. Cargo liners required to meet FAR 25.855(a) and (a-1) are fabricated using fiberglass reinforced resins because of the burn-through and impact resistance.

C.8.2 Thermoplastics

Linings that see less abuse and do not require high strength are fabricated from thermoplastics because less expensive fabrication methods are used. Flight deck sidewalls, upper door liners, attendant stations, and closeouts are typical applications for vacuum and pressure formed thermoplastics such as ABS, polycarbonate, and polyetherimide. In many applications, thermoplastics are integrally pigmented and textured and do not require any decorative covering.

C.9 Electrical Components

C.9.1 Wire and Cable Insulation

Wire and cable insulation comprises a substantial amount of the nonmetallic material in an aircraft. For general wire and cable applications inside the pressure shell, the majority of the insulation used is polyimide (Kapton). Not quite as prevalent is irradiated, crosslinked, polyethylenetetrafluoroethylene. In some areas, aromatic polyamide braiding is used to cover power feeder cables for scuff resistance. For higher temperature and fuel areas polytetrafluorothylene (PTFE) is used almost exclusively. Where very high temperature or burn-through resistance is a requirement, filled PTFE is typically used. Asbestos had been used as the filler in the past, but has been replaced by proprietary fibers. To withstand the high temperature requirements of fire zones, heavily nickel-plated copper wire is used to ensure continued operation of electrical equipment. All wire insulations must meet FAR 25.1359(d), and those located in fire zones must also meet FAR 25.1359(b).

C.9.2 Conduit and Tubing

Different types of conduit and tubing are used for electrical wires and components. Polyvinyl fluoride and polyolefin heat shrink tubing, silicone glass fiber braid, and extruded and convoluted nylon tubing are industry standards.

C.9.3 Connectors

Most connectors in an aircraft are made of Bakelite aluminum with silicone or hardened dielectric material inserts and have no specific FAR burn requirements. Connectors located in firewalls, however, must be fireproof and are made of low carbon or stainless steel to meet burnthrough requirements.

C.10 Firewalls

Firewalls are required around all designated fire zones (e.g., engine compressor, accessory sections) to isolate a fire (see figure C-4). Titanium and steel of at least 0.015-inch thickness are used as firewalls. Steel is the preferred material as it does not warp under heat to the extent titanium does. To provide even more burnthrough resistance in specific areas, resin-impregnated high-silica glass or coated niobium is used.

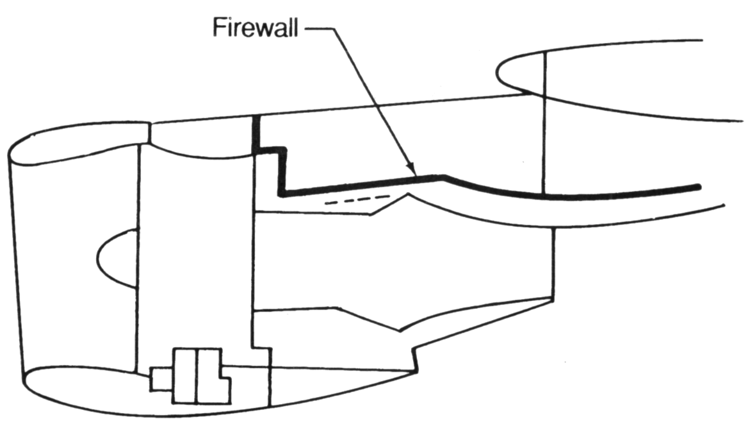


Figure C-4. Typical High Bypass Engine

C.11 Windows

All aircraft windows at present are fabricated from stretched cast polymethylmethacrylate. Stretched acrylic has the optical clarity, strength, low weight, and solvent resistance required. All windows must meet FAR 25.853(b-2).

C.12 Small Parts

Except for electrical wire and cable insulation and for small parts (such as knobs, handles, rollers, fasteners, clips, grommets, rub strips, pulleys, and small electrical parts) that the Administrator finds would not contribute significantly to the propagation of a fire, parts/materials not identified in FAR 25.853(a), (b), (b-1), or (b-2) shall not have a burn rate greater than 4 inches per minute when tested horizontally in accordance with FAR 25.853 (b-3).

Appendix D
Regulatory Methodology Used by Other Countries

D.1 Introduction

Air commerce is very much an international business. Aircraft designed and built in one country are imported and operated in other countries. Airlines based in one country have route networks that extend to many other countries. A complicated set of international agreements is, therefore, required to ensure the safe design and operation of aircraft operated internationally and has led to the status that the regulatory methodologies used by most nations are relatively similar.

D.2 Foreign Airworthiness Authorities and Regulations

Each country is responsible for setting appropriate requirements and enforcement procedures to ensure the safe design and operation of aircraft in that country. This includes aircraft registered and operated in that country and foreign-registered aircraft operated to that country in international commerce.

Most countries have their own airworthiness authorities and codes or regulations to some degree of detail. In addition to their own regulations, many countries also accept sections of other countries' codes for aircraft certification and approval, particularly Federal Aviation Regulations (FARs) of the United States and British Civil Airworthiness Requirements (BCARs) of the United Kingdom. In addition, Joint Airworthiness Regulations (JARs) from the Joint Aviation Authorities of Europe.

Table D-1 identifies airworthiness authorities and additional country codes adopted for issuance of a certificate of airworthiness.

D.3 Regulations Covering Foreign Air Carriers

Airlines based in one country that wish to transport passengers and/or goods into another country must comply with the requirements imposed on foreign carriers by the host country before the service can start. Generally, such agreements are more or less reciprocal.

In the United States, the requirements are contained in FAR 129, "Operations: Foreign Air Carriers and Foreign Operators of U.S. Registered Aircraft Engaged in Common Carriage," and mandate essentially that the aircraft and aircrew involved be certificated in the country of registry, and that the operation of the aircraft observe the air traffic rules and procedures prescribed for U.S. air carriers.

In other countries, the requirements are generally similar to those in the United States.

D.4 Certification of Foreign-Manufactured Aircraft

Aircraft manufactured in one country are often sold and exported to other countries for operation. This is particularly true of large transport aircraft manufactured in the United States, the United Kingdom, and the Airbus consortium countries (France, Spain, West Germany, and the United Kingdom).

The aircraft must meet specified airworthiness regulations of the importing country and must receive from the exporting country whatever licenses or permits are needed for it to be exported.

During the 1950s and 1960s, large transport aircraft were manufactured almost exclusively in the United States, the United Kingdom, and the Soviet Union. Many of these aircraft were purchased and imported by other countries. Most countries not allied with the Soviet Union purchased and imported large transport aircraft from the United States or the United Kingdom. Since these aircraft were certificated to the FARs or the very similar BCARs, it was expeditious and beneficial for other countries to base their own regulations on FARs and/or BCARs.

Table D-1. Air Worthiness Authorities and Country Codes

Country	Airworthiness Authority	Airworthiness Standards
Argentina	Direccion Nacional de Aeronavegabilidad	Information Bulletins No. 13 and 24
Australia	Department of Transport Airworthiness Division	Australian Air Navigation Order 101
Brazil	Departmento de Aviacaco Civil	Brazilian Aeronautical Certification Requirements
Canada	Airworthiness Division Transport Canada	FAR Parts 23, 25, 27, 29, 31, 33,and 35 JAR 22 TSOs
Denmark	Director of Civil Aviation	FAR BCAR JAR
Finland	National Board of Aviation Flight Safety Department	JAR 25 FAR Finnish Aviation Regulations detail any deviations
France	Direction Generale de l'Aviation Civile (DGAC)	JAR 25 FAR Parts 23, 27, and 29
Germany, Federal Republic of	Luftfahrtbundesamt (LBA)	FAR Parts 23, 25, 27, and 29 JAR 22 and 25
Indonesia	Directorate General of Air Communications	Civil Aviation Safety Regulations, based on FAR Parts 23, 25, 27, 29, 33,35, and 37
Ireland	Department of Transport Aeronautical Airworthiness Service	BCAR FAR
Italy	Ministereo dei Trasporti Direzi- one Generale Dell'Aviazionne Civile	Parts 223, 225, 226, 228, 231, 233, and 235 of RAI Technical Rules, based on FAR Parts 23, 25, 27, 29, 31, 33 and 35 JAR
Japan	Airworthiness Division Civil Aviation Bureau Ministry of Transport	Annex to Civil Aeronautics Regulations of Japan
Mexico	Direccion General de Aeronautica Civil	Reglamento de Operacion de Aeronaves Civiles y Circular relativos a certificados de aeronavegabilidad
Netherlands, Kingdom of	Aeronautical Inspection Directorate	Netherlands Airworthiness Requirements, based on JAR and FAR
New Zealand	Director of Civil Aviation Ministry of Transport	New Zealand Civil Airworthness Requirements C-1, C-2, C-3, and C-4
Norway	Civil Aviation Administration Aeronautical Inspection Department	JAR FAR BCAR
Sweden	Board of Civil Aviation Flight Safety Department	FAR JAR Swedish Civil Aviation Regulations detail any deviations
Switzerland	Federal Office for Civil Aviation	FAR Franch Airworthiness Code (LFSM) JAR German Airworthiness Code (LFSM) BCAR
United Kingdom	Civil Aviation Authority	BCAR JAR
United States	Federal Aviation Administration	FAR

Beginning in the 1970s, aircraft began to be manufactured in more countries. In addition, the aircraft manufacturing industry has an increasing number of international companies and, as a result, many multinational business ventures have evolved. Foreign governments have approached this growth in the airplane industry by organizing their own airworthiness authorities and regulations and by entering into international agreements regarding airplane certification.

D.4.1 Bilateral Airworthiness Agreements

A useful procedure to reduce the problems associated with certification of aircraft by importing countries is the Bilateral Airworthiness Agreement (BAA). These agreements generally state that for those requirements in the two countries' regulations that overlap, the importing country will accept the exporting country's certification of compliance. Requirements imposed by the importing country that are not included in the exporting country's regulations must be separately shown to have been met.

The United States negotiates BAAs primarily with countries who have an aeronautical product they desire to export to the United States. When a request is made to establish a BAA, the FAA must evaluate the foreign airworthiness authority's technical competence, capabilities, and regulatory authority, and the country's airworthiness laws and regulations to ensure that an equivalent level of safety will be met. Currently, the United States has 24 such agreements. Those countries have BAAs with the United States; those BAA components are identified in table D-2. A copy of each BAA can be found in Advisory Circular 21-18, "Bilateral Airworthiness Agreements."

BAAs are not considered to be trade agreements; they are technical agreements, existing only to facilitate the reciprocal acceptance of certification. Most BAAs address the following issues:

1. The importing country shall give the same validity to the certification given by the exporting country.

2. The aeronautical authority of the importing country shall have the right to make acceptance of any certification by the airworthiness authority of the exporting country. This depends on the product meeting any additional requirements that the importing country finds necessary that would be applicable for a similar product produced in the importing country.

3. Each airworthiness authority shall keep the other informed on all relevant laws, regulations, and requirements.

4. In the event of conflicting interpretations of a regulation, the interpretation of the country originating the relation shall prevail.

In the United States, the Federal Aviation Administration (FAA) implements BAAs through the export and import certification regulations of FAR Part 21.

D.4.2 Joint Airworthiness Regulations (JARs)

The Joint Aviation Authorities (JAA) is an associated body of the European Civil Aviation Conference (ECAC) representing the civil aviation regulatory authorities of a number of European States who have agreed to co-operate in developing and implementing common safety regulatory standards and procedures. This co-operation is intended to provide high and consistent standards of safety and a "level playing-field" for competition in Europe. Much emphasis is also placed on harmonizing the JAA regulations with those of the USA.

Table D-2. Summary of Products Eligible for U.S. Import Under Bilateral Agreements

BILATERAL COUNTRIES (Revised 1999)	**Aircraft**	**Replacement/Modification Parts for Exported Aircraft**	**Aircraft Engines**	**Replacement/Modification Parts for Exported Engines**	**Propellers**	**Replacement/Modification Parts for Exported**	**Appliances**	**Replacement/Modification Parts for Exported**	**Materials**	**Parts**	**Subassemblies**	**Third Country Provisions**	**Maintenance**	**Agreement Date**	**See Reference Notes Number**
Argentina	X	X	X	X	X	X	X	X	X	X	X			1991	
Australia	X	X	X	X	X	X	X	X	X	X	X	X		1975	1, 2, 3
Austria	X	X	X	X	X	X								1959	
Belgium	X	X	X	X	X	X	X	X	X	X	X	X		1973	1, 2
Brazil	X	X	X	X	X	X	X	X	X	X	X	X		1976	1, 2
Canada	X	X	X	X	X	X	X	X	X	X	X	X	X	1984	1, 2
China	X	X					X							1991	4
Czech Republic	X	X	X	X	X	X	X	X						1970	
Denmark	X	X	X	X	X	X	X	X	X	X	X	X		1970	2
Finland	X	X					X	X						1974	5
France	X	X	X	X	X	X	X	X	X	X	X	X		1973	1, 2
Germany	X	X	X	X	X	X	X	X	X	X	X	X	 X	1999 1998	1, 2, 13
Indonesia														1992	6
Israel	X	X	X	X	X	X	X	X	X	X	X			1974	2
Italy	X	X	X	X	X	X	X	X	X	X	X	X		1973	1, 2
Japan	X	X	X	X	X	X	X	X	X	X	X	X		1977	1, 2
Malaysia	X	X					X							1997	7
Netherlands	X	X	X	X	X	X	X	X	X	X	X	X		1974	1, 2
New Zealand	X	X	X	X	X	X	X	X	X	X	X			1979	2, 8
Norway	X	X					X	X						1978	
Poland	X	X	X	X	X	X	X	X	X	X	X	X		1980	2, 9
Romania	X	X												1976	10
Russia	X	X							X					1998	11
Singapore							X	X	X	X	X	X		1981	1, 2, 12
South Africa	X	X	X	X	X	X	X	X	X	X	X			1984	2
Spain	X	X					X	X						1978	
Sweden	X	X	X	X	X	X	X	X	X	X	X	X		1973	1, 2
Switzerland	X	X	X	X	X	X	X	X	X	X	X			1977	2
United Kingdom	X	X	X	X	X	X	X	X	X	X	X	X		1972	1, 2

The JAA Membership is based on signing the "JAA Arrangements" document originally signed by the then current member States in Cyprus in 1990. Based on these Arrangements and related commitments, the JAA's objectives and functions may be summarised as follows:

Objectives:

- To ensure, through co-operation on regulation, common high levels of aviation safety within the Member States.
- To achieve a cost effective safety system so as to contribute to an efficient aviation industry.

- To contribute, through the uniform applications of common standards, to fair and equal competition within the member states.

- To promote, through international co-operation, the JAA standards and system to improve the safety of aviation worldwide.

Functions:

- To develop and adopt Joint Aviation Requirements (JARs) in the fields of aircraft design and manufacture, aircraft operations and maintenance, and the licensing of aviation personnel.

- To develop administrative and technical procedures for the implementation of JARs.

- To implement JARs and the related administrative and technical procedures in a co-ordinated and uniform manner.

- To adopt measures to ensure, whenever possible, that pursuance of the JAA safety objective does not unreasonably distort competition between the aviation industries of Member States or place companies of Member States at a competitive disadvantage with companies of non-Member States.

- To provide the principal center of professional expertise in Europe on the harmonization of aviation safety regulation.

- To establish procedures for joint certification of products and services and where it is considered appropriate to perform joint certification.

- To co-operate on the harmonization of requirements and procedures with other safety regulatory authorities, especially the Federal Aviation Administration (FAA).

- Where feasible, to co-operate with foreign safety regulatory authorities, especially the FAA, on the certification of products and services.

JAA's work was started in 1970 (when it was known as the Joint Airworthiness Authorities). Originally its objectives were only to produce common certification codes for large aeroplanes and for engines. This was to meet the needs of European industry, particularly for products manufactured by international consortia (eg., Airbus). Since 1987 its work has been extended to operations, maintenance, licensing and certification/design standards for all classes of aircraft. Common procedures and the approval of design, production, and maintenance organizations are covered. A single Joint Certification team, working on behalf of all the JAA countries, is used for certification of new aircraft and engines. After the successful completion of the evaluations, Type Certificates are issued simultaneously, and on a common basis, by all States.

The JAA originated as the Authorities' response to the technical and economic needs of the European aviation industry. However, since 1 January 1992, JAA codes, as they are completed, are referenced in the European Community Regulation on Harmonized Technical Standards and become law in the EC States.

Industry is fully represented in committees and working groups developing requirements and procedures and in a joint assembly and joint boards where policy issues are debated.

The JAA, as presently constituted, carries out its tasks of approval, certification and safety monitoring using staff of the national authorities, who also retain the responsibility for the legal findings of granting licenses and certificates, etc. The JAA Headquarters is responsible for the process of rulemaking, harmonization and standardization, (using specialist staff from the national authorities), the decision-making system, the "infrastructure," and various related tasks.

The relevant committees and working groups for the work in the Materials Handbook are the following:

- JAA Research Committee

  The committee is tasked to promote, coordinate, and disseminate the results of aviation safety research carried out in JAA countries and to prepare proposals for aviation safety research funds by the European Commission and to liaison with the EU as necessary.

- Project Advisory Group on Occupant Survivability

  This group, reporting to the JAA Research Committee, is tasked to advise on the Research Committee on matters related to Occupant Survivability

- The Cabin Safety Study Group

  This group reports to the JAA Certification Director at the JAA Headquarters.
  The purpose of the Cabin Safety Study group is to consider the Cabin Safety Requirements related to the design and construction and equipment requirements for the JAR-25.

In 1979 a milestone was passed when JAR 25, which was based on FAR 25 and covered large transport aircraft, was adopted. France, the Netherlands, the United Kingdom, and West Germany have adopted JAR 25 as their sole, common code for certification of large transport aircraft. Incidentally, FAR 25 Amendments are not automatically adopted into JAR 25; they must first be accepted by the Steering Committee before incorporation.

REFERENCE NOTES

1. These bilateral agreements contain a third-party country provision which provides for import/export certification of products by the CAA of a country other than the country of manufacture. In these instances, the exporting country must certify that the products conform to the design covered by the certificate or approval of the importing country (which would be other than country of manufacture) and that the products are in proper state of airworthiness. This provision only applies when all three countries (i.e., manufacturing, importing, and exporting countries) have similar agreements for the reciprocal acceptance of such certifications covering the same class of products. The specific text of the applicable bilateral agreements should be consulted for any limitations.

2. The U.S. has bilateral agreements with these countries which provide for the reciprocal acceptance of conformity inspections (certificates of conformity) for components (i.e., materials, parts, and subassemblies) produced within the limits of each particular bilateral, provided that

   a. an agreement exists between the manufacturers in the importing and exporting countries;

   b. the component is of such complexity that a determination of conformity cannot readily be made by the manufacturer in the importing country;

   c. the airworthiness authorities of the importing country have notified the airworthiness authorities of the exporting country of the applicable design, test, and quality control requirements; and

   d. the authority of the exporting country is willing to undertake the conformity inspection task.

3. The U.S./Australian BAA contains a two-party country provision which provides for

   a. reciprocal certification whereby Australia can issue an export certificate for a U.S.-manufactured product located in that country which is to be exported to the U.S.

b. conversely, the U.S. can issue an export certificate for an Australian-manufactured product that is located in the U.S. and is to be exported to Australia.

c. such certifications will state that the product conforms to the importing country's type design and is in a proper state of airworthiness.

4. The Schedule of Implementation Procedures for the U.S./China BAA provides for U.S. acceptance of Chinese TSO appliances, fixed-wing aircraft not exceeding 12,500 lbs., and commuter category airplanes up to 19 passengers with a maximum certificated takeoff weight of 19,000 lbs.

5. Although this bilateral agreement contains a provision for including appliances and replacement or modification parts, therefore, by mutual consent of both countries' aviation authorities, no appliances nor replacement/ modification parts have been included to date.

6. The Schedule of Implementation Procedures for the U.S./Indonesia BAA is limited, when exporting aeronautical products from Indonesia to the U.S., to the production approval and airworthiness certification or approval of civil aeronautical products for which the Indonesian manufacturer holds the manufacturing rights to a U.S. type certificate under a licensing agreement with a U.S. manufacturer or with a manufacturer in another state with which the U.S. has an agreement for the reciprocal acceptance of type design certifications.

7. The U.S./Malaysia Implementation Procedures for Airworthiness provides for U.S. acceptance of Malaysian TSO appliances and small metal airplanes of up to nine passengers with a maximum certificated takeoff weight of 12,500 lbs.

8. The U.S./New Zealand BAA is limited to

   a. Export from New Zealand to the U.S.:

      i. Fixed-wing aircraft constructed in New Zealand not exceeding a maximum weight of 12,500 pounds and their spare (replacement) parts;

      ii. Appliances for use on civil aircraft and their spare (replacement) parts;

      iii. Components for fixed-wing aircraft not exceeding 12,500 pounds

   b. Export from U.S. to New Zealand:

      i. U.S.-constructed civil aircraft, aircraft engines and propellers and their spare (replacement) parts;
      ii. Appliances for use on civil aircraft and their spare (replacement) parts;
      iii. Components for use on civil aircraft and related products.

9. The U.S./Poland BAA is limited to

   a. Products which may be exported from Poland to U.S. (or U.S. possession):

      i. Civil gliders and replacement/modification parts therefore designed and produced in Poland;

      ii. Piston engines of 1,000 h.p. or less with associated propellers and accessories and replacement/ modification parts therefore produced in Poland;

      iii. Small fixed-wing aircraft of 12,500 pounds of less and replacement/modification parts therefore;

      iv. Helicopters with associated accessories and replacement/ modification parts therefore;

      v. Turbine engines and replacement/modification parts therefore; and,

vi. Components and appliances for U.S.-manufactured products of the types specified in subparagraphs i., ii., iii., iv., and v. above.

b. Products which may be exported from the U.S. to Poland:

i. U.S.-designed and produced aircraft, engines, propellers, components, appliances, and replacement/ modification parts therefore; and

ii. U.S.-produced components and appliances for Polish-manufactured products and replacement and spare parts therefore.

10. The U.S./Romania bilateral provides for U.S. acceptance of Romanian and motorized gliders only.

11. The U.S./Russia Implementation Procedures for Airworthiness limit U.S. acceptance to Russian—

a. New and used, metal aircraft having up to nine passengers and a maximum certificated takeoff weight of 12,500 lbs or less,

b. New and used transport category aircraft (cargo configuration only) with FAA-certificated engines, propellers, and avionics, approved for Category I and Category II instrument approach procedures; and

c. Metallic materials.

Aircraft eligible for import to the U.S. must have been designed to the applicable Russian aviation regulations (APs). Aircraft built to early regulations are not covered under this agreement.

12. The U.S./Singapore BAA is limited to –

a. Export from Singapore to the U.S.:

i. U.S.-designed component for use in the manufacture of an aircraft or related product in the U.S. (Note: Such components may also be shipped directly from Singapore to other States [other than the U.S.], when authorized by the FAA, for use as a replacement or modification part on U.S.-registered aircraft located in the other State) and;

ii. Appliances approved under Federal Aviation Regulations, § 21.617, Technical Standard Order Design Approval.

iii. Note 1 of this document (third party country provision) only applies to those products listed under the foregoing subparagraphs 1. and 2. exported from Singapore to the U.S.

b. Export from the U.S. to Singapore:

i. All products listed in the summary chart (page 1 of this appendix); and

ii. Note 1 of this document (third-party country provision) applies to all products listed in the summary chart, exported from the U.S. to Singapore.

13. On August 23, 1999, Implementation Procedures for Airworthiness were concluded under the U.S./Germany Bilateral Aviation Safety Agreement. This IPA includes reciprocal acceptance of all aeronautical products and STCs. (The IPA replaces the 1974 U.S./Germany Bilateral Airworthiness Agreement.) A Maintenance Implementation Procedure was concluded with Germany in 1997 for reciprocal acceptance of repair station certifications (contact AFS-300).

BILATERAL AGREEMENTS

	Country	Agreement Type	Application/Scope of U.S. Acceptance
1.	Argentina	• BAA • Schedule of Implementation Procedures	Applies to all aeronautical products, including components
2.	Australia	• BAA	Applies to all aeronautical products and certain components
3.	Austria	• BAA	Applies to all aeronautical products
4.	Belgium	• BAA	Applies to all aeronautical products and certain components
5.	Brazil	• BAA	Applies to all aeronautical products and certain components
6.	Canada	• BAA • Schedule of Implementation Procedures	Applies to all aeronautical products, including components
7.	China	• BAA • Schedule of Implementation Procedures	Applies to fixed-wing aircraft not exceeding 12,500 lbs., commuter category airplanes up to 19 passengers with a maximum certificated takeoff weight of 19,000 lbs. or less, and TSO appliances
8.	Czech Republic	• BAA • Operating Procedures	Applies to all aeronautical products
9.	Denmark	• BAA	Applies to all aeronautical products and certain components
10.	Finland	• BAA	Applies to gliders and aircraft appliances
11.	France	• BAA	Applies to all aeronautical products and certain components
12.	Germany	• BASA Executive Agreement • Implementation Procedures for Airworthiness	Applies to all aeronautical products and certain components
13.	Indonesia	• BAA • Schedule of Implementation Procedures	Applies to production oversight in Indonesia under licensing agreements with U.S. manufacturers
14.	Israel	• BAA	Applies to all aeronautical products, appliances, and components
15.	Italy	• BAA	Applies to all aeronautical products and certain components
16.	Japan	• BAA	Applies to all aeronautical products and certain components
17.	Malaysia	• BASA • Implementation Procedures for Airworthiness	Applies to TSO appliances and small, all metal airplanes up to nine passengers with a maximum certificated takeoff weight of 12,500 lbs.
18.	Netherlands	• BAA	Applies to all aeronautical products and certain components
19.	New Zealand	• BAA	Applies to fixed-wing aircraft not exceeding 12,500 lbs.
20.	Norway	• BAA	Applies to all categories of civil aircraft and appliances
21.	Poland	• BAA	Applies to certain components, gliders, piston engines of 1,000 h.p. or less, associated propellers, helicopters, turbine engines, and fixed-wing aircraft not exceeding 12,500 lbs.

BILATERAL AGREEMENTS

	Country	Agreement Type	Application/Scope of U.S. Acceptance
22.	Romania	• BAA	Applies to gliders and motorized gliders
23.	Russia	• BASA Executive Agreement • Implementation Procedures for Airworthiness	Applies to small, all metal airplanes up to nine passengers with a maximum certificated takeoff weight of 12,500 lbs and to transport category cargo airplanes (both with FAA-certificated engines, propellers, and avionics).
24.	Singapore	• BAA	Applies to TSO appliances and components
25.	South Africa	• BAA	Applies to all categories of civil aircraft
26.	Spain	• BAA	Applies to all categories of civil aircraft and appliances
27.	Sweden	• BAA	Applies to all aeronautical products and certain components
28.	Switzerland	• BAA	Applies to all aeronautical products and certain components
29.	United Kingdom	• BAA	Applies to all aeronautical products and certain components

Appendix E
Aircraft Industries Internal Test Methods and Guidelines

As written, Federal Aviation Administration (FAA) test procedures for meeting the requirements set forth in Federal Aviation Regulation (FAR) 25 sometimes contain incomplete documentation (e.g., the firewall test). In order to establish standardized guidelines for these test procedures, including more detailed instructions and safety precautions, individual aircraft manufacturers have established some of their own internal documentation. This documentation, as well as having detailed instructions, is at times also used to certify different materials to applicable FARs. Table E-1 contains a listing of each FAR fire test and the equivalent company internal test method document number, as well as the applicable American Society for Testing and Materials (ASTM) standard, if any. Other testing related to fire safety (such as toxicity) is also listed. These documents are normally available from the listed company.

Table E-1. Industry Test Documentation

FAA Regulation		Industry Test Documentation						
Burn Test Description	**FAR Paragraph No.**	**Airbus**	**British Aerospace**	**Boeing**	**Douglas**	**Shanghai Aircraft Research Institute**	**Daimler-Benz Aerospace**	**ASTM**
Piping/hose assemblies	25.1183 (a)		ISO/DIS 2685					
Fire zone wire	25.1359 (b)		ISO/DIS 2685		MIL-C-25038			
Wire insulation	25.1359 (d)	ATS 1000.001	BACM 1555A		DMS 1501		ATS 1000.001	ASTM-F 777
60-second vertical	25.853 (a)	ATS 1000.001	BACM 1551A	BSS 7230 F1	DMS 1510		ATS 1000.001	ASTM F 501
OSU heat release	25.853 (a-1)		BAEP 4508	BSS 7322	DMS 2277		W-TE335-304/87	ASTM Modified E 906*
12-second vertical	25.853 (b)	ATS 1000.001	BACM 1555A	BSS 7230 F2	DMS 1511		ATS 1000.001	ASTM F 501
2.5-in/min horizontal	25.853 (b-2)	ATS 1000.001	BACM 1555A	BSS 7230 F3	DMS 1505		ATS 1000.001	ASTM F 776
4-in/min horizontal	25.853 (b-3)	ATS 1000.001	BACM 1555A	BSS 7230 F4	DMS 1507		ATS 1000.001	ASTM F 776
Oil burner seats	25.853 (c)		BAEP 4508	BSS 7303	DMS 2274	HB 7263	TBD	*
Fire containment	25.853(d)		BACM 1555A	Document No. D6T11679	DMS 1513			
3 second, 45 degree	25.855 (a)	ATS 1000.001	BACM 1555A	BSS 7230 F5	DMS 1508		ATS 1000.001	ASTM F 1103
Oil burner, cargo liner	25.855 (a-1)		BAEP 4508	BSS 7323	DMS 2273		TBD	*
Radiant heat test	TSO-C69a, Appendix 2	TSO		BSS 7315				ASTM F 828
Other NBS smoke	25.853 (a-1)	ATS 1000.001	BAEP 4625	BSS 7238	DMS 1500		ATS 1000.001	ASTM F 814
Toxicity		ATS 1000.001	BAEP 4623	BSS 7239	DMS 2294	HB 7066	ATS 1000.001	
Lot							ASTM D 2863	ASTM D 2863

*ASTM test method being written by subcommittee F7.06.

Appendix F—Laboratories Actively Using Fire Test Procedures

The companies listed in table F-1 are actively using the fire test procedures discussed in this Handbook (This list is not complete or inclusive.)

Table F-1. Laboratories Actively Using Fire Test Procedures

Laboratory Company Name	Fire Test Conducted										
	Bunsen Burner	Heat Release	Smoke Test	Cargo Oil Burner	Seat Oil Burner	Evac Slide Radiant Heat	Powerplant Fire test	Powerplant Hose Assembly	Powerplant Elec Wire	Powerplant Connectors	Aircraft Blanket Test
AaBe Textiles B.V. De Posthoornstraat 5; 5048 AS Tilburg Postbus 5126; 5004 EC Tilburg, Holland 31 13 46 57 506	x			x	x						
Accufleet 16511 Hedgecroft Drive, Suite 210 Houston, TX 77060 281-999-0033	x			x	x						x
① **Albany International Research Company** 777 West Street PO Box 9114 Mansfield, MA 02048-9114 508-339-7300	x	x	x								
Atlas Electric Devices Company 4114 N. Ravenswood Avenue Chicago, IL 60613 773-327-4520	x	x ②									
① **The Boeing Company** Boeing Technology Services PO Box 3707 M/S: 9R-28 Seattle, WA 98124 206-277-4600	x	x ②	x	x ①	x ①	x	x ①	x	x	x	
Boeing-Douglas Products Division 3855 Lakewood Boulevard Dept. EY2, M/C D001-0018 Long Beach, CA 90845 562-593-4427	x	x ②	x	x	x	x	x	x	x	x	
Custom Products, Inc. PO Box 1141 Mooresville, NC 28115 704-663-4159	x ①				x ①						

① Commerical testing services offered.
② FAA-accepted heat release apparatus
③ The organizations may be able to conduct additional fire tests not identified above. Only tests conducted regularly are specified.

Table F-1. Laboratories Actively Using Fire Test Procedures (Continued)

Laboratory Company Name	Fire Test Conducted										
	Bunsen Burner	Heat Release	Smoke Test	Cargo Oil Burner	Seat Oil Burner	Evac Slide Radiant Heat	Powerplant Fire test	Powerplant Hose Assembly	Powerplant Elec Wire	Powerplant Connectors	Aircraft Blanket Test
Delsen Testing Laboratories 1024 Grand Central Avenue Glendale, CA 91201 818-247-4106	x	x	x	x							
① **Driessen Aircraft Interior Systems** 10781 Forbes Avenue Garden Grove, CA 92843 714-265-2911	x	x ②	x								
①, ③ **East-West Technology Corporation** 119 Cabot Street West Babylon, NY 11704 516-420-0530	x			x	x		x	x	x	x	
①, ③ **East-West Technology Corporation** P.O. Box 220716 West Palm Beach, FL 33422-0716 561-776-7339	x			x	x		x	x	x	x	
③ **Environ Laboratories, Inc.** 9725 Girard Avenue South Minneapolis, MN 55431-2621 1-800-826-3710							x	x	x	x	
Fiberite, Inc. 2055 E. Technology Circle Tempe, AZ 85284 602-730-2127	x	x	x								
GE Plastics Burn Lab, Building 30 One Lexan Lane Mt. Vernon, IN 47620 (812) 831-7654	x	x	x ②								
① **The Govmark Organization, Inc.** PO Box 807 Bellmore, NY 11710 516-293-8944	x	x	x	x	x ③		x ③				
Herb Curry, Inc. 1701 Leonard Road P.O. Box 753 Mt. Vernon, IN 47620-0753 (812) 838-6703	x	x	x ②								
① **Hoechst AG** Brandversuchsanlage, C 369 D-65926 Frankfurt/M, Germany 49 69 305 3476	x	x	x		x						

① Commerical testing services offered.
② FAA-accepted heat release apparatus
③ The organizations may be able to conduct additional fire tests not identified above. Only tests conducted regularly are specified.

Table F-1. Laboratories Actively Using Fire Test Procedures (Continued)

Laboratory Company Name	Fire Test Conducted										
	Bunsen Burner	Heat Release	Smoke Test	Cargo Oil Burner	Seat Oil Burner	Evac Slide Radiant Heat	Powerplant Fire test	Powerplant Hose Assembly	Powerplant Elec Wire	Powerplant Connectors	Aircraft Blanket Test
ISOVOLTA Aktiengesellschaft A-2355 Wr. Neudorf/Austria 43 2236 605 315		x ②									
① **Lantal Textiles** PO Box 1330 4901 Langenthal, Switzerland 41 62 916 7171	x	x	x		x						
③ **Omega Point Laboratories** 16015 Shady Falls Road Elmendorf, TX 78112-9784 210-635-8100	x	x	x								
③ **ORTECH Corporation** Fire & Flammability Centre 2395 Speakman Drive Mississauga, Ontario, L5K 1B3, Canada 905-822-4111	x	x	x		x						
Schneller, Inc. PO Box 670 Kent, OH 44240 330-673-1400	x	x ②	x								
① **SGS U.S. Testing Company, Inc.** 5555 Telegraph Road Los Angeles, CA 90040 213-838-1600	x	x ②	x	x	x		x	③			
① **SGS U.S. Testing Company, Inc.** 291 Fairfield Avenue Fairfield, NJ 07004 973-575-5252											x
Shanghai Aircraft Research Institute Longhua Airport Building, PO Box 232-003 Shanghai 200232, People's Republic of China 86 21 643 88 606	x	x	x	x	x						
Skandia, Inc. 5181 Falcon Road Rockford, IL 61020 815-227-1611	x				x						

① Commerical testing services offered.
② FAA-accepted heat release apparatus
③ The organizations may be able to conduct additional fire tests not identified above. Only tests conducted regularly are specified.

Table F-1. Laboratories Actively Using Fire Test Procedures (Continued)

Laboratory Company Name	Fire Test Conducted										
	Bunsen Burner	Heat Release	Smoke Test	Cargo Oil Burner	Seat Oil Burner	Evac Slide Radiant Heat	Powerplant Fire test	Powerplant Hose Assembly	Powerplant Elec Wire	Powerplant Connectors	Aircraft Blanket Test
① **Southwest Research Institute** Department of Fire Technology 6220 Culebra Road, PO Drawer 28510 San Antonio, TX 78284 210-522-2410	x	x ②	x		③						
① **Swedish National Testing and Research Institute (Sveriges Provnings-och Forskningsinstitut)** Fire Technology/Box 857 SE-501 15 Boras, Sweden 46 33 16 50 00	x		x								
Traveltex Interiors Paris Nord II 78, allee des Erables 93420 Villepinte, Frane 33 1 49 38 18 18	x		x ③								
① **Underwriters Laboratories Inc.** Fire Protection Department 333 Pingsten Road Northbrook, IL 60062 847-272-8800	x	x	x	③	③	③	③	③	③	x	
Vatell Corporation PO Box 66 Christiansburg, VA 24073 540-961-3576		x		x	x	x	x	x			
Weber Aircraft 1300 E. Valencia Drive Fullerton, CA 92631 714-449-3000	x				x						

① Commerical testing services offered.
② FAA-accepted heat release apparatus
③ The organizations may be able to conduct additional fire tests not identified above. Only tests conducted regularly are specified.

Appendix G
Commercial Manufacturers of Fire Test Equipment

The following companies manufacture test and/or calibration equipment used to conduct the fire tests described in this Handbook.

Table G-1. Commercial Manufacturers of Fire Test Equipment

EQUIPMENT DESCRIPTION	SUPPLIER/MANUFACTURER
Test Chamber used for Vertical, Horizontal, and 45-Degree Bunsen Burner Test described in Chapters 1, 2, and 3.	Atlas Electric Devices Co. 4114 Ravenwood Avenue Chicago, IL 60613 (723) 327-4520 The Govmark Organization, Inc. P.O. Box 807 Bellmore, NY 11710 (516) 293-8944 Fire Testing Technology 2 Friar's Lane Mill Valley, CA 94941 (415) 388-8278
Test apparatus used for 60-Degree Bunsen Burner Test described in Chapter 4.	Atlas Electric Devices Co. 4114 Ravenwood Avenue Chicago, IL 60613 (723) 327-4520 Fire Testing Technology 2 Friar's Lane Mill Valley, CA 94941 (415) 388-8278
Rate of Heat Release Apparatus described in Chapter 5.	Atlas Electric Devices Co. 4114 Ravenwood Avenue Chicago, IL 60613 (723) 327-4520 The Govmark Organization, Inc. P.O. Box 807 Bellmore, NY 11710 (516) 293-8944 Fire Testing Technology 2 Friar's Lane Mill Valley, CA 94941 (415) 388-8278

Table G-1. Commercial Manufacturers of Fire Test Equipment (Continued)

EQUIPMENT DESCRIPTION	SUPPLIER/MANUFACTURER
Smoke Density Chamber described in Chapters 6 and 19.	Newport Scientific, Inc. 8246-E Sandy Court Jessup, MD 20794 (301) 498-6700 The Govmark Organization, Inc. P.O. Box 807 Bellmore, NY 11710 293-8944 Fire Testing Technology 2 Friar's Lane Mill Valley, CA 94941 (415) 388-8278
Gun type oil burner described in Chapters 8, 9, 11, and 12.	Park Oil Burner Manufacturing Co. 1413 Marmora Avenue Atlantic City, NJ 08401 (609) 344-8058 (Note: Does not supply cone.)
Water-cooled calorimeter described in Chapters 5, 8, 9, 11, and 12.	Vatell Corporation P.O. Box 66 Christiansburg, VA 24073 (540) 961-3576 (Supplier of Thermogage™ products for heat-flux sensing and calibration) Medtherm Corporation P.O. Box 412 Huntsville, AL 35804 (205) 837-2000
Insulation/backing material used for specimen preparation, calorimeter mounting, baffle, etc. described in Chapters 5, 6, 7, 8, 11, and 12.	Thermal Ceramics P.O. Box 923 Dept. 140 Augusta, GA 30903 (706) 796-4200
Oil Burner Test Rigs described in Chapters 7, 8, 12, and 15.	The Govmark Organization, Inc. P.O. Box 807 Bellmore, NY 11710 (516) 293-8944
Aircraft Blanket Tester described in Chapter 18.	The Govmark Organization, Inc. P.O. Box 807 Bellmore, NY 11710 (516) 293-8944