



Overview — Title 14 of the Code of Federal Regulations (14 CFR)

Figure 12-1 reflects the changes in aviation related regulations, which have occurred during the time frame indicated in the left column. Just as aircraft continue to evolve with ever improving technology, so do the regulations, publications, forms, and records required to design, build, and maintain them.

The Federal Aviation Administration (FAA) regulations that govern today’s aircraft are found in Title 14 of the Code of Federal Regulations (14 CFR). [Figure 12-2] There are 68 regulations organized into three volumes under Title 14, Aeronautics and Space. A fourth volume

deals with the Department of Transportation, and the fifth volume is focused on NASA.

These 68 regulations can be separated into the following three categories:

1. Administrative
2. Airworthiness Certification
3. Airworthiness Operation

Since 1958, these rules have typically been referred to as “FARs,” short for Federal Aviation Regulations. However, another set of regulations (Title 48) is titled “Federal Acquisitions Regulations,” and this has led

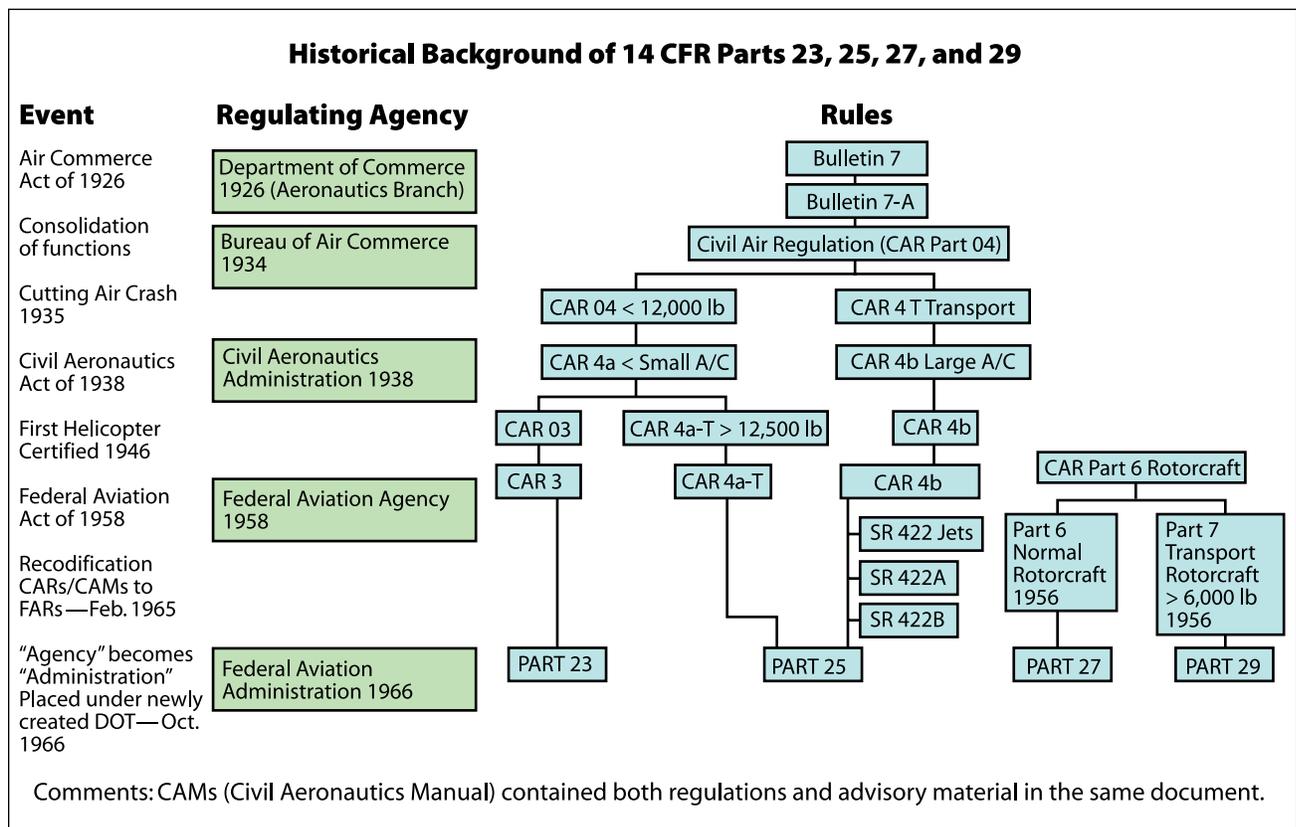


Figure 12-1. FAA historical background of aviation related regulations.

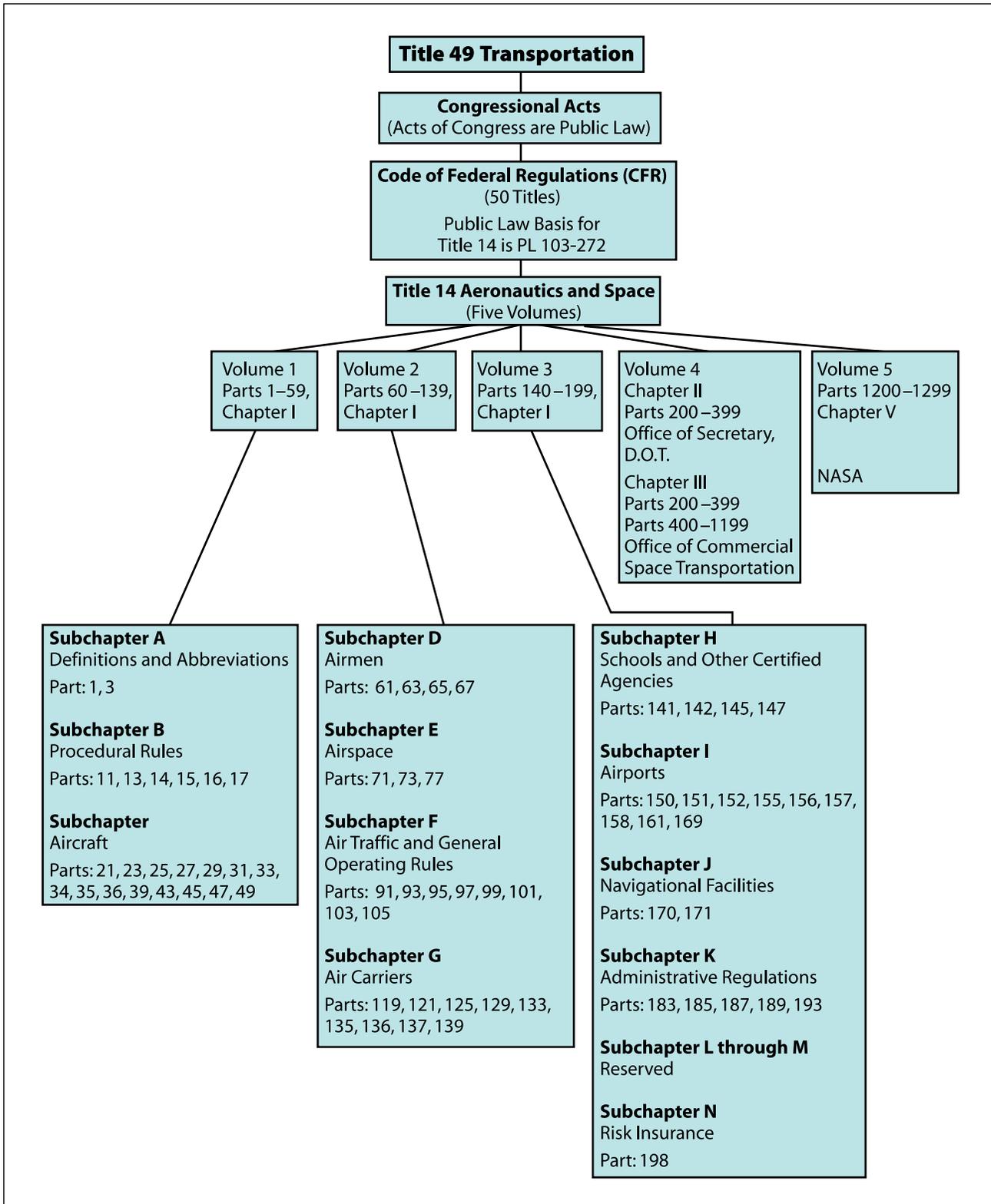


Figure 12-2. Title 14 of the Code of Federal Regulations.

Special Federal Aviation Regulations		
SFAR No.	Title	Appears in 14 CFR
13	—	Part 25
14	—	Part 121
23	—	Part 23
36	—	Parts 121, 135, 145
50–2	Special Flight Rules in the Vicinity of the Grand Canyon National Park, AZ	Parts 91, 121, 135
60	Air Traffic Control System Emergency Operation	Parts 91, 93
71	Special Operating Rules for Air Tour Operators in the State of Hawaii	Parts 121, 135
73	Robinson R–22/R–44 Special Training and Experience Requirements	Part 61
77	Prohibition Against Certain Flights Within the Territory and Airspace of Iraq	Part 91
79	Prohibition Against Certain Flights Within the Flight Information Region (FIR) of the Democratic People’s Republic of Korea (DPRK)	Part 91
80	Alternative Communications Dispatching Procedures	Part 121
87	Prohibition Against Certain Flights Within the Territory and Airspace of Ethiopia	Part 91
88	Fuel Tank System Fault Tolerance Evaluation Requirements	Part 21
92–5	Flightcrew Compartment Access and Door Designs	Part 121
93	Temporary Extension of Time to Allow for Certain Training and Testing	Parts 61, 63, 121, 135, 142
97	Special Operating Rules for the Conduct of Instrument Flight Rules (IFR) Area Navigation (RNAV) Operations using Global Positioning Systems (GPS) in Alaska	Parts 71, 91, 95, 121, 125, 129, 135
98	Construction or Alteration in the Vicinity of the Private Residence of the President of the United States	Part 77
100–1	Relief for U.S. Military and Civilian Personnel Who Are Assigned Outside the United States in Support of U.S. Armed Forces Operations	Parts 61, 63, 65
103	Process for Requesting Waiver of Mandatory Separation Age for Certain Federal Aviation Administration (FAA) Air Traffic Control Specialists in Flight Service Stations, Enroute or Terminal Facilities, and the David J. Hurley Air Traffic Control System Command Center	Part 65
104	Prohibition Against Certain Flights by Syrian Air Carriers to the United States	Part 91
105	Operating Limitations for Unscheduled Operations at Chicago’s O’Hare International Airport	Part 93
106	Rules for Use of Portable Oxygen Concentrator Systems Onboard Aircraft	Parts 121, 125, 135
107	Prohibition Against Certain Flights Within the Territory and Airspace of Somalia	Part 91

This chart is current as of the book publishing date. Please visit www.faa.gov for a current list of SFARs.

Figure 12-3. Appendix 3 of Advisory Circular (AC) 00-44, Status of Federal Aviation Regulations.

to confusion with the use of the acronym “FAR.” Therefore, the FAA began to refer to specific regulations by the term “14 CFR part XX.” Most regulations and the sections within are odd numbered because the FAA realized in 1958 when the Civil Aeronautics Regulations were recodified into the Federal Aviation Regulations, that it would be necessary to add regulations later.

Over the years, the FAA has sometimes seen the need to issue Special Federal Aviation Regulations (SFAR).

[Figure 12-3] These are frequently focused very specifically on a unique situation, and are usually given a limited length of time for effectiveness. Note that the SFAR number is purely a sequential number and has no relevance to the regulation it is addressing or attached to.

The remainder of this text focuses only on those regulations relative to airworthiness certification. There are 20 of these listed in Figure 12-4, and they are shown graphically in Figure 12-5, along with five

Part 1:	Definitions and Abbreviations
Part 13:	Investigative and Enforcement Procedures
Part 21:	Certification Procedures for Products and Parts
Part 23:	Airworthiness Standards: Normal, Utility, Acrobatic, and Commuter Category Airplanes
Part 25:	Airworthiness Standards: Transport Category Airplanes
Part 33:	Airworthiness Standards: Aircraft Engines
Part 34:	Fuel Venting and Exhaust Emission Requirements for Turbine Engine Powered Airplanes
Part 35:	Airworthiness Standards: Propellers
Part 39:	Airworthiness Directives
Part 43:	Maintenance, Preventive Maintenance, Rebuilding, and Alteration
Part 45:	Identification and Registration Marking
Part 47:	Aircraft Registration
Part 65:	Certification: Airmen Other Than Flight Crewmembers
Part 91:	General Operating and Flight Rules
Part 121:	Operating Requirements: Domestic, Flag, and Supplemental Operations
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; and Rules Governing Persons on Board Such Aircraft
Part 135:	Operating Requirements: Commuter and On Demand Operations and Rules Governing Persons on Board Such Aircraft
Part 145:	Repair Stations
Part 183:	Representatives of the Administrator

Figure 12-4. List of FAA regulations relative to airworthiness certification.

additional regulations that will not be addressed in this chapter. (Part 31 — Airworthiness Standards, Manned Free Balloons; Part 34 — Fuel Venting and Exhaust Emission Requirements for Turbine Engine Powered Airplanes; Part 36 — Noise Standards: Aircraft Type and Airworthiness Certification; Part 61 — Certification: Pilots, Flight Instructors, and Ground Instructors; and Part 63 — Certification of Flight Crew Members Other Than Pilots.) A significant benefit of this chart is the visual effect showing the interaction of the regulation with other regulations and the placement of the regulation relative to its impact on airworthiness. It is fundamentally important that the definition of the term “airworthy” be clearly understood.

Only recently did the FAA actually define the term “airworthy” in a regulation. (Refer to the 14 CFR part 3 excerpt following this paragraph.) Prior to this definition in part 3, the term could be implied from reading part 21, section (§) 21.183. The term was defined in other non-regulatory FAA publications, and could also be implied from the text found in block 5 of FAA Form 8100-2, Standard Airworthiness Certificate. This certificate is required to be visibly placed on board each civil aircraft. (Refer to “Forms” presented later in this chapter.)

Part 3 General Requirements

Sec. 3.5 Statements about products, parts, appliances and materials.

(a) Definitions. The following terms will have the stated meanings when used in this section:

Airworthy means the aircraft conforms to its type design and is in a condition for safe operation.

Product means an aircraft, aircraft engine, or aircraft propeller.

There are three primary regulations that govern the airworthiness of an aircraft. The “Big Three” are:

1. 14 CFR Part 21 — Certification Procedures for Products and Parts
2. 14 CFR Part 43 — Maintenance, Preventive Maintenance, Rebuilding, and Alterations
3. 14 CFR Part 91 — General Operating and Flight Rules

Note that the chart in Figure 12-5 shows most of the other airworthiness certification regulations link to one of these regulations. Note also the solid line located in the center of the chart. This line represents the separation between an aircraft or aircraft parts obtaining Original Airworthiness (left side of the line) and Recurrent Airworthiness (right side of the line).

Although the history section that opens this chapter discusses “The FAA” as if it was a single unit, it is important to understand that there are various subgroups within the FAA, which have differing responsibilities of oversight in the aviation industry. These may vary by organizational chart or geographic location.

The maintenance technician will interact mostly with FAA personnel from the Flight Standard Service (AFS) but may also have some interaction with FAA personnel from the Aircraft Certification Service (AIR).

Since regulations change over the years, it should be noted that not every aircraft currently flying meets the current design regulations as printed this year. When regulations are revised, they are printed in the Federal Register and released with an “Amendment number” that ties them to the regulation being revised. Aircraft are required to meet only the specifications in force at the time the aircraft is built. (*Note:* The preceding statement does not apply to the mandatory requirements imposed by Airworthiness Directives (AD), which usually have a compliance date included in the text of the AD note.)

Maintenance Related Regulations

14 CFR Part 1 — Definitions and Abbreviations

This section is a very comprehensive, but certainly not all inclusive, list of definitions that both pilots and mechanics should become familiar with. Many regulations often provide additional definitions, which are unique to their use and interpretation in that specific part.

The Abbreviations and Symbols section (§1.2) tends to be highly focused on those abbreviations related to flight.

14 CFR Part 21 — Certification Procedures for Products and Parts

This regulation (the first of the “Big Three” identified earlier) identifies the requirements of and the procedures for obtaining type certificates, supplemental type certificates, production certificates, airworthiness certificates, and import and export approvals. Some of the other major areas covered in this part are the authorization procedures for obtaining a delegation option authorization, becoming a designated alteration station (DAS), or obtaining a Part Manufacture Approval (PMA) or an authorization related to producing a Technical Standard Order (TSO) part are also included in this regulation. Note that most of the part 21 triangle lies to the left of the vertical line reflecting its significance in the original airworthiness phase. [Figure 12-5] One of the most important sections of this regulation is §21.50, Instructions for continued airworthiness and manufacturer’s maintenance manuals having airworthiness limitations sections. When an aircraft is delivered new from the manufacturer, it comes with maintenance manuals that define the

inspection and maintenance actions necessary to maintain the aircraft in airworthy condition. Also any STC modification that was developed after 1981 must have, as part of the STC documentation, a complete set of instructions for continued airworthiness (ICA). This ICA contains inspection and maintenance information intended to be used by the technician in maintaining that part of the aircraft which has been altered since it was new. This ICA is comprised of 16 specific subjects. [Figure 12-6.] An ICA developed in accordance with this checklist should be acceptable to the ASI reviewing major alteration.

14 CFR Part 23 — Airworthiness Standards: Normal, Utility, Acrobatic, and Commuter Category Airplanes

Aircraft certificated under part 23 represent the greatest portion of what the industry refers to as “general aviation.” These aircraft vary from the small two-place piston engine, propeller-driven trainers that are frequently used for flight training, to turbine powered corporate jets used to transport business executives. Seating capacity is limited to nine or less on all aircraft except the commuter aircraft where the maximum passenger seating is 19, excluding the pilot and copilot seats.

This part specifies the airworthiness standards that must be met in order for a manufacturer to receive a type certificate and for the aircraft to receive an airworthiness certificate. Part 23 aircraft are those aircraft that have a maximum certificated takeoff weight of 12,500 pounds or less, except for those aircraft in the commuter category. The maximum certificated takeoff weight limit rises to 19,000 pounds or less for these aircraft.

Part 23 has seven subparts, six of them providing detailed criteria for the design of these aircraft. The first, Subpart A, defines the applicability of this regulation. The others are:

- Subpart B — Flight
- Subpart C — Structure
- Subpart D — Design and Construction
- Subpart E — Powerplant
- Subpart F — Equipment
- Subpart G — Operating Limitations and Information

Within each of these subparts are numerous sections that specify details, such as center of gravity, gust load factors, removable fasteners, the shape of certain cockpit controls, engine and propeller requirements, fuel tank markings, cockpit instrumentation mark-

The Shell FAR Chart Relating the (14 CFR Parts)

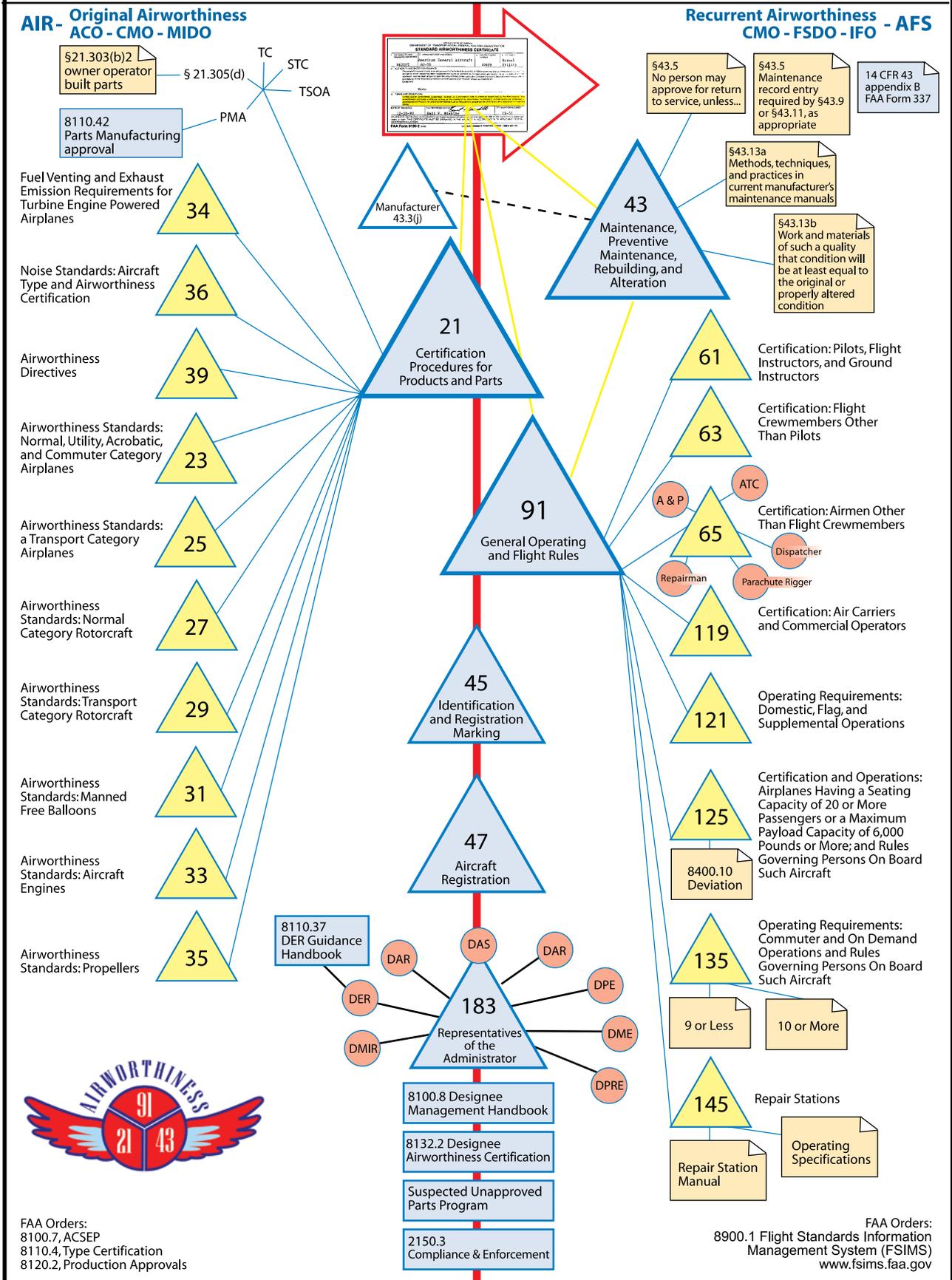


Figure 12-5. Graphic chart of FAA regulations.

UNITED STATES OF AMERICA DEPARTMENT OF TRANSPORTATION—FEDERAL AVIATION ADMINISTRATION STANDARD AIRWORTHINESS CERTIFICATE			
1 NATIONALITY AND REGISTRATION MARKS N620FT	2 MANUFACTURER AND MODEL American General Aircraft AG-5B	3 AIRCRAFT SERIAL NUMBER 10009	4 CATEGORY Normal Utility
5 AUTHORITY AND BASIS FOR ISSUANCE This airworthiness certificate is issued pursuant to the Federal Aviation Act of 1958 and certifies that, as of the date of issuance, the aircraft to which issued has been inspected and found to conform to the type certificate therefor, to be in condition for safe operation, and has been shown to meet the requirements of the applicable comprehensive and detailed airworthiness criteria provided by Annex 8 to the Convention on International Civil Aviation, except as noted herein. Exceptions None			
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, preventive 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 12-20-90	FAA REPRESENTATIVE <i>Emil F. Mielke</i> Emil F. Mielke	DESIGNATION NUMBER CE-51	
Any alteration, reproduction, or misuse of this certificate may be punishable by a fine not exceeding \$1,000 or imprisonment not exceeding 2 years, or both. THIS CERTIFICATE MUST BE DISPLAYED IN THE AIRCRAFT IN ACCORDANCE WITH APPLICABLE FEDERAL AVIATION REGULATIONS.			
FAA Form 8100-2 (8-82)		U.S. GOVERNMENT PRINTING OFFICE: 1988-0-562-105	

<p style="text-align: center;">Administrative Regulations Subchapters A and B</p> <p>14 CFR Part 1: Definitions and Abbreviations</p> <ul style="list-style-type: none"> 1.1 General Definitions 1.2 Abbreviations and Symbols 1.3 Rules of Construction <p>14 CFR Part 11: General Rulemaking Procedures</p> <ul style="list-style-type: none"> Subpart A – Rulemaking Procedures Subpart B – Paperwork Reduction Act Control Numbers <p>14 CFR Part 13: Investigative and Enforcement Procedures</p> <ul style="list-style-type: none"> Subpart A – Investigative Procedures Subpart B – Administrative Actions Subpart C – Legal Enforcement Actions Subpart D – Rules and Practice for FAA Hearings Subpart E – Orders of Compliance Under the Hazardous Materials Transportation Act Subpart F – Formal Fact-Finding Investigation Under an Order of Investigation Subpart G – Rules of Practice in FAA Civil Penalty Actions Subpart H – Civil Monetary Penalty Inflation Adjustment Subpart I – Flight Operational Quality Assurance Programs 	<p>Acceptable Data: methods, techniques, and practices used in the absence of current manufacturer's maintenance instructions or Instructions for Continued Airworthiness [see 14 CFR §43.13(a) and AC 43.13-1B(1)]</p> <p>Airworthiness: that condition of an aircraft, airframe, engine, propeller, appliance, or component part where it conforms to its approved type design and is in a condition for safe operation [see 14 CFR §3.5(a)]</p> <p>Approved Data: unless used with reference to another person or entity, means data approved by the Administrator [required for major repairs or alterations, see 14 CFR §65.95(a), 14 CFR §145.201(c)(2)]</p> <p>Repair: a procedure, executed in accordance with data, to restore an aircraft, airframe, engine, propeller, appliance, or component part to at least equal its original or properly altered condition.</p> <p>This chart is intended to be used as a template for discussions relating to the regulatory issues surrounding the certification of airworthiness. It is by no means all inclusive, but intended to be used as an educational tool in conjunction with complete and current regulatory and related materials.</p> <p>When considering the airworthiness status of an aircraft, airframe, aircraft engine, propeller, appliance, or component part, first consider how it originally crossed the fence [red vertical line, from left to right] and gained its airworthiness identity. For used components/materials, you must then determine how that airworthiness status has been maintained or restored.</p>
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From a concept developed by Wyman Shell, Manager FAA MIDO-VNY

Figure 12-5. Graphic chart of FAA regulations. (continued)

ing and placards, cabin aisle width, and flammability resistant standards.

**14 CFR Part 25—Airworthiness Standards:
Transport Category Airplanes**

The standards in this part apply to large aircraft with a maximum certificated takeoff weight of more than 12,500 pounds. This segment of aviation is usually referred to as “commercial aviation” and includes most of the aircraft seen at a large passenger airport, except for the commuter aircraft included in part 23. However, the ability to carry passengers is not a requirement for aircraft certified to part 25. Many of these aircraft are

also used to transport cargo. This chapter is subdivided into the same design subpart categories and the same sequence as the requirements specified in part 23.

**14 CFR Part 27—Airworthiness Standards:
Normal Category Rotorcraft**

This regulation deals with the small rotor wing aircraft and is consistent to part 23 with limiting the passenger seating to nine or less. However, the maximum certificated weight is limited to 7,000 pounds. It contains the same six design subparts identified in part 23, which provides the details for developing the aircraft.

Item	Subject
1.	Introduction: This section briefly describes the aircraft, engine, propeller, or component that has been altered. Include any other information on the content, scope, purpose, arrangement, applicability, definitions, abbreviations, precautions, units of measurement, referenced publications, and distribution of the ICA as applicable.
2.	Description: Of the major alteration, its functions, including an explanation of its interface with other systems, if any.
3.	Control, operation information: Or special procedures, if any.
4.	Servicing information: Such as types of fluids used, servicing points, and location of access panels, as appropriate.
5.	Maintenance instructions: Such as recommended inspection/maintenance periods in which each of the major alteration components is inspected, cleaned, lubricated, adjusted, and tested, including applicable wear tolerances and work recommended at each scheduled maintenance period. This section can refer to the manufacturer's instructions for the equipment installed where appropriate (e.g., functional checks, repairs, inspections). It should also include any special notes, cautions, or warnings, as applicable.
6.	Troubleshooting information: Information describing probable malfunctions, how to recognize those malfunctions, and the remedial actions to be taken.
7.	Removal and replacement information: This section describes the order and method of removing and replacing products, parts, and any necessary precautions. This section should also describe or refer to manufacturer's instructions to make required tests, trim checks, alignment, calibrations, center of gravity changes, lifting or shoring, etc., if any.
8.	Diagrams: Of access plates and information, if needed to gain access for inspection.
9.	Special inspection requirements: Such as X-ray, ultrasonic testing, or magnetic particle inspection, if required.
10.	Application of protective treatments: To the affected area after inspection and/or maintenance, if any.
11.	Data: Relative to structural fasteners such as type, torque, and installation requirements, if any.
12.	List of special tools: Special tools that are required, if any.
13.	For commuter category aircraft: The following additional information must be furnished, as applicable: A. Electrical loads. B. Methods of balancing flight controls. C. Identification of primary and secondary structures. D. Special repair methods applicable to the aircraft.
14.	Recommended overhaul periods: Are required to be noted on the ICA when an overhaul period has been set by the manufacturer of a component or equipment. If there is no overhaul period, the ICA should state for item 14: "No additional overhaul time limitations."
15.	Airworthiness limitation section: Include any "approved" airworthiness limitations identified by the manufacturer of FAA Type Certificate holding Office (e.g., an STC incorporated in a larger field-approved major alteration may have an airworthiness limitation). The FAA inspector shall not establish, alter or cancel airworthiness limitations without coordinating with the appropriate FAA Type Certificate Holding Office. If there are no changes to the airworthiness limitations, the ICA should state for item 15: "No additional airworthiness limitations" or "Not Applicable."
16.	Revision: This section should include information on how to revise the ICA. For example, a letter will be submitted to the local FSDO with a copy of the revised FAA Form 337 and revised ICA. The FAA inspector accepts the change by signing block 3 and including the following statement: "The attached revised/new Instructions for Continued Airworthiness (date____) for the above aircraft or component major alteration have been accepted by the FAA, superseding the Instructions for Continued Airworthiness (date____)." Once the revision has been accepted, a maintenance record entry will be made, identifying the revision, its location, and date of the Form 337.

Figure 12-6. ICA Checklist.

14 CFR Part 29—Airworthiness Standards: Transport Category Rotorcraft

This part (section) specifies those standards applicable to rotorcraft with a maximum certified weight greater than 7,000 pounds. However, it also includes additional parameters based upon seating capacity and an additional weight limit. Those parameters are passenger seating, (nine or less, ten or more) and whether the rotorcraft is over or under a maximum weight of 20,000 pounds. The same six design subparts exist in this part as are in parts 23, 25, and 27.

14 CFR Part 33—Airworthiness Standards: Aircraft Engines

Each of the four preceding 14 CFR regulations require that the engine used in the aircraft must be “type certificated.” Part 33 details the requirements for both reciprocating and turbine style aircraft engines. It not only specifies the design and construction requirements, but also the “block test” requirements that subject the engine to extremely demanding testing in order to prove its capability of enduring the stresses of powering the aircraft.

14 CFR Part 35—Airworthiness Standards: Propellers

Just as each engine used on an aircraft must have a type certificate, the propeller must also be type certificated. This part is arranged the same way that part 33 is, in that subpart B specifies design and construction and subpart C covers tests and inspections.

14 CFR Part 39—Airworthiness Directives

In spite of all the emphasis on proper design and certification testing, sometimes the actual day-to-day use of the aircraft causes unanticipated wear or failure to occur. When that happens, if the FAA determines that the wear or failure represents an unsafe condition, and that the condition is likely to exist in other products of the same type of design, it will issue an AD. Actual AD notes are not included in part 39, but rather are printed in the Federal Register and are linked to this part as amendments to part 39, §39.13. AD notes are legally enforceable rules that apply to aircraft, aircraft engines, propellers, and appliances.

14 CFR Part 43—Maintenance, Preventive Maintenance, Rebuilding, and Alteration

This regulation represents the heart of aviation maintenance, and is the second of the “Big Three” regulations previously identified. The 13 rules and six appendices

contained within part 43 provide the standard for maintaining all 185,000 civilian aircraft currently registered in the United States. Note that the entire part 43 triangle lies to the right of the vertical line, indicating its relationship to maintaining continued airworthiness. A more detailed explanation of this regulation is presented later in this text. [Figure 12-5]

14 CFR Part 45—Identification and Registration Marking

Part 45 identifies the requirements for the identification of aircraft, engines, propellers, certain replacement and modification parts, and the nationality and registration marking required on U.S.-registered aircraft. All type-certificated products must have the following information on a fireproof dataplate or similar approved fireproof method.

1. Builder’s name
2. Model designation
3. Builder’s serial number
4. Type certificate number (if any)
5. Production certificate number (if any)
6. For aircraft engines, the established rating.
7. Reference to compliance or exemption to 14 CFR Part 34, Fuel Venting and Exhaust Emission Requirements for Turbine Engine Powered Airplanes
8. Any other information that the FAA determines to be appropriate

Replacement and modification parts, which are produced in accordance with a parts manufacturing approval (PMA) (14 CFR §21.303), must have the following information permanently and legibly marked:

1. The letters “FAA-PMA.”
2. The name, symbol, or trademark of the holder of the PMA.
3. The part number.
4. The name and model designation for each type-certificated product on which it can be installed.

If a part has a specified replacement time, inspection interval, or other related procedure specification in the maintenance manual or Instruction for Continued Airworthiness (ICA), that part must have a part number and a serial number (or the equivalent of each).

The manufacturer of a life-limited part must either provide marking instructions for that part, or state that the part cannot be marked without a compromise to its integrity.

Exceptions are made for the identification of parts that are too small to be practical to mark the required data.

Nationality and registration marks (commonly known as the N-number for U.S.-registered aircraft) can vary in size, depending on the year that the aircraft was built, and whether or not the aircraft has been repainted. The most common size is at least 12 inches in height. Small aircraft built at least 30 years ago or replicas of these, or experimental exhibition or amateur-built aircraft may use letters at least 2 inches in height. Only a few aircraft are authorized to display registration markings of at least 3 inches. Note that this regulation sits directly on the vertical line in Figure 12-5 indicating that it applies to both original and recurrent airworthiness. [Figure 12-5]

14 CFR Part 47—Aircraft Registration

This regulation provides the requirements for registering aircraft. It includes procedures for both owner and dealer registration of aircraft.

14 CFR Part 65—Certification: Airmen Other Than Flight Crewmembers

Note: SFAR 100-1. Relief for U.S. Military and Civilian Personnel who are assigned outside the United States in support of U.S. Armed Forces Operations is a good example of the specific nature and limited time frame that are part of an SFAR.

Pilots, flight instructors, and ground instructors are certificated under part 61; flight crew other than pilots are certificated under part 63. However, many other people are also required to be certificated by the FAA for the U.S. aviation fleet to operate smoothly and efficiently. Part 65 addresses many of those other persons.

- Subpart B—Air Traffic Control Tower Operators
- Subpart C—Aircraft Dispatchers
- Subpart D—Mechanics
- Subpart E—Repairmen
- Subpart F—Parachute Riggers

A more detailed discussion of this chapter with a special emphasis on mechanics is included in Chapter 13, The Mechanic Certificate.

14 CFR Part 91—General Operating and Flight Rules

This is the final regulation of the “Big Three” identified earlier in this chapter. Notice that most of this icon is located to the right of the central vertical line in Figure 12-5, which visually indicates its “operational” involvement or “recurrent airworthiness.” (Although it is an operational regulation that is focused toward the owner, operator, and/or pilot of the aircraft, the maintenance technician must have an awareness of this regulation.) Two examples of these maintenance related issues are:

1. §91.207—Emergency locator transmitters
Paragraph (c)(2)—battery replacement interval and requirement for a logbook entry indicating the expiration date of the new battery.
2. §91.213—Inoperative Instruments and Equipment
Paragraph (a)(2)—a letter of authorization from the Flight Standards District Office (FSDO), authorizing the operation of the aircraft under a minimum equipment list (MEL) constitutes a supplemental type certificate (STC) and must be carried in the aircraft during flight.

Subpart E—Maintenance, Preventive Maintenance, and Alterations (sections 91.401 through 91.421) is the section of most interest to the technician. He or she should be familiar with it, because it does carry some (indirect) responsibility for the technician. Note that the part 91 icon in Figure 12-5 has a direct line to part 43. This is because §91.403(b) states “No person may perform maintenance, preventive maintenance, or alterations on an aircraft other than as prescribed in this subpart and other applicable regulations, including part 43 of this chapter.”

A more complete discussion of this regulation, especially Subpart E—Maintenance, Preventive Maintenance, and Alterations is presented later in this chapter.

14 CFR Part 119—Certification: Air Carriers and Commercial Operators

In order to better understand the next three regulations discussed here (parts 121, 125, and 135) a brief overview of part 119 will be beneficial. See Figure 12-7, 14 CFR part 119 Applicability of Regulations. There are more than 50 Advisory Circulars in the 120 series alone, providing additional non-regulatory information concerning the variety of procedures involved with these operations. There are basically three different

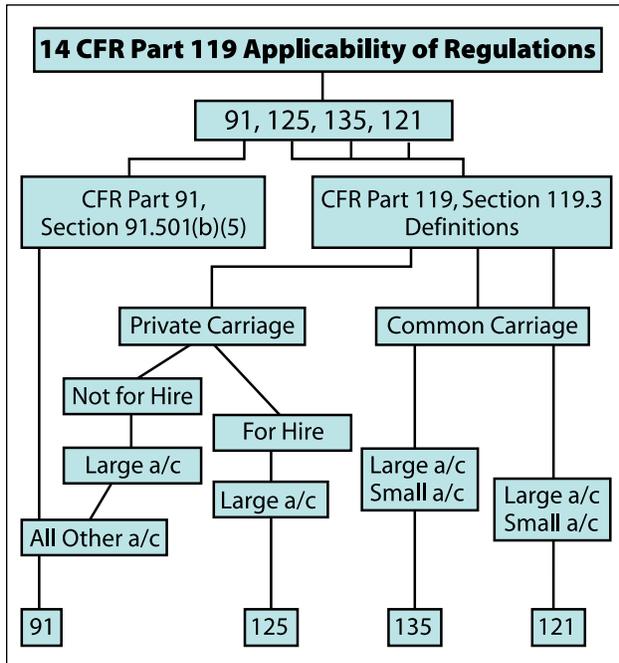


Figure 12-7. Applicability of Regulations.

criteria which must be analyzed in order to properly determine which regulation applies. These are:

1. Is the service provided for private carriage or common carriage?
2. Is the aircraft for hire or is it not for hire?
3. Is it a large or small aircraft?

AC 120-12, as revised, provides the following definition regarding the above criteria:

“A carrier becomes a common carrier when it “holds itself out” to the public, or to a segment of the public, as willing to furnish transportation within the limits of its facilities to any person who wants it. There are four elements in defining a common carrier; (1) a holding out of a willingness to (2) transport persons or property (3) from place to place (4) for compensation. This “holding out” which makes a person a common carrier can be done in many ways and it does not matter how it is done. Signs and advertising are the most direct means of “holding out” but are not the only ones... Carriage for hire which does not involve “holding out” is private carriage. Private carriers for hire are sometimes called “contract carriers,” but the term is borrowed from the Interstate Commerce Act and legally inaccurate when used in connection with the Federal Aviation Act. Private carriage for hire is carriage for one or several selected customers, generally on a long term basis. The number of contracts must not be too great; otherwise, it implies a willingness to make a contract with any-

body. A carrier operating pursuant to 18 to 24 contracts has been held to be a common carrier because it held itself out to serve the public generally to the extent of its facilities. Private carriage has been found in cases where three contracts have been the sole basis of the operator’s business.”

Operations that constitute common carriage are required to be conducted under 14 CFR part 121 or 135. Private carriage may be conducted under part 91 or 125.

The term “for hire” is not defined in any of the FAA documents, but is generally understood to mean that compensation for both direct and indirect expenses associated with the flight, as well as a profit margin for the operator are collected from the person or persons benefiting from the flight operation.

The determination of whether the aircraft is large or small is based upon the definition provided in 14 CFR part 1 (i.e., if the aircraft has maximum certificated takeoff weight of 12,500 pounds or more, it is a large aircraft. All aircraft less than 12,500 maximum certificated takeoff weight are considered to be small aircraft).

It may also help the reader understand when 121, 125, and 135 regulations apply, by taking a brief look at a list of flight operations to which part 119 does not apply.

1. Student instruction
2. Nonstop sightseeing flights with less than 30 seats and less than 25 nautical miles from the departure airport
3. Ferry or training flights
4. Crop dusting or other agricultural operations
5. Banner towing
6. Aerial photography or surveying
7. Fire fighting
8. Powerline or pipeline patrol
9. Parachute operations on nonstop flights within 25 nautical miles from the departure airport
10. Fractional ownership in accordance with part 91, subpart K

14 CFR Part 121 — Operating Requirements: Domestic, Flag, and Supplemental Operations

Part 121 establishes the operational rules for air carriers flying for compensation or hire. A domestic operation is any scheduled operation (within the 48 contiguous states, the District of Columbia, or any territory or

possession) being conducted with either a turbo-jet aircraft, an airplane having 10 or more passenger seats, or a payload capacity greater than 7,500 pounds.

A “flag” operation means any scheduled operation (operating in Alaska or Hawaii to any point outside of those states, or to any territory or possession of the United States, or from any point outside the United States to any point outside the United States) being conducted with either a turbo-jet aircraft, an airplane having 10 or more passenger seats, or a payload capacity greater than 7,500 pounds.

“Supplemental” operation means any common carriage operation conducted with airplanes having more than 30 passenger seats (if less than 30, the airplane must also be listed on the operations specifications of domestic and flag carriers), with a payload capacity of more than 7,500 pounds.

Part 121 operators are required by part 119 to have the following personnel:

- Director of Safety
- Director of Operations
- Director of Maintenance
- Chief Pilot
- Chief Inspector

There are 23 subparts and 15 appendices in this regulation; however, only two subparts (J and L) are of concern for the mechanic. Subpart J—Maintenance, Preventive Maintenance, and Alterations, identifies Special Airworthiness Requirements, which deals with many of the mechanical aspects of a passenger or cargo aircraft. Subpart L—Maintenance, Preventive Maintenance, and Alterations, requires that a part 121 operator must have an operational manual which contains the following information:

- Organizational chart.
- List of persons who may perform required inspection.
- Company maintenance, preventive maintenance, or alterations.
- A system to both preserve and retrieve maintenance and inspection related information.

There is also a section (§121.368) added in 2002 that establishes the requirement for conducting inspections on aging aircraft. Additional §121.370 lists various transport category commercial aircraft that require FAA-ACO approval to operate beyond a specified

number of flights. Both of these regulations came about following FAA and NTSB review of various commercial airline accidents.

14 CFR 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; and Rules Governing Persons on Board Such Aircraft

This regulation applies to private and noncommon carriage when such operations are conducted in airplanes having 20 or more seats (excluding crewmembers) or having a payload capacity of 6,000 pounds or more. There must also be “operations specifications” issued to the operator which include the following information:

- Kinds of operations authorized
- Types of aircraft and registration numbers of the airplanes authorized for use
- Approval of the provisions of the operator’s manual relating to airplane inspections, together with the necessary conditions and limitations
- Registration numbers of the airplanes that are to be inspected under an approved airplane inspection program (AAIP) under §125.247
- Procedures for the control of weight and balance of airplanes
- Any other item that the administrator determines is necessary

Just as in part 121, subpart (E) identifies special airworthiness requirements dealing mostly with the mechanical devices of the aircraft.

14 CFR Part 135 — Operating Requirements: Commuter and On Demand Operations and Rules Governing Persons on Board Such Aircraft

As the title of this section states, this regulation is applicable to short distance commercial aircraft operations or “commuters” and nonscheduled carriers that operate “on demand.” These aircraft are frequently referred to as air taxi or air charter aircraft.

Preceding the regulation are several SFARs. One of these, SFAR 36, is of interest to the technician because, although it is linked here directly to part 135, it is also linked in the text to parts 121 and 145. The significance of SFAR 36 is that it allows for a company with sufficient engineering and certification personnel to perform major repairs on products it is authorized to work on, without having the technical data approved by the FAA Administrator.

Aircraft operated under part 135 must be operated and maintained in accordance with the certificate holder's operations manual. This manual, when accepted by the FAA, specifies how the flight crew, ground personnel, and maintenance technicians will conduct their operations.

A pivotal portion of this regulation is §135.411, Applicability, which is the first section in subpart J. This section specifies that having a type certificated passenger seating configuration of nine or less may be maintained in accordance with the maintenance manual provided by the aircraft manufacturer. Those aircraft having a type certificated passenger seating configuration of 10 or more seats must be maintained in accordance with a maintenance manual written by the air carrier, which must then be submitted to the FAA for review and approval. The requirements for the maintenance manual are specified in §135.427. Sections 135.415 through 135.417, and 135.423 through 135.443 specify additional maintenance requirements. It should be noted that sections (§§)135.415, 135.416 and 135.417 are applicable regardless of the number of seats in the aircraft.

A major change in the "nine or less" aircraft maintenance requirements occurred in February of 2005 when §135.422 regarding aging aircraft was incorporated into part 135.

This new subpart (note the even number) to 14 CFR part 135 specifically prohibits a certificate holder from operating certain aircraft unless the Administrator has completed the aging aircraft inspection and records review. This inspection requires the certificate holder to show the FAA that the maintenance of age-sensitive parts and components has been adequate to ensure safety.

This section applies only to multiengine aircraft in scheduled operation, with nine or fewer passenger seats. It does *not* apply to aircraft operating wholly, or even partly, in Alaska.

The required record review start date varies depending on the age of the aircraft. However, once initiated, the repetitive inspection intervals are not to exceed seven years.

The certificate holder must make both aircraft and records available to the FAA for inspection and review. The certificate holder must notify the Administrator at least 60 days in advance of the availability of the aircraft and the records for review.

The records must include the following information:

1. Total years in service of the airplane
2. Total time in service of the airframe
3. Date of the last inspection and records review required by this section
4. Current status of life-limited parts
5. Time since the last overhaul of all structural components required to be overhauled on a specific time basis
6. Current inspection status of the airplane, including the time since the last inspection required by the inspection program under which the airplane is maintained
7. Current status of applicable airworthiness directives, including the date and methods of compliance, and, if the AD involves recurring action, the time and date when the next action is required
8. A list of major structural alterations
9. A report of major structural repairs and the current inspection status of those repairs

14 CFR Part 145 — Repair Stations

This regulation underwent a major rewrite released in 2004 and was the most comprehensive change in nearly 20 years.

It may be of interest to note that one does not need to hold an airframe and powerplant (A&P) certificate to be employed at a repair station. The repair station may employ both certified technicians (repairman—in accordance with the requirements of part 65, subpart E) and noncertified personnel. All work that is signed off is done so using the repair station certificate number, and must be done only by persons authorized by part 65 to approve an article for return to service. Just as other certificate holders must have an operations manual, the repair station must have a "repair station manual" which must contain:

- An organizational chart.
- Procedures for maintaining rosters.
- Description of housing, facilities, and equipment.
- Procedures for revising the capability list and conducting a self-evaluation (audit).
- Procedures for revising the training program.
- Procedures governing work done at another location.

- Procedures for working on air carrier aircraft.
- Description of the required records and record keeping.
- Procedures for revising the repair station manual.
- Description of the system to identify and control the sections of the manual.

All records from repair station maintenance activity must be kept a minimum of 2 years.

Domestic repair station certificates are effective until they are surrendered, suspended, or revoked. The certificates of foreign repair stations expire, usually after 1 or 2 years, and must be renewed.

14 CFR Part 147 — Aviation Maintenance Technician Schools

Part 147 defines the requirements for obtaining a maintenance training certificate. This certificate may be for either airframe, or powerplant, or a combination of the two. The minimum number of curriculum hours for conducting either airframe or powerplant training independently is 1,150.

If both airframe and powerplant ratings are offered, the combined total curriculum hours are 1,900. This is because of the 1,150 hours specified to obtain either the Airframe or the Powerplant rating; 400 hours are devoted to general studies. Only one set of general studies hours is applicable to the combined total. Therefore, 400 hours can be subtracted from the implied total of 2,300 hours ($1,150 \times 2$) to obtain the reduced figure of 1,900 hours. Requirements are detailed as follows:

- Appendix A lists Curriculum Requirements
- Appendix B lists General Curriculum Subjects
- Appendix C lists Airframe Curricular Subjects
- Appendix D lists Powerplant Curriculum Subjects

14 CFR Part 183 — Representatives of the Administrator

As the aviation industry grows and the design, manufacture, and testing of aircraft gets more complex, the FAA faces both budget constraints and personnel shortages. As early as 1962, the FAA began a program to allow private sector persons in various areas of industry to be “designees” or “representatives of the FAA Administrator.” These people are *not* FAA employees, but rather are designated by the FAA to act on their behalf. Most people are aware that regular doctors may serve as “aviation medical examiners,” skilled pilots

can become “pilot examiners,” and frequently maintenance school instructors serve as “technical person examiners” to administer the oral and practical portion of the FAA testing. Other lesser known designees are the designated engineering representatives (DER), the designated manufacturing inspection representatives (DMIR), and the designated airworthiness representatives (DAR).

- DERs approve data based upon their engineering training and their knowledge of FAA regulations.
- DMIRs make conformity inspections *only* at their employer. They are similar to “designated repairmen” because they are only authorized to inspect parts at their employers’ facility.
- DARs conduct conformity inspections whenever they are authorized to do so by the FAA. They can do this for either manufacturing or maintenance facilities depending on their specific authorization.

Detailed Explanation of Primary Regulations (Parts 43 and 91)

14 CFR Part 43 — Maintenance, Preventive Maintenance, Rebuilding, and Alteration

§43.1 Applicability

Paragraph (a) states quite clearly that aircraft (whether U.S.- or foreign-registered operating under part 121 or 135) and component parts thereof, must be maintained in accordance with the rules set forth in this part. However, although paragraph (b) states quite clearly the type of aircraft for which this part does *not* apply, it seems to have led to considerable confusion within the aviation industry. If an aircraft is flying with a Special Airworthiness—Experimental certificate (FAA Form 8130-7, Special Airworthiness Certificate—pink color certificate) and that is *the only* airworthiness certificate this aircraft has ever had, then part 43 does not apply.

Conversely, sometimes during maintenance (especially Supplemental Type Certificate (STC) modification—the STC will be addressed later in this chapter) it becomes necessary to temporarily place the aircraft into Special Airworthiness—Experimental. This is done to show compliance with federal regulations. These aircraft must still be maintained in accordance with part 43 because the aircraft had a different kind of airworthiness (in this example a Standard) prior to being issued the Special.

§43.2 *Records of overhaul and rebuilding*

These terms are not defined in part 1, and are given full explanation in this subpart. Each term states that it may not be used to describe work done on an aircraft, airframe, aircraft engine, propeller, appliance, or component part unless that item has been:

- Disassembled,
- Cleaned,
- Inspected,
- Repaired as Necessary,
- Reassembled, and
- Tested,

The key difference between the two terms is in determining how the item will be tested. If it will be “tested in accordance with approved standards acceptable to the Administration which have been developed and documented by the manufacturer, the item is said to be overhauled.” This is basically another way of describing “service limits,” which is a term frequently used to describe manufacturer specified acceptable limits for used parts. A “rebuilt” item, on the other hand, must be tested to the same tolerances and limits as a new item.

§43.3 *Persons authorized to perform maintenance, preventive maintenance, rebuilding, and alterations*

There are nine different persons who may perform maintenance: (Reminder: Per part 1, the FAA definition of a person is “an individual, firm, partnership, corporation, association, joint-stock association, or governmental entity. It includes a trustee, receiver, assignee, or similar representative of any of them.”)

1. Certified mechanic per part 65.
2. Certified repairman per part 65.
3. Person working under the supervision of a certified mechanic or repairman.
4. Holder of repair station certificate.
5. Holder of an air carrier certificate.
6. Holder of pilot certificate (other than a sport pilot certificate) may perform preventive maintenance on an aircraft he or she owns or operates. This does not apply to aircraft operated under part 121, 129, or 135. (*Note:* Preventive maintenance is identified in appendix A, paragraph C of this part.)
7. Pilot of a rotorcraft (when operated under part 135 and in remote areas) may perform specific preventive maintenance actions. These actions

may only be accomplished under the following conditions:

- The mechanical difficulty or malfunction occurred enroute to or in the remote area.
 - The pilot has been satisfactorily trained and is authorized in writing by the certificate holder to perform the required maintenance.
 - There is no certificated mechanic available.
 - The certificate holder has procedures to evaluate the work performed when a decision for airworthiness is required.
 - The work done is listed in paragraph (c) or Appendix A of this chapter.
8. Holder of part 135 certificate may allow pilots of aircraft with nine or less passenger seats to remove and reinstall cabin seats and stretchers, and cabin mounted medical oxygen bottles.

These actions may only be accomplished under the following conditions:

- The pilot has been satisfactorily trained and is authorized in writing by the certificate holder to perform the required maintenance
 - The certificate holder has written procedures available to the pilot to evaluate the work performed
9. Manufacturer may inspect and rebuild any item it has manufactured.

§43.5 *Approval for return to service after maintenance, preventive maintenance, rebuilding, or alteration*

Returning an aircraft component of an aircraft to service after maintenance, preventive maintenance, rebuilding or alteration must be done by creating an appropriate maintenance record entry as required by either §43.9 or 43.11. This may include the use of FAA Form 337, Major Repair and Alteration, if the maintenance action was a major repair or a major alteration.

Whenever a maintenance action is being planned, it is critical that the technician understands exactly:

1. What he/she is going to do,
2. How that work is classified by the FAA, and
3. What type of documentation will be required to support this activity.

The first question to consider is “Is this a repair or an alteration?” This should be a relatively simply decision since a repair basically returns the aircraft to its previous or unaltered condition (i.e., replacing magnetos, an exhaust system, tires, or brakes). Even replacing an entire engine (although it is a big job) is still a repair if it is the one properly specified for that aircraft. An alteration, on the other hand, *always changes or modifies* the aircraft from its previous state (i.e., installing winglets, new avionics, or an engine that is NOT listed in the aircraft TCDS). Please refer to part 1 and part 43, appendix A, for additional clarification and examples.

The second question to consider is whether or not the work that will be performed constitutes a major or a minor maintenance action. A “major” action is typically one that might appreciably affect weight, balance, structural strength, performance, powerplant operation, flight characteristics, or other qualities affecting airworthiness, and that are not done according to accepted practices or cannot be done by elementary operations. (The reader is again requested to refer to part 1 and part 43, appendix A, for additional clarification and examples.) This is a much more complex question, but it is extremely important as it drives the final question concerning the substantiating documentation.

The third question deals with the type of documentation required to substantiate the work performed. Minor repairs and alterations need only to refer to “acceptable” data, such as manufacturers’ maintenance manuals or AC 43.13-1, the maintenance action can simply be recorded in the maintenance record as a logbook entry. Major repairs and alterations require “approved data” Some examples of approved data are: AD Notes, STCs, TCDS’s, DAS specific authorizations, DER specific delegations, and FAA-approved manufacturer Service Bulletins.

Sometimes the repair or alteration being performed does not have previously approved data. In that case the technician may request that the FAA accomplish a “Field Approval.” In this procedure, the technician completes the front side of Form 337 through block 6 (leaving block 3 open for later FAA approval) and then indicates in block 8 on the back what work is to be done, and what the substantiating reference data is. Form 337 is then submitted to the local FAA FSDO office for review and approval by an ASI. If necessary, this ASI may seek input from other ASIs or FAA specialists to assist in the review of the data. If the data is found to comply with FAA regulations, the ASI will enter one of the following statements in

block 3, depending on whether the ASI has performed a review of the data only, or has physically inspected the aircraft:

- “The technical data identified herein has been found to comply with applicable airworthiness requirements and is hereby approved for use only on the above described aircraft, subject to conformity inspection by a person authorized in part 43, section 43.7.”
- or
- “The alteration or repair identified herein complies with the applicable airworthiness requirements and is approved for use only on the above described aircraft, subject to conformity inspection by a person authorized in part 43, section 43.7.”

§43.7 Persons authorized to approve aircraft, airframes, aircraft engines, propellers, appliances, or component parts for return to service after maintenance, preventive maintenance, rebuilding, or alteration

There are seven different persons listed in this section who may sign return to service (RTS) documentation:

1. Certified mechanic or holder of an inspection authorization.
2. Holder of a repair station certificate.
3. Manufacturer.
4. Holder of an air carrier certificate.
5. Certificated private pilot.
6. Repairman certificated with a maintenance rating for light sport aircraft only.
7. Certificated sport pilot for preventive maintenance on an aircraft owned and or operated by him or her.

Note that although a certificated repairman is authorized to work on a product undergoing maintenance, preventive maintenance, rebuilding, or alterations (refer to §43.3), he or she is *not* authorized to approve that product for return to service. He or she must make the appropriate maintenance record entry per the requirements of §43.9 or 43.11.

§43.9 Content, form and disposition of maintenance, preventive maintenance, rebuilding, and alteration records (except inspections performed in accordance with parts 91 and 125, and §§135.411(a)(1) and 135.419 of this chapter).

The first observation is that this section specifically excludes inspection entries (those are covered in

§43.11). This section deals exclusively with maintenance record entries.

The next observation should be that the list of maintenance actions includes “preventive maintenance.” As stated in the explanation of §43.3, a certificated pilot is authorized to perform preventive maintenance on the aircraft he or she owns or operates. Therefore, remember that the pilot *must* make a record entry of the preventive maintenance he or she has accomplished.

There are three distinct issues to be addressed in the maintenance entry, and they answer the questions of “what? when? and who?”

What — a description of the work performed.

When — the date the work was completed.

Who — the name of the person who did the work if other than the person who approves the Return to Service

— the signature, certificate number, and type of certificate of the person who is approving the work for return to service.

Note: Frequently, logbooks have a statement entered that ends something like this: “... and is hereby returned to service. Joe Fixer A&P, Certificate #123456789.” As this section of the regulation currently reads, that part of the record entry is not required, since §43.9 clearly states that “the signature constitutes the approval for return to service only for the work performed,” which also leads to another point. The technician is only signing off the work he or she has done. We will see later in the explanation of §43.11 that an inspection write-up usually carries a broader scope of responsibility. This section is very clear that the entry completed in accordance with this section *only* holds the technician responsible for the service maintenance action he or she entered.

If the maintenance accomplished was a major repair or alteration (both of which require supporting approved data), the work must be documented on FAA Form 337. If the maintenance action was a major repair and it was done by a certificated repair station, a signed copy of the completed customer work order accompanied by a signed maintenance release may be used in lieu of the FAA Form 337.

§43.10 Disposition of life-limited aircraft parts

(Note the even number again; this regulation became part of 14 CFR part 43 in 2002.)

This section presents two terms not previously defined in 14 CFR:

1. Life-limited part means any part for which a mandatory replacement limit has been specified.
2. Life status means the accumulated cycles, hours, or any other mandatory limit of a life-limited part.

This section then goes on to specify what to do with parts that are temporarily removed from and then reinstalled on a type-certificated product.

1. With parts that are removed from a type certified product and not immediately reinstalled.
2. How to transfer life-limited parts from one type-certificated product to another.

When a life-limited part is removed, the person removing it from the type-certificated product must control the part and assure proper tracking of the life-limiting factor. This is to prevent the installation of the part *after* it has reached its life limit.

There are seven possible methods the technician or repair facility may choose from to comply with this requirement.

1. Recordkeeping.
2. Tagging.
3. Non-permanent marking.
4. Permanent marking.
5. Segregation.
6. Mutilation.
7. Any other method approved or accepted by the FAA.

When a life-limited part is transferred, the information concerning the life status of that part must be transferred with it. (Although regulations already did exist which required the tracking of life-limited parts when they were installed on an aircraft, this regulation was generated to govern the disposition of such parts when they were removed from the aircraft.)

§43.11 Content, form, and disposition of records for inspections conducted under parts 91 and 125, and §135.411(a)(1) and 135.419 of this chapter.

Although this section deals exclusively with inspection record entries, the requirements are similar to §43.9 in that information of what, when, and who is required.

1. **What**—type of inspection, including a brief description.
2. **When**—date of the inspection and the total time in service
3. **Who**—the signature, certificate number, and kind of certificate of the person approving *or disapproving* the return to service.

Since this is an inspection write-up and not a maintenance entry, it is quite possible that the inspecting technician could reject or disapprove the item being inspected for the return to service. When that situation occurs, the regulation states in paragraph (b) that a list of discrepancies must be given to the owner. A reference to this list and its delivery to the aircraft owner must be reflected in the record entry. Although the regulation neither specifies how those discrepancies can be cleared, nor who may do them, it should be noted that any appropriately rated repair station or certificated technician can perform the required maintenance actions. When they are completed and the proper maintenance record entries are generated in accordance with §43.9, the aircraft is approved for return to service. It is neither necessary to have an additional inspection, nor is it necessary to contact the disapproving inspector.

If the aircraft is on a progressive inspection program, the inspection statement changes slightly from the statement referenced earlier by adding the reference to both a “routine inspection” and a “detailed inspection.” (Refer to explanatory text of §43.15 for a definition of these terms.)

Inspections accomplished in accordance with other inspection program requirements must identify that particular program and which part of the program the inspection completed.

§43.12 Maintenance records: Falsification, reproduction, or alteration

The aviation community relies heavily on trust and honesty in both oral and written communication. The maintenance log entries described in §§43.9 and 43.11 provide the documentation trail relied upon by aircraft owners, pilots, and technicians regarding the aircraft’s

maintenance history. Falsification of these records is potentially dangerous to the personnel who rely on the accuracy of these records.

This section identifies that fraudulent entries are unacceptable. If someone commits such an act, that action is the basis for suspension or revocation of the appropriate certificate, authorization, or approval. A technician who is encouraged by his or her employer, or by anyone else, to falsify records in any way should remember this comment: “Companies come and go, but my signature lasts a lifetime. I will not use it inappropriately.”

§43.13 Performance rules (general)

This section deals with the specific requirements for conducting maintenance. (*Note:* This section is probably the best to reflect the relationship between the FAA’s numbering of ACs and the regulations they are related to.) Paragraph 3 on the cover page of AC 43.13-1B, Acceptable Methods, Techniques, and Practices—Aircraft Inspection and Repair (dated 9/8/98) states:

“3. Reference: Title 14 of the Code of Federal Regulations part 43, §43.13(a) states that each person performing maintenance, alteration, or preventive maintenance on an aircraft, engine, propeller, or appliance shall use the methods, techniques, and practices prescribed in the current manufacturer’s maintenance manual or Instructions for Continued Airworthiness prepared by the manufacturer, or other methods techniques or practices acceptable to the Administrator, except as noted in §43.16.” [Figure 12-8]

Although not all ACs are this directly linked, there is a definite relationship. (Refer to the text in this chapter on advisory circulars for additional information.)

Aircraft maintenance technicians are highly skilled personnel because aviation maintenance work requires a great attention to detail. The complexity of technology on today’s aircraft demands a significant level of communication to properly accomplish maintenance, preventive maintenance, rebuilding, or alteration. This communication frequently comes in written form, i.e., manufacturer’s maintenance manuals or instructions for continued airworthiness. If neither of these documents provides the guidance the technician needs, it is possible that the information found in AC 43.13 may be sufficient.

In addition to the documentation, the technician must also use the proper tools, equipment, and test apparatus



U.S. Department
of Transportation

**Federal Aviation
Administration**

Advisory Circular

TITLE 14 OF THE CODE OF FEDERAL REGULATIONS (14 CFR) GUIDANCE MATERIAL

**Subject: ACCEPTABLE METHODS,
TECHNIQUES, AND PRACTICES—AIRCRAFT
INSPECTION AND REPAIR**

Date: 9/8/98

AC No: 43.13-1B

Initiated by: AFS-640

Change: 1

1. PURPOSE. This advisory circular (AC) contains methods, techniques, and practices acceptable to the Administrator for the inspection and repair of nonpressurized areas of civil aircraft, only when there are no manufacturer repair or maintenance instructions. This data generally pertains to minor repairs. The repairs identified in this AC may only be used as a basis for FAA approval for major repairs. The repair data may also be used as approved data, and the AC chapter, page, and paragraph listed in block 8 of FAA form 337 when:

- a. the user has determined that it is appropriate to the product being repaired;
- b. it is directly applicable to the repair being made; and
- c. it is not contrary to manufacturer's data.

2. CANCELLATION. The AC 43.13-1A dated 1988 is canceled.

3. REFERENCE: Title 14 of the Code of Federal Regulations part 43, section 43.13(a) states that each person performing maintenance, alteration, or preventive maintenance on an aircraft, engine, propeller, or appliance shall use the methods, techniques, and practices prescribed in the current manufacturer's maintenance manual or Instructions for Continued Airworthiness prepared by its manufacturer, or other methods, techniques, or practices acceptable to the Administrator, except as noted in section 43.16. FAA inspectors are prepared to answer questions that may arise in this regard. Persons engaged in the inspection and repair of civil aircraft should be familiar with 14 CFR part 43, Maintenance, Preventive Maintenance, Rebuilding, and Alteration, and part 65, Subparts A, D, and E of Certification: Airmen Other Than Flight Crewmembers, and the applicable airworthiness requirements under which the aircraft was type certificated.

4. ACKNOWLEDGMENTS. The FAA would like to thank the following persons and organization for their assistance in producing AC 43.13-1B: Richard Finch, Richard Fischer, Michael Grimes, Ray Stits, William A. Watkins, and the SAE, Aerospace Electronics and Electrical Systems Division. Acknowledgment is also extended to all in the aviation community who commented on the document.

5. COMMENTS INVITED. Comments regarding this AC should be directed to DOT/FAA;
ATTN: Airworthiness Programs Branch, AFS-610; PO Box 25082; Oklahoma City, OK 73125

Acting Deputy Director, Flight Standards Service

that will ensure that the work complies with accepted industry practices. If the test equipment specified by the manufacturer is not available, equipment that is determined to be equivalent and acceptable to the Administrator may be used. The technician should be cautious, however, as “proving” the equivalence of test equipment may not be as simple as it seems.

Air carriers (commercial — “scheduled” airlines operating under part 121 and the “commuter/on demand” aircraft operating under part 135, and foreign air carriers and operators of U.S.-registered aircraft under part 129) may use the maintenance manual required by the operations specifications to comply with the requirements of this section. The operator must provide a continuous airworthiness maintenance and inspection program acceptable to the Administrator.

§43.15 Additional Performance Rules for Inspections

This section presents a general comment concerning the responsibility of conducting an inspection and then provides details of three separate conditions.

1. If a rotorcraft is being inspected, specific items, such as rotor transmissions and drive shafts, must be inspected.
2. When performing an annual or 100-hour inspection, a checklist must be used. This checklist may be a personal one or one from the manufacturer; either way, it must include the scope and detail of the inspection in appendix D. Specific engine performance is also required to be tested (or monitored) as part of RTS for an annual or 100-hour inspection. This applies whether the aircraft is reciprocating or turbine powered.
3. If a progressive inspection is being conducted, it must be preceded by a complete aircraft inspection. (*Note:* A progressive inspection is the result of breaking down the large task of conducting a major inspection into smaller tasks which can be accomplished periodically without taking the aircraft out of service for an extended period of time.) Two new definitions are also presented here, “routine” and “detailed.” A routine inspection is a visual examination or check of the item, but no disassembly is required. A detailed inspection is a thorough examination of the item including disassembly. The overhaul of a component is considered to be a detail inspection.

Any inspection work that is conducted away from the normal work location must be performed as if it were

occurring at the maintenance facility, including using the same forms and procedures.

§43.16 Airworthiness limitations

The technician performing inspection or maintenance actions on an aircraft must be certain he/she has all appropriate data available. This includes manufacturers’ maintenance manuals, operations specifications approved by the FAA under part 121, 123, or 135, or an inspection program approved under §91.409. Instructions for Continued Airworthiness, as required by §21.50 must also be consulted when available. (Since 1998 the FAA has required ICAs to be generated for all major alterations which are accomplished by the field approval process.) This section specifies that the technician is responsible to perform inspection or maintenance in accordance with all the preceding instructions.

§43.17 Maintenance, preventive maintenance, or alterations performed on U.S. aeronautical products by certain Canadian persons

This section was significantly revised in 2005 as the result of a Bilateral Aviation Safety Agreement (BASA) between the United States and Canada. The two countries have enjoyed a long and professional relationship with respect to reciprocal aviation maintenance activity. This section of part 43 both defines some terms and gives specific limitations as to what an Aviation Maintenance Engineer (AME is the Canadian equivalent to the U.S. A&P) may do to maintain U.S.-registered aircraft located in Canada. It also provides similar limitations for an Approved Maintenance Organization. (AMO is the Canadian equivalent to the U.S.-certified repair stations.)

Appendix A — Major Alterations, Major Repairs, and Preventive Maintenance

This appendix provides a comprehensive, but not exclusive, list of the subjects stated. Paragraph (a) is titled Major Alteration, and is further subdivided as follows:

- Airframe
- Powerplant
- Propeller
- Appliance

That same subdivision is used in paragraph (b), which is titled Major Repairs.

Paragraph (c) is titled Preventive Maintenance and identifies those maintenance actions, which are defined

as preventive maintenance (provided the maintenance does not involve complex assembly operations). Preventive maintenance work may be accomplished by the holder of at least a private pilot certificate provided he or she is the owner or operator of that aircraft, and it is not operated under part 121, 129, or 135.

Appendix B — Recording of Major Repairs and Major Alterations

In most cases when a major repair or alteration is accomplished, FAA Form 337, Major Repair or Alteration, is completed at least in duplicate with the original going to the aircraft owner and a copy sent to the FAA Aircraft Registration Branch in Oklahoma City where all civil aircraft information is compiled and retained. *Note:* Historically the second copy was sent to the local FAA Flight Standards District Office (FSDO) within 48 hours after RTS. This copy is reviewed by an ASI and then forwarded by the FSDO to FAA records on OK City. However, in the fall of 2005 the FAA made a significant change to this submittal process and now requires the technician to submit the Form 337 directly to the Aircraft Registration Branch in Oklahoma City. (Although a third copy is not required, it makes good business sense for the technician or certified repair station to keep a copy of the work that was accomplished.)

However, if a certificated repair station completes a major repair, it may provide the customer with a signed copy of the work order and a maintenance release signed by an authorized representative of the repair station, instead of the FAA Form 337.

If the major repair or alteration was done by an authorized Canadian maintenance person (AME or AMO), the copy normally provided to the FAA-FSDO is sent directly to the FAA Aircraft Registration Branch.

Finally, if extended range tanks are installed in either passenger or cargo compartments, the technician must generate a third FAA Form 337 for the modification. This copy must be placed and retained in the aircraft. (Refer to §91.417(d).)

Appendix C is reserved for future use and therefore currently contains no information.

Appendix D — Scope and Detail of Items To Be Included in Annual and 100-Hour Inspections

Some important items to consider in this appendix are:

1. The list of items and areas to be inspected are exactly the same for an annual as a 100 hour. (The only difference is who is authorized to approve

the aircraft for return to service following the inspection.) Refer to §65.95(a)(2), which states that an IA must perform an annual inspection.

2. The aircraft and engine must be cleaned prior to conducting the inspection.
3. Any miscellaneous item not covered in the detailed list provided must also be inspected for improper installation and operation.
4. There are eight specific areas identified for detail inspection. They are the fuselage hull group, cabin/cockpit group, engine/nacelle group, landing gear group, wing/center section group, empennage assembly, propeller group, and the radio group.

Appendix E — Altimeter System Test and Inspection

This is commonly referred to as “the 411 test.” (Refer to §91.411, which requires that no person may operate an aircraft in controlled airspace under IFR unless the aircraft has had this test completed successfully within the preceding 24 months.) This section, which requires detailed testing of the static pressure system, the altimeter, and the automatic pressure altitude reporting equipment, also requires that the test information be recorded in the maintenance logs *and* on the altimeter.

Appendix F — ATC Transponder Tests and Inspections

This is commonly referred to as “the 413 test.” (Refer to §91.413, which requires that no person may use a transponder unless it has had this test completed successfully within the preceding 24 months.) This section specifies an extremely complex set of tests, which may be accomplished either as a bench test, or by using portable test equipment. Major categories of the testing required are radio reply frequency, suppression, receiver sensitivity, radio frequency peak output power, and mode S (when applicable). Upon completion of testing, proper entries must be made in the maintenance record.

14 CFR Part 91 — General Operating and Flight Rules

Subpart A — General

As mentioned in the brief overview of the regulation portion earlier in this chapter, this part is actually addressing the operation of the aircraft. For example, §91.7(a) states “no person may operate a civil aircraft unless it is in an airworthy condition.” We learned earlier that this term means that the aircraft conforms to its approved type design and is in condition for safe

operation. When the pilot performs a preflight inspection, he or she is making a determination concerning the “condition for safe operation.” The pilot does not usually determine “conformity to type design” unless he or she performs a review of the maintenance records. However, since that is fundamental to the definition of airworthy, it is still part of their responsibility. Therefore, a professional and ethical technician will want to help the customer understand his or her responsibilities in maintaining and documenting the airworthiness of the aircraft.

Subpart E—Maintenance, Preventive Maintenance, and Alterations

§91.401—Applicability

Although this subpart describes in general the rules regarding maintenance, preventive maintenance, and alteration, certain sections do not apply if the aircraft is operated in accordance with part 121, 125, 129, or 135.

§91.403—General

The owner/operator holds the primary responsibility for maintaining the aircraft in airworthy condition. This includes compliance with all applicable airworthiness directives and is the reason that the FAA sends new AD notes to the registered owners of the affected aircraft. All maintenance performed must be accomplished in accordance with part 43. Compliance with the appropriate manufacturer maintenance manuals and Instructions for Continued Airworthiness is also required. Mandatory replacement times, inspection intervals, and related procedures as specified in the FAA-approved operations specifications must also be complied with.

§91.405—Maintenance required

The owner/operator is required to have the appropriate inspections made, and to have discrepancies repaired in accordance with part 43. He or she is also required to ensure that the appropriate entries have been made in the maintenance records. Any inoperative instruments or equipment must be properly placarded as inoperative.

§91.407—Operation after maintenance, preventive maintenance, rebuilding or alteration

Whenever the aircraft has undergone maintenance, preventive maintenance, rebuilding or alteration, it must have been approved for return to service and a proper entry made in the maintenance records. If the maintenance that was done could have appreciably

changed the flight characteristics, an appropriately rated pilot must perform an operational flight check of the aircraft and must make an entry of the flight in the maintenance records. If ground testing and inspection can show conclusively that the maintenance has not adversely affected the flight characteristics, no flight test is required.

§91.409—Inspections

This section identifies various types of inspection applicable to the civilian aircraft fleet. Paragraph (a) defines the requirement for an annual inspection. However, there are certain exceptions to this regulation:

1. Aircraft operating under a special flight permit.
2. Aircraft operating with a current experimental certificate.
3. Aircraft operating with a light sport aircraft certificate.
4. Aircraft operating with a provisional certificate.
5. Aircraft operating in accordance with the operational specification of a part 125 or 135 certificate holder.
6. Aircraft operating under a progressive inspection program.

Annual inspections are usually the inspection method associated with small “general aviation” aircraft. If this same aircraft is used for hire (including flight instruction for hire), then the aircraft must also be inspected every 100 hours of time in service. This requirement for a 100-hour inspection to be conducted on an aircraft is en route to reach a facility that will be conducting the inspection. Any time accrued between 100 and 110 hours is subtracted from the hours remaining before the *next* 100-hour inspection.

Since aircraft used for hire only generate revenue when they are flying, any time that the aircraft is “down for inspection” can result in a loss of income for the owner/operator. Therefore, the FAA has made provision to minimize the impact of the 100-hour and annual inspection requirement. The owner/operator may petition the local FSDO for approval of a progressive inspection program. This program breaks the complete inspection of the aircraft into smaller, less time-consuming steps. (Refer to part 43, appendix D.) This inspection may be either performed or supervised by a technician holding an Inspection Authorization (IA). The program must ensure at all times that the aircraft is airworthy. The owner/operator must submit

an inspection schedule with his or her application to the FAA. This schedule must identify the time intervals (hours or days) when routine and detailed inspections are to be accomplished. (Refer to §43.15.) Just as with the 100-hour inspection, a 10-hour maximum extension of a specified inspection interval is allowed if the aircraft is en route. A change in the inspection interval is also allowed for changes in service experience.

If the progressive inspection is discontinued, the aircraft will again be subject to the traditional annual and 100-hour inspections.

Other inspection programs, which may be applicable to other aircraft, are a continuous airworthiness inspection program and an approved aircraft inspection program (AAIP). The former program is applicable to either a part 121 or 135 carrier, but the latter program is limited to part 135 operators only. Finally, the owner/operator may use either a current inspection program recommended by the aircraft manufacturer or one established by the owner/operator and approved by the local FSDO. Any subsequent changes to that program must also be approved by the local FSDO.

There may be an instance when the operator of an aircraft wishes to change from one type of inspection program to another. In that case the time in service, calendar times, or cycles of operation from the current program must be carried over to the subsequent program.

§91.410—Special maintenance program requirements

After the separation of an 18-foot section of the upper fuselage area of an Aloha Airlines Boeing 737 in 1988, Boeing, the FAA, and the NTSB carefully studied this catastrophic failure. It was determined that corrosion and fatigue failure had occurred due to the numerous pressurization cycles this aircraft had experienced during its use by Aloha Airlines. This 19-year-old aircraft had over 90,000 landing cycles on it. The subsequent lessons learned from this event have led the FAA to impose flight cycle life limits on various commercial aircraft. Those limits and the specific aircraft impacted are identified in paragraph (a) of this section. Paragraph (b) specifies requirements for inspection of the fuel tank system on all turbine powered transport category aircraft having a passenger capacity of 30 or more, or a maximum certificated payload capacity of 7,500 pounds or more, if they were type certificated after January 1, 1958. This requirement is a result of the in-flight breakup of a 25-year-old Boeing Model 747-100 series airplane on July 17, 1996, after takeoff from

Kennedy International Airport in New York, resulting in 230 fatalities. The accident investigation conducted by the National Transportation Safety Board (NTSB) indicated that the center wing fuel tank exploded due to an unknown ignition source. This accident prompted the FAA to examine the underlying safety issues surrounding fuel tank explosions, the adequacy of the existing regulations, the service history of airplanes certificated to these regulations, and existing maintenance practices relative to the fuel tank system. This rule requires design approval holders of certain turbine-powered transport category airplanes, and of any subsequent modifications to these airplanes, to substantiate that the design of the fuel tank system precludes the existence of ignition sources within the airplane fuel tanks. It also requires developing and implementing maintenance and inspection instructions to assure the safety of the fuel tank system. For new type designs, this rule also requires demonstrating that ignition sources cannot be present in fuel tanks when failure conditions are considered, identifying any safety-critical maintenance actions, and incorporating a means either to minimize development of flammable vapors in fuel tanks or to prevent catastrophic damage if ignition does occur. These actions are based on accident investigations and adverse service experience, which have shown that unforeseen failure modes and lack of specific maintenance procedures on certain airplane fuel tank systems may result in degradation of design safety features intended to preclude ignition of vapors within the fuel tank.

§91.411—Altimeter system and altitude reporting equipment tests and inspections

Commonly referred to as “the 411 test.” This section specifies the requirements for testing the static pressure system, each altimeter instrument, and each automatic pressure altitude reporting system every 24 calendar months. The static system must also be tested any time it has been “opened and closed” except for the normal use of the system drain, and alternate static system pressure valves. If the automatic pressure altitude reporting system of the air traffic control (ATC) transponder is either installed or subjected to maintenance actions, the system must also be tested per appendix E of part 43.

Due to the inherent design and accuracy of this system, only certain persons may perform these tests: the aircraft manufacturer, a properly rated repair station, or a certificated airframe mechanic. It should be noted that the airframe technician may *only* perform the inspection and test of the static pressure system. Calibration

and maintenance of related instruments is specifically prohibited to the technician by the language of 14 CFR §65.81 and specifically allowed in 14 CFR §145.59 for repair stations holding an “instrument rating.”

TSO'd items are considered to be “tested and inspected” as of the date they were manufactured. The maximum altitude for which the system was tested is the maximum altitude at which the aircraft can be flown IFR in controlled airspace.

§91.413—ATC transponder tests and inspections

This “413 test” is the other test required every 24 months. Whenever the ATC transponder is installed or has undergone maintenance, the complete system must be tested and inspected in accordance with appendix E of part 43. The transponder itself must be tested and inspected in accordance with appendix F of part 43. As with the 411 test, only certain persons are authorized to conduct the tests. They are: the manufacturer of the aircraft, a properly certificated repair station, or the holder of a continuous airworthiness maintenance program under part 121 or 135.

§91.415—Changes to aircraft inspection programs

If the FAA determines that the inspection program established and approved under either §91.409 or 91.1109 must be revised to ensure continued safety and adequacy of the program, the owner/operator must make the necessary changes as identified by the Administrator. If the owner/operator desires to contest this request, they must petition the FAA to reconsider their request to change the program within 30 days of receiving the change request from the FAA.

§91.417—Maintenance records

The understanding and implementation of this section is fundamental to the aircraft industry, in general, and the aircraft owner/operator, in specific. A professional maintenance technician should not only be knowledgeable of this section, but should also be able to help the owner/operator understand it. [Figure 12-9] This section identifies four types of records—two are quite specific (paragraphs (a) and (d)) and two are more general: (a)(1) and (a)(2). Paragraph (a) refers to the 411 and 413 testing, which requires testing every 24 months; therefore records must be kept for that length of time.

Paragraph (d) refers to the installation of fuel tanks in the cabin or cargo area. The FAA Form 337 authorizing this installation must be kept on board the aircraft all the time.

Note: Other than this paragraph, there is no requirement that the maintenance records of the aircraft be carried on the aircraft. In fact, there are very logical reasons that in most cases they shouldn't be. The two biggest concerns are damaged or lost records. It is much safer to retain the logs in a filing system in the office. It is also a very wise idea to have the logbook copied or scanned, and retained at a separate location should a catastrophic event (fire, flood, tornado, hurricane, and so forth) occur at the site the original records are retained.

Subparagraph (a)(1) then lists those records which are later defined in (b)(1) as being only retained for 1 year or until the work is repeated or superseded. Subparagraph (a)(2) specifies the records that are permanent records, and are identified in subparagraph (b)(2) as those which must be transferred with the aircraft. Refer to the chart for further clarification. [Figure 12-9]

Paragraph (c) requires that all of the maintenance records mandated by this section be made available upon request to the Administrator or any authorized representative of the National Transportation Safety Board. Furthermore, the owner/operator must provide the Form 337 required to be aboard the aircraft whenever additional fuel tanks are installed in either the passenger compartment or the baggage compartment (per paragraph (d)) to any law enforcement officer upon request.

§91.419—Transfer of maintenance records

When an aircraft is sold, it is logical that the records are transferred with it. They may be either in plain language or coded. However, the purchaser may elect to permit the seller to retain the actual records, but if that occurs, the purchaser (now the current owner/operator) must still make available upon request, these records to either the FAA or the NTSB.

§91.421—Rebuilt engine maintenance records

This section presents the term “zero time.” Although not truly given as a definition, the wording of the regulation is very clear that an aircraft engine, when rebuilt by the engine manufacturer or an agency approved by the manufacturer, may be given a new maintenance record, showing no previous operating history. This new record must include a signed statement with the date it was rebuilt, any changes incorporated by compliance with AD notes, and compliance with any of the manufacturer's service bulletins.

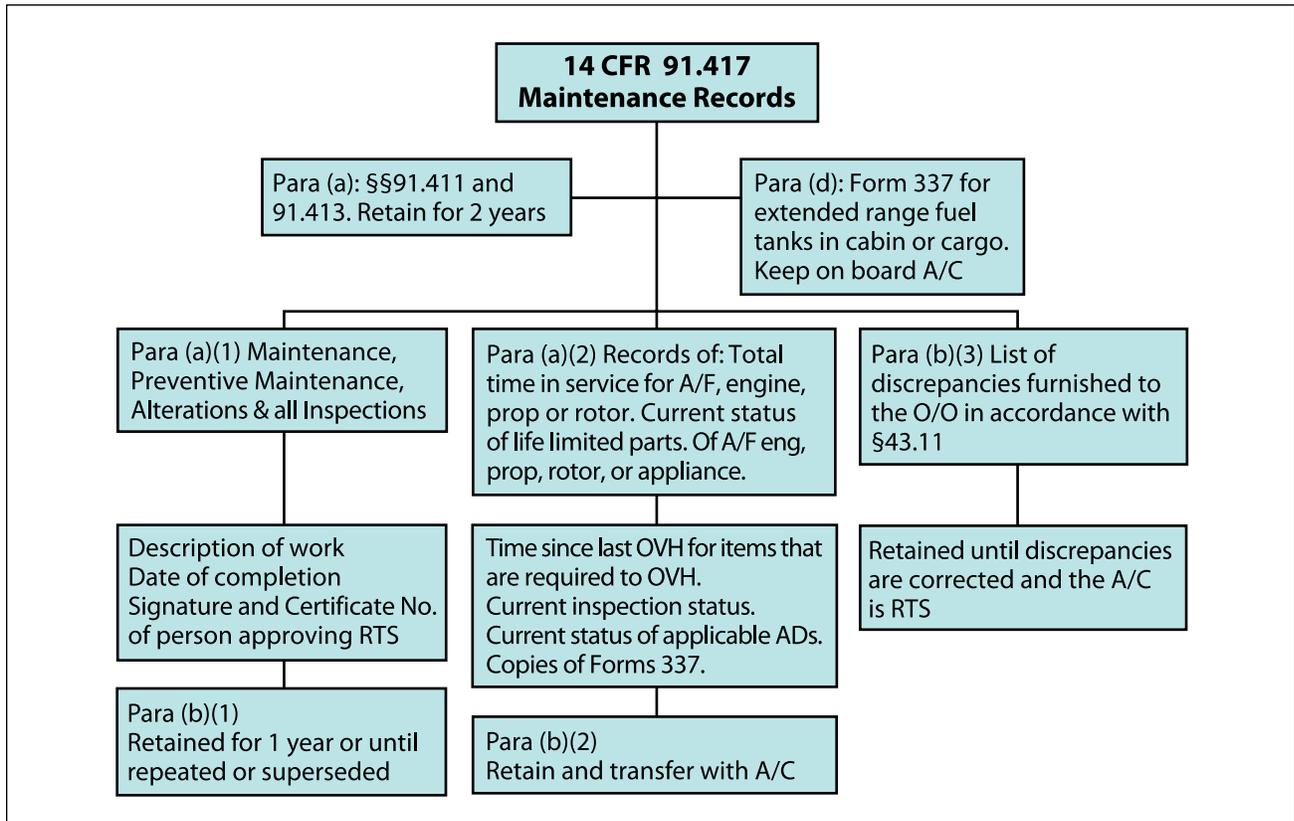


Figure 12-9. Maintenance records.

Civil Air Regulations (CARs)

Prior to 1926, access to flying was totally uncontrolled. No licensing or certification was required. By the middle of the 1920s, it became obvious that unregulated private and commercial flying was dangerous. There was a growing awareness and acceptance that regulation could improve safety and encourage growth in aviation. Therefore, in 1926 the aviation industry requested Congress to enact federal legislation to regulate civil aviation. Thus, the Air Commerce Act of 1926 provided for the:

1. Establishment of airways.
2. Development of aviation aids.
3. Investigation of aviation accidents.
4. Licensing of pilots.
5. Certification of aircraft.

The CARs were part of the original certification basis for aircraft first certified in the 1940s, 1950s, and 1960s by the CAA. Therefore, the CARs may still be needed as a reference for these older aircraft. [Figure 12-10]

CAR 3 — Airplane Airworthiness — Normal, Utility, Acrobatic, and Restricted Purpose Categories

As the name implies, and Figure 12-1 indicates, this specific regulation is the basis for the current part 23 regulation. It has the following subpart categories:

- A—Airworthiness Requirements
- B—Flight Requirements—General
- C—Strength Requirements—General
- D—Design and Construction—General
- E—Powerplant Installations—Reciprocating Engines
- F—Equipment

Some examples of CAR 3 aircraft are Piper PA 22, PA 28, PA 32 and Cessna 182, 195, and 310.

Note: The “CAR” acronym actually has two interpretations: Civil Air Regulations and Canadian Aviation Regulations. The technician must clearly understand the difference, and recognize when one or the other is appropriate.

Predecessor Regulations to the Federal Aviation Regulations (14 CFR)	
	Aeronautical Bulletins
Aeronautics Bulletin No. 7A	Airworthiness Requirements for Aircraft
Aeronautics Bulletin No. 7H	Alteration and Repair of Aircraft
	Civil Air Regulations
CAR Part 1 Amdt. 1-9	Certification, Identification, and Marking of Aircraft and Related Products
CAR Part 3 Amdt. 1-14	Airplane Airworthiness—Normal, Utility, Acrobatic, and Restricted Purpose Categories
CAR Part 4a Amdt. 1	Airplane Airworthiness
CAR Part 4b Amdt. 1-15	Airplane Airworthiness: Transport Categories
CAR Part 6 Amdt. 1-7	Rotorcraft Airworthiness: Normal Category
CAR Part 7 Amdt. 1-5	Rotorcraft Airworthiness: Transport Categories
CAR Part 8	Aircraft Airworthiness: Restricted Category
CAR Part 9 Amdt. 1	Aircraft Airworthiness: Limited Category
CAR Part 10 Amdt. 1	Certification and Approval of Import Aircraft and Related Products
CAR Part 13 Amdt. 1-6	Aircraft Engine Airworthiness
CAR Part 14 Amdt. 1	Aircraft Propeller Airworthiness
CAR Part 18 Amdt. 1-3	Maintenance, Repair, and Alteration of Airframes, Powerplants, Propellers, and Appliances
	Civil Aeronautics Manual
CAM 1	Certification, Identification, and Marking of Aircraft and Related Products
CAM 3	Airplane Airworthiness: Normal, Utility, and Acrobatic Categories
CAM 4b	Airplane Airworthiness: Transport Category
CAM 6	Rotorcraft Airworthiness: Normal Category
CAM 7	Rotorcraft Airworthiness: Transport Category
CAM 8	Aircraft Airworthiness: Restricted Category
CAM 9	Aircraft Airworthiness: Limited Category
CAM 10	Certification and Approval of Imported Aircraft and Related Products
CAM 13	Aircraft Engine Airworthiness
CAM 14	Aircraft Propeller Airworthiness
CAM 18	Maintenance, Repair, and Alterations of Airframe, Powerplants, Propellers, and Appliances

Figure 12-10. CARs.

CAR 4a — Airplane Airworthiness

This regulation, which originated in 1936, was last amended on April 7, 1950. The subparts included in this regulation are:

- A—Airworthiness Requirements
- B—Definitions
- C—Structural Loading Conditions, General Structural Requirements
- D—Proof of Structure
- E—Detail Design and Construction
- F—Equipment
- G—Powerplant Installation
- H—Performance
- I—Miscellaneous Requirements

Initially this regulation was the basis for establishing the design requirements for virtually all aircraft produced in the 1930s, 1940s, and 1950s.

Eventually CAR 3 evolved as the regulatory material specific to small aircraft, and CAR 4a and b focused on regulatory requirements for large aircraft. It is very important to review the type certificate data sheet for each aircraft. The Cessna 140 for example, was certified as a landplane under CAR 3, but under CAR 4a as a ski-plane or seaplane.

Another example of a more current and larger aircraft is the Gulfstream 1159 and 1159A. The former is certified under CAR 4b, but the latter is certified to 14 CFR part 25.

Suspected Unapproved Parts (SUPs)

There are four types of aircraft parts:

1. Good parts with good paperwork.
2. Good parts with bad paperwork.
3. Bad parts with “good” (bogus) paperwork.
4. Bad parts with bad paperwork.

The first of those listed represents properly authorized parts and when properly installed are approved parts, and the aircraft can be returned to service.

The last of those listed represent obviously unauthorized and unapproved parts. The technician should be alert for these, and must never install them on an aircraft.

The center two categories of parts represent suspected unapproved parts. If either the physical part *or* the paperwork associated with the part is questionable, it is best to contact the shop foreman, shift supervisor, or the assigned quality individual to discuss your concerns. Suspected unapproved parts (SUPs) should be segregated and quarantined until proper disposition can be determined. Contacting the manufacturer of the product is a good way to start gathering the facts concerning the product in question. (Refer to the current version of Advisory Circular (AC) 21-29, Detecting and Reporting Suspected Unapproved Parts, for additional information.) Contact the FAA—System Surveillance and Analysis Division (AIR-300), P.O. Box 17030, Washington, DC 20041; using FAA Form 8120-11, Suspected Unapproved Parts Report, or call the FAA Aviation Safety Hotline at 1-800-255-1111.

Other FAA Documents

Advisory Circulars (ACs)

The FAA issues advisory circulars to inform the aviation public in a systematic way of non-regulatory material. Unless incorporated into a regulation by reference, the contents of an advisory circular are not binding on the public. Advisory circulars are issued in a numbered-subject system corresponding to the subject areas of the Federal Aviation Regulations (Title 14 of the Code of Federal Regulations, Chapter I, Federal Aviation Administration) and Chapter III, Commercial Space Transportation, Federal Aviation Administration, Department of Transportation, Parts 400–450. An AC is issued to provide guidance and information in a designated subject area or to show a method acceptable to the Administrator for complying with a related federal aviation regulation.

Because of their close relationship to the CFRs, ACs are arranged in a numbered system which corresponds to the subject areas of the CFRs. In some series, consecutive numbers may be missing. These numbers were either assigned to advisory circulars still in preparation, which will be issued at a later date or were assigned to advisory circulars that have been canceled.

They are issued and updated irregularly with new revisions designated by letters of the alphabet. The suffix following an AC number indicates a revision to that AC and cancels the previous edition. For example, AC 00-6A replaces and cancels AC 00-6; AC 00-7D replaces and cancels AC 00-7C. ACs may be canceled without replacement, either by the issuing office, by another AC, or by another publication. [Figure 12-11]

Advisory Circular Numbering System

The Circular Numbering System

1. General. The advisory circular numbers relate to the 14 CFR subchapter titles and correspond to the Parts, and when appropriate, to the specific sections of 14 CFR.
2. General and specific subject numbers. The subject numbers and related subject areas are as follows:

General Subject Number (1)	Specific Subject Number (2)	Subject
00		General
	1	Definitions and Abbreviations
10		Procedural Rules
	11	General Rule-Making Procedures
	13	Investigation and Enforcement Procedures
20		Aircraft
	21	Certification Procedures for Products and Parts
	23	Airworthiness Standards: Normal, Utility, and Acrobatic Category Airplanes
	25	Airworthiness Standards: Transport Category Airplanes
	27	Airworthiness Standards: Normal Category Rotorcraft
	29	Airworthiness Standards: Transport Category Rotorcraft
	31	Airworthiness Standards: Manned Free Balloons
	33	Airworthiness Standards: Aircraft Engines
	34	Fuel Venting and Exhaust Emission Requirements for Turbine Engine Powered Airplanes
	35	Airworthiness Standards: Propellers
	36	Noise Standards: Aircraft Type and Airworthiness Certification
	39	Airworthiness Directives
	43	Maintenance, Preventive Maintenance, Rebuilding, and Alteration
	45	Identification and Registration Marking
	47	Aircraft Registration
	49	Recording of Aircraft Titles and Security Documents

General Subject Number (1)	Specific Subject Number (2)	Subject
60		Airmen
	61	Certification: Pilots and Flight Instructors
	63	Certification: Flight Crewmembers Other Than Pilots
	65	Certification: Airmen Other Than Flight Crewmembers
	67	Medical Standards and Certification
70		Airspace
	71	Designation of Federal Airways, Area Low Routes, Controlled Airspace, and Reporting Points
	73	Special Use Airspace
	75	Establishment of Jet Routes and Area High Routes
	77	Objects Affecting Navigable Airspace
90		Air Traffic and General Operating Rules
	91	General Operating and Flight Rules
	93	Special Air Traffic Rules and Airport Traffic Patterns
	95	IFR Altitudes
	97	Standard Instrument Approach Procedures
	99	Security Control of Air Traffic
	101	Moored Balloons, Kites, Unmanned Rockets, and Unmanned Free Balloons
	103	Ultralight Vehicles
	105	Parachute Jumping
	107	Airport Security
	108	Airplane Operators Security
	109	Indirect Air Carrier Security
119		Certification: Air Carriers and Commercial Operators
120		Air Carriers, Air Travel Clubs, and Operators for Compensation or Hire: Certification and Operations
	121	Certification and Operations: Domestic, Flag, and Supplemental Air Carriers and Commercial Operators of Large Aircraft

Figure 12-11. List of advisory circular numbers.

Advisory Circular Numbering System <i>(continued)</i>					
General Subject Number (1)	Specific Subject Number (2)	Subject	General Subject Number (1)	Specific Subject Number (2)	Subject
120		<i>(Continued)</i>	170		Navigational Facilities
	125	Certification and Operations: Airplanes Having a Seating Capacity of 20 or More Passengers or a Maximum Payload Capacity of 6,000 Pounds of More		170	Establishment and Discontinuance Criteria for Airport Traffic Control Tower Facilities
	127	Certification and Operations of Scheduled Air Carriers with Helicopters		171	Non-Federal Navigation Facilities
	129	Operations of Foreign Air Carriers	180		Administrative Regulations
	133	Rotorcraft External-Load Operations		183	Representatives of the Administrator
	135	Air Taxi Operators and Commercial Operators		185	Testimony by Employees and Production of Records in Legal Proceedings
	137	Agricultural Aircraft Operations		187	Fees
	139	Certification and Operations: Land Airports Serving CAB-Certificated Air Carriers		189	Use of Federal Aviation Administration Communication System
140		Schools and Other Certificated Agencies	190		Withholding Security Information
	141	Pilot Schools		191	Withholding Security Information from Disclosure Under the Air Transportation Security Act of 1974
	143	Ground Instructors		198	Aviation Insurance Program
	145	Repair Stations	210		Flight Information
	147	Aviation Maintenance Technician Schools		211	Aeronautical Charts and Flight Information Publications
150		Airport Noise Compatibility Planning		212	Publication Specification: Charts and Publications
	151	Federal Aid to Airports	400		Commercial Space Transportation
	152	Airport Aid Program		440	Financial Responsibility
	155	Release of Airport Property from Surplus Property Disposal Restrictions			
	156	State Block Grant Pilot Program			
	157	Notice of Construction, Alteration, Activation, and Deactivation of Airports			
	158	Passenger Facilities Charges			
	159	National Capital Airports			
	159/10	Washington National Airport			
	159/20	Dulles International Airport			
	161	Notice and Approval of Airport Noise and Access Restrictions			
	169	Expenditures of Federal Funds for Nonmilitary Airports or Air Navigational Facilities Thereon			

1— Based on 14 CFR Subchapter Titles (excluding the 210 series)
2— Based on 14 CFR Part Titles (excluding the 210 series)

3. Within the General Subject Number Areas, specific selectivity in advisory circular mail lists is available corresponding to the applicable 14 CFR parts. For example: under the 60 general subject area, separate mail lists for advisory circulars issued in the 61, 63, 65, or 67 series are available. An AC numbered "60" goes to all numbers in the 60 series. When the volume of circulars in a series warrants a subsubject breakdown, the general number is followed by a slash and a subsubject number.
4. Individual circular identification numbers. Each circular has a subject number followed either by a dash and a consecutive number (135-15) or a period with a specific 14 CFR section number, followed by a dash and a consecutive number (135.169-2) identifying the individual circular. This consecutive number is not used again in the same subject series. Revised circulars have a letter (A, B, C, etc.) after the consecutive number to show complete revisions. Changes to circulars have Chg. 1, Chg. 2, Chg. 3, etc., after the identification number on pages that have been changed. The date on a revised page is changed to the date of the change transmittal.

Figure 12-11. List of advisory circular numbers. (continued)

Airworthiness Directives (ADs)

In accordance with part 39 of Title 14 of the Code of Federal Regulations, the FAA issues airworthiness directives in response to deficiencies and/or unsafe conditions found in aircraft, engines, propellers, or other aircraft parts. ADs, as they are known in the industry, require that the relevant problem must be corrected on all aircraft or aircraft parts using the same design. ADs are initiated as either proposed, corrective, or final (telegraphic) via the Federal Register. The Federal Register is the official daily publication of the United States Government. It is the printed method of informing the public of laws that are enacted or will be enacted. Electronic versions of ADs are available from the Federal Register and from the Regulatory and Guidance Library. You can search by manufacturer, model, or AD number. All ADs are “incorporated by reference” into part 39, and are considered final. ADs must be followed to remain in compliance with the FAA. Once an AD has been issued, a person/company is authorized to use the affected aircraft or part only if it has been corrected in accordance with the AD.

AD Content

Generally, ADs include:

- A description of the unsafe condition.
- The product to which the AD applies.
- The required corrective action or operating limitations, or both.
- The AD effective date.
- A compliance time.
- Where to go for more information.
- Information on alternative methods of compliance with the requirements of the AD.

AD Number

ADs have a three-part number designator. The first part is the calendar year of issuance. The second part is the biweekly period of the year when the number is assigned. The third part is issued sequentially within each biweekly period.

Applicability and Compliance

The AD subject line specifically identifies the type certificate holder of the aircraft or products affected by the AD. The specific models affected, and any special considerations, such as specific installed part numbers or modifications, are listed in the AD applicability section. In order to find all applicable ADs for a specific product, you must search for ADs on the product, air-

craft, engine(s), propeller, or any installed appliance. If there are multiple series under the aircraft or engine model, you must also search for ADs applicable to the model as well as the specific series of that model. The final determination of ADs applicable to a particular product can only be made by a thorough examination of the ADs and the product logbooks. No person may operate a product to which an AD applies, except in accordance with the requirements of the AD. Furthermore, the owner or operator of an aircraft is required by 14 CFR §91.403 to maintain the aircraft in compliance with all ADs. The AD specifies a compliance time that relates to the effective date of the AD. That compliance time determines when the actions are required.

Alternative Method of Compliance

Different approaches or techniques that are not specified in an AD can, after FAA approval, be used to correct an unsafe condition on an aircraft or aircraft product. Although the alternative was not known at the time the AD was issued, an alternative method may be acceptable to accomplish the intent of the AD. A compliance time that differs from the requirements of the AD can also be approved if the revised time period and approved alternative method provides an acceptable level of safety as the requirements of the AD.

Aircraft Listings

This document contains the specifications and data for certificated aircraft when the number of registered aircraft is 50 or fewer.

Aircraft Specifications

“Specifications” were originated during implementation of the Air Commerce Act of 1926. Specifications are FAA recordkeeping documents issued for both type certificated and non-type-certificated products which have been found eligible for U.S. airworthiness certification. Although they are no longer issued, specifications remain in effect and will be further amended. Specifications covering type-certificated products may be converted to type certificate data sheets at the option of the type certificate holder. However, to do so requires the type certificate holder to provide an equipment list. A specification is *not* part of a type certificate. Specifications are subdivided into five major groups as follows:

1. Group I—Type Certificate Aircraft, Engines and Propellers. Covering standard, restricted, and limited types issued for domestic, foreign, and military surplus products.

2. Group II—Aircraft, Engine, and Propeller Approvals. Covering domestic, foreign, and military surplus products constructed or modified between October 1, 1927, and August 22, 1938, all of which have met minimum airworthiness requirements without formal type certification. Such products are eligible for standard airworthiness certification as though they are type-certificated products.
3. Group III—Aircraft, Engine, and Propeller Approvals. Covering domestic products manufactured prior to October 1, 1927, foreign products manufactured prior to June 20, 1931, and certain military surplus engines and propellers all of which have met minimum airworthiness requirements of the Air Commerce Act of 1926 and implementing Air Commerce Regulations without formal type certification. Such products are eligible for standard airworthiness certification as though they are type-certificated products.
4. Group IV—Engine Ratings. Covering unapproved engines rated for maximum power and speed only, their use being limited to specific aircraft with maximum gross weights less than 1,000 pounds. Such engines are not eligible for independent airworthiness certification. These ratings are no longer issued.
5. Group V—Engine Approvals. Covering military surplus engines meeting Civil Air Regulation (CAR) 13 design requirements without formal type certification. Such engines are eligible for airworthiness certification as though they are type-certificated engines.

Aviation Maintenance Alerts (AC 43-16)

This is a monthly electronic publication of the FAA that provides information concerning malfunction or defects observed by technicians throughout the aviation industry. The data is supplied to the FAA on FAA Form 8010-4, Malfunction or Defect Report, which may be submitted to the FAA either electronically via the Internet, or by downloading a paper copy and completing it manually. After review, the FAA may print and format the inspection information into the AC. The professional maintenance technician will make full use of the information and will review it regularly when conducting an inspection. The monthly material is separated as necessary into airplanes, helicopters, powerplants, propeller, and accessory categories and then presented alphabetically in the category. Below is a sample Alert from the January 2005 issue. Notice the reference to the ATA code after the title. Refer to

“Non-FAA Documents” presented later in this chapter for an explanation of these codes.

Cessna; 182T; Locked Rudder Trim Wheel; ATA 2721

A transit customer required help as his rudder trim was stuck in the full-right position. The attending mechanics found the trim indicator pin had jumped free of its positioning track and locked the trim wheel. After adjustment, the system was cycled to full extremes several times. The submitter notes they could replicate the “jammed” trim condition with extreme R/H trim. This aircraft was the second 182 observed by these mechanics having this particular problem.

Part total time: 31.9 hours.

Supplemental Type Certificates (STC)

A supplemental type certificate (STC) is a document issued by the FAA approving a product (aircraft, engine, or propeller) modification. [Figure 12-12] The STC defines the product design change, states how the modification affects the existing type design, and lists serial number effectivity. It also identifies the certification basis listing specific regulatory compliance for the design change. Information contained in the certification basis is helpful for those applicants proposing subsequent product modifications and evaluating certification basis compatibility with other STC modifications. Refer to Figure 12-13 for a listing of how TCs and STCs are numbered.

Possession of the STC document does not constitute rights to the design data or installation of the modification. The STC and its supporting data (drawings, instructions, specifications, and so forth) are the property of the STC holder. You must contact the STC holder to obtain rights for the use of the STC.

Type Certificate Data Sheets (TCDS)

The TCDS is a formal description of the aircraft, engine, or propeller. It lists limitations and information required for type certification including airspeed limits, weight limits, thrust limitations, and so forth.

Type certificate data sheets and specifications set forth essential factors and other conditions which are necessary for U.S. airworthiness certification. Aircraft, engines, and propellers which conform to a U.S. type certificate (TC) are eligible for U.S. airworthiness certification when found to be in a condition for safe

United States of America
Department of Transportation — Federal Aviation Administration
Supplemental Type Certificate

Number SA7855SW 150-308
ARH

This certificate, issued to Sarnes Aircraft Company
1100 Airport Drive
Bethany, Oklahoma 73008

certifies that the change in the type design for the following product with the limitations and conditions therefor as specified hereon meets the airworthiness requirements of Part 23 of the Federal Aviation Regulations.

Original Product — Type Certificate Number: A12SO
Make: DEMANDER
Model: 114

Description of Type Design Change:

Installation of McCauley B3D32C419/82NHA-5 Propeller on Demander Model 114 airplane in accordance with Sarnes Aircraft Co., Installation Instructions dated July 13, 1990, Revision A dated August 22, 1990, or later FAA approved revision.

Limitations and Conditions:

FAA approved Sarnes Aircraft Co. Flight Manual Supplement dated August 23, 1990, must accompany this modification. Compatibility of this modification with previously installed equipment must be determined by installer.

This certificate and the supporting data which is the basis for approval shall remain in effect until surrendered, suspended, revoked, or a termination date is otherwise established by the Administrator of the Federal Aviation Administration.

Date of application: February 9, 1990

Date reissued:

Date of issuance: August 23, 1990

Date amended: Amd. 1, September 10, 1990



By direction of the Administrator

Jane Doe
(Signature)

Jane Doe
Airplane Certification Office

(Title)

Any alteration of this certificate is punishable by a fine of not exceeding \$1,000, or imprisonment not exceeding 3 years, or both.

This certificate may be transferred in accordance with FAR 21.47.

Figure 12-12. Supplemental type certificate.

Forms and Guidance for Certification Projects

Type Certificate Numbering System (5 Parts)

1. **S** indicates a supplemental type certificate (blank if a type certificate)
2. **X** = An alpha digit to identify the type of product; that is,
 - A** = Small Airplane
 - B** = Balloon
 - E** = Engine
 - G** = Glider
 - P** = Propeller
 - R** = Rotorcraft
 - S** = Airship
 - T** = Transport Airplane
3. **nnnnn** = Assigned number automatically generated by ACOS; for example 00146
4. **YY** = Two alpha digits to identify the issuing Aircraft Certification Office (ACO)
 - AC** = ASW-150, Ft. Worth Airplane Certification Office
 - AK** = ACE-115N, Anchorage Aircraft Certification Office
 - AT** = ACE-15A, Atlanta Aircraft Certification Office
 - BO** = ANE-150, Boston Aircraft Certification Office
 - CH** = ACE-115C, Chicago Aircraft Certification Office
 - DE** = ANM-100D, Denver Aircraft Certification Office
 - EN** = ANE-140, Engine Certification Office, Boston
 - LA** = ANM-100L, Los Angeles Aircraft Certification Office
 - MC** = ACE-100M, Military Certification Office
 - NY** = ANE-170, New York Aircraft Certification Office
 - RC** = ASW-170, Ft. Worth Rotorcraft Aircraft Certification Office
 - SE** = ANM-100S, Seattle Aircraft Certification Office
 - SC** = ASW-190, Ft. Worth Special Certification Office
 - WI** = ACE-115W, Wichita Aircraft Certification Office
5. **D** = Indicates Designated Alteration Station (DAS) issued STC (blank if not DAS issued)

As an example, SA00125AT would be an STC issued by the Atlanta ACO on a small airplane with the assigned number 00125.

Figure 12-13. Numbering system for TCs and STCs.

operation and ownership requisites are fulfilled. [Figure 12-14]

Type certificate data sheets were originated and first published in January 1958. 14 CFR part 21, §21.41 indicates they are part of the type certificate. As such, a type certificate data sheet is evidence the product has been type certificated. Generally, type certificate data sheets are compiled from details supplied by the type certificate holder; however, the FAA may request and incorporate additional details when conditions warrant. [Figure 12-15]

Under federal law, no civil aircraft registered in the United States can operate without a valid airworthiness certificate. This certificate must be approved and

issued by the FAA; and it will only be issued if the aircraft and its engines, propellers, and appliances are found to be airworthy and meet the requirements of an FAA-approved type certificate. The FAA issues a type certificate when a new aircraft, engine, propeller, and so forth, is found to meet safety standards set forth by the FAA. The TCDS lists the specifications, conditions, and limitations under which airworthiness requirements were met for the specified product, such as engine make and model, fuel type, engine limits, airspeed limits, maximum weight, minimum crew, and so forth. TCDS's are issued and revised as necessary to accommodate new models or other major changes in the certified product. TCDS's are categorized by TCD holder and product type.

The United States of America
Federal Aviation Administration
Department of Transportation

Type Certificate

Number A6WF

This certificate issued to **MCDONNELL DOUGLAS CORPORATION**
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 4b of the Federal Aviation Regulations.

DC-9-11, DC-9-12, DC-9-13, DC-9-14, DC-9-15,
DC-9-31, DC-9-15F, DC-9-32, DC-9-32F, DC-9-41,
DC-9-33F, DC-9-21, DC-9-51, DC-9-34F, DC-9-34,
DC-9-81, DC-9-82, DC-9-83

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 three pages.

Date of application: See Page 2.

Date of issuance: See Page 3.

By direction of the Administrator

(Signature) Keith D. Anderson

(Title) MANAGER, LOS ANGELES AIRCRAFT
CERTIFICATION OFFICE

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 12-14. Type certificate.

**Department of Transportation
Federal Aviation Administration**

A6WE
Revision 26
McDonnell Douglas
DC-9-11, DC-9-12, DC-9-13, DC-9-14,
DC-9-15, DC-9-15F, DC-9-21, DC-9-31,
DC-9-32, DC-9-32 (VC-9C), DC-9-32F,
DC-9-32F (C-9A, C-9B), DC-9-33F,
DC-9-34, DC-9-34F, DC-9-41, DC-9-51,
DC-9-81 (MD-81), DC-9-82 (MD-82),
DC-9-83 (MD-83), DC-9-87 (MD-87),
MD-88, MD-90, 717-200

November 1, 2001

Type Certificate Data Sheet No. A6WE

This Data sheet, which is part of Type Certificate No. A6WE, prescribes condition and limitations under which the product for which the Type Certificate was issued meets the airworthiness requirements of the Civil Air Regulations and Federal Aviation Regulations.

Type Certificate Holder: McDonnell Douglas Corporation
Long Beach, California

Type Certificate Ownership Record: McDonnell Douglas Corporation transferred ownership of the TC A6WE to The Boeing Company on January 30, 1998. MDC is a subsidiary of The Boeing Company.

The DC-9, -10, -20, -30, -40, and -50 Series; and DC-9-81/-82/-83/-87, MD-88, MD-90, and 717 are defined as follows:

- DC-9-10 SeriesDC-9-11, DC-9-12, DC-9-13, DC-9-14, DC-9-15, DC-9-15F
- DC-9-20 Series.....DC-9-21
- DC-9-30 Series.....DC-9-31, DC-9-32, DC-9-32 (VC-9C), DC-9-32F, DC-9-32F (C-9A, C-9B), DC-9-33F,
DC-9-34, and DC-9-34F
- DC-9-40 Series.....DC-9-41
- DC-9-50 Series.....DC-9-51
- DC-9-81/-82/-83/-87DC-9-81 (MD-81), DC-9-82 (MD-82), DC-9-83 (MD-83), DC-9-87 (MD-87)
- MD-88.....MD-88
- MD-90.....MD-90-30
- 717.....717-200

Page No.	1	2	3	4	5	6	7	8	9	10
Rev. No.	26	26	26	26	26	26	26	26	26	26
Page No.	11	12	13	14	15	16	17	18	19	20
Rev. No.	26	26	26	26	26	26	26	26	26	26
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Rev. No.	26	26	26	26	26	26	26	26	26	26
Page No.	31	32	33	34	35	36	37	38	39	40
Rev. No.	26	26	26	26	26	26	26	26	26	26
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Rev. No.	26	26	26	26	26	26	26	26	26	26
Page No.	51	52	53	54	55	56	57	58	59	60
Rev. No.	26	26	26	26	26	26	26	26	26	26
Page No.	61	62	63	64	65	66	67	68	69	70
Rev. No.	26	26	26	26	26	26	26	26	26	26
Page No.	71	72	73	74	75	76	77	78	79	80
Rev. No.	26	26	26	26	26	26	26	26	26	26

Note: Revision 26 of the A6WE Type Certificate Data Sheet is formatted as the most recent change to FAA Type Certificate Data Sheet presentation. Revision 26 to the A6WE Type Certificate Data Sheet incorporates all previous A6WE revisions.

Figure 12-15. Type Certificate Data Sheet.

JASC/ATA 100 Code Listings					
11	Placards and Markings	34	Navigation	64	Tail Rotor
12	Servicing	35	Oxygen	65	Tail Rotor Drive
14	Hardware	36	Pneumatic	67	Rotors Flight Control
18	Helicopter Vibration	37	Vacuum	71	PowerPlant
21	Air Conditioning	38	Water/Waste	72	Turbine/Turboprop Engine
22	Auto Flight	45	Central Maintenance System	73	Engine Fuel and Control
23	Communications	49	Airborne Auxiliary Power	74	Ignition
24	Electrical Power	51	Standard Practices/Structures	75	Air
25	Equipment/Furnishings	52	Doors	76	Engine Controls
26	Fire Protection	53	Fuselage	77	Engine Indicating
27	Flight Controls	54	Nacelles/Pylons	78	Engine Exhaust
28	Fuel	55	Stabilizers	79	Engine Oil
29	Hydraulic Power	56	Windows	80	Starting
30	Ice and Rain Protection	57	Wings	81	Turbocharging
31	Instruments	61	Propellers/Propulsors	82	Water Injection
32	Landing Gear	62	Main Rotor	83	Accessory Gearboxes
33	Lights	63	Main Rotor Drive	85	Reciprocating Engine

Figure 12-16. Maintenance classification.

Non-FAA Documents

Air Transport Association (ATA) 100

To standardize the technical data and maintenance activities on large and therefore complex aircraft, the ATA has established a classification of maintenance related actions. These are arranged with sequential numbers assigned to ATA chapters. These chapters are consistent regardless of which large aircraft is being worked on. [Figure 12-16]

Manufacturers' Published Data

The original equipment manufacturer (OEM) is usually the best source of information for the operation of and maintenance on a particular product. Whether the product is a complete aircraft (Cessna 172, Boeing 777, or Airbus A380), an engine, or a component of the engine (i.e., thrust reverser, hydraulic pump, generator, and so forth), the manufacturer is required by 14 CFR part 21, §21.5 to provide a current approved airplane or rotorcraft flight manual and (if applicable) a rotorcraft maintenance manual. If the product is a TC'd or STC'd item, §21.50 requires the holder of the design

approval to provide one set of complete Instructions for Continued Airworthiness (ICAs). Additional requirements for ICAs are specified in §§23.1529, 25.1529, 27.1529 and 29.1529. These sections further refer the reader to appendix G (for parts 23 and 25) and appendix A (for parts 27 and 29). Regardless of which appendix is referred, the requirements in the appendix for the ICA are as follows:

General: The aircraft ICA must contain instructions for continued airworthiness for each engine, propeller, or appliance and the interface of those appliances and products with the aircraft.

Format: The ICA must be in the form of a manual or manuals appropriate to the data being provided.

Content: The manual contents must be in English and must include:

- Introductory information including an explanation of the airplane's features and data as necessary to perform maintenance or preventive maintenance.

- A description of the aircraft and its systems, including engine, propeller, and appliances.
- Basic operating information describing how the aircraft and its components are controlled.
- Servicing information with such detail as servicing parts, task capacities, types of fluid to be used, applicable pressures for the various systems, access panels for inspection and servicing, lubrication points, and types of lubricants to be used.

The maintenance instructions must include the following data:

- Recommended schedule for cleaning, inspecting, adjusting, testing, and lubricating the various parts.
- Applicable wear tolerances.
- Recommended overhaul periods.
- Details for an inspection program that identifies both the frequency and the extent of the inspections necessary to provide for continued airworthiness.
- Troubleshooting information.
- The order and method for proper removal and replacement of parts.
- Procedures for system testing during ground operations.
- Diagrams for structural access plates.
- Details for application of special inspection techniques.
- Information concerning the application of protective treatments after inspection.
- Information relative to the structural fasteners.
- List of any special tools needed.

Airworthiness Limitations

The ICA must contain a separate and clearly distinguishable section titled “Airworthiness Limitations.” Within this section are mandatory replacement times, structural inspection interval, and related inspection procedures.

All of this is quite understandable to be included in the initial release of documents when the aircraft is delivered. However, over the course of the life of an aircraft, various modifications can and often do occur. Whether these are as simple as a new cabin to galley sliding door, or as complex as a navigation related STC, any major alteration requires that this type of

maintenance data be provided to the owner, so that subsequent maintenance, inspection, and repair can be properly accomplished. As aircraft and their systems become more and more complex, and society continues its preoccupation with litigation for every incident, it is imperative that the technician have the right information, that it is current, and that he or she has the proper tools, including those required for any special inspection, and correct replacement parts. If any one these items is required, and the technician does not have it accessible, he or she is in violation of 14 CFR §§65.81(b), 43.13(a), and 43.16 if he or she attempts to return the aircraft to service.

Manufacturers may provide this required information in a variety of different manuals:

- **Operating Instructions**—The Airplane Flight Manual (AFM) or the Pilot’s Operating Handbook (POH) provides the pilot with the necessary and proper information to properly operate the aircraft. These manuals are usually listed in the aircraft type certificate data sheet, and therefore are a required item for the aircraft to be considered airworthy.
- **Maintenance Manuals**—These manuals are often referred to as AMM (Aircraft Maintenance Manual) or CMM (Component Maintenance Manual).

The AMM is focused on the entire aircraft and therefore provides the “big picture” for the maintenance technician. It provides information concerning the maintenance (including troubleshooting and repair) of the aircraft and systems on the aircraft.

The CMM, on the other hand, is focused on a specific item or component such as hydraulic pump, generator, or thrust reverser. It will provide the bench mechanic with detail troubleshooting information and will usually serve also as an overhaul manual giving details for disassembly, cleaning, inspection, repair as necessary, reassembly, and testing in accordance with approved standards and technical data accepted by the Administrator. (Refer to 14 CFR §43.2(a).) When maintenance is done according to the CMM, the technician should always include the appropriate references in the maintenance record entry required by §43.9 or 43.11.

Service Bulletins (SB)

Throughout the life of a product (whether TC’d or not), manufacturing defects, changes in service, or design improvements often occur. When that happens, the OEM will frequently use an SB to distribute the

information to the operator of the aircraft. SBs are good information and should be strongly considered by the owner for implementation to the aircraft. However, SBs are not required *unless* they are referred to in an AD note or if compliance is required as a part of the authorized inspection program. (Refer to §39.27.)

Structural Repair Manual (SRM)

As the name implies, this manual carries detail information for the technician concerning an aircraft's primary and secondary structure, criteria for evaluating the severity of the detected damage, determining the feasibility of a repair, and alignment/inspection information. This manual is usually a separate manual for large aircraft. On small aircraft, this information is often included in the AMM.

Forms

Airworthiness Certificates

In addition to the registration certificate, which indicates the ownership of an aircraft, an airworthiness certificate indicates the airworthiness of the aircraft. Advisory Circular (AC) 21-12, Application for U.S. Airworthiness Certificate, FAA Form 8130-6, is a comprehensive guide for the completion of the application form for this certificate. There are two certificates: standard and special. FAA Form 8100-2, Standard Airworthiness Certificate, may be issued to allow

operation of a type-certificated aircraft in one or more of the following categories: [Figure 12-17]

- Normal
- Utility
- Acrobatic
- Commuter
- Transport
- Manned Free Balloon
- Special Classes

FAA Form 8130-7, Special Airworthiness Certificate, may be issued to authorize the operation of an aircraft in the following categories: [Figure 12-18]

- Primary
- Restricted
- Multiple
- Limited
- Light-Sport
- Experimental
- Special Flight Permit
- Provisional

Airworthiness certificates may be issued by either FAA personnel or FAA designees. (Refer to 14 CFR §§183.31 and 183.33.) The certificate must not only be

UNITED STATES OF AMERICA DEPARTMENT OF TRANSPORTATION—FEDERAL AVIATION ADMINISTRATION STANDARD AIRWORTHINESS CERTIFICATE			
1. NATIONALITY AND REGISTRATION MARKS	2. MANUFACTURER AND MODEL	3. AIRCRAFT SERIAL NUMBER	4. CATEGORY
5. AUTHORITY AND BASIS FOR ISSUANCE This airworthiness certificate is issued pursuant to the Federal Aviation Act of 1958 and certifies that, as of the date of issuance, the aircraft to which issued has been inspected and found to conform to the type certificate therefor, to be in condition for safe operation, and has been shown to meet the requirements of the applicable comprehensive and detailed airworthiness code as provided by Annex 8 to the Convention on International Civil Aviation, or except as noted herein. Exceptions:			
6. TERMS AND CONDITIONS Unless sooner surrendered, suspended, revoked, or a termination date is otherwise established by the Administrator, this airworthiness certificate is effective as long as the maintenance, preventative maintenance, and alterations are performed in accordance with Parts 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)		*U.S. G.P.O. 1995 669-242	

Figure 12-17. FAA Form 8100-2, Standard Airworthiness Certificate.

UNITED STATES OF AMERICA DEPARTMENT OF TRANSPORTATION - FEDERAL AVIATION ADMINISTRATION SPECIAL AIRWORTHINESS CERTIFICATE	
A	CATEGORY/DESIGNATION
	PURPOSE
B	MANUFACTURER NAME
	ADDRESS
C	FLIGHT FROM
	TO
D	N— SERIAL NO.
	BUILDER MODEL
E	DATE OF ISSUANCE EXPIRY
	OPERATING LIMITATIONS DATED ARE A PART OF THIS CERTIFICATE
	SIGNATURE OF FAA REPRESENTATIVE DESIGNATION OR OFFICE NO.
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 8130-7 (10/82) SEE REVERSE SIDE	

A	This airworthiness certificate is issued under the authority of the Federal Aviation Act of 1958 and the Federal Aviation Regulations (FAR).
B	This airworthiness certificate authorizes the manufacturer named on the reverse side to conduct production flight tests, and only production flight tests, of aircraft registered in his name. No person may conduct production flight tests under this certificate: (1) Carrying persons or property for compensation or hire; and/or (2) Carrying persons not essential to the purpose of the flight.
C	This airworthiness certificate authorizes the flight specified on the reverse side for the purpose shown in Block A.
D	This airworthiness certificate certifies that as of the date of issuance, the aircraft to which issued has been inspected and found to meet the requirements of the applicable FAR. The aircraft does not meet the requirements of the applicable comprehensive and detailed airworthiness code as provided by Annex 8 to the Convention On International Civil Aviation. No person may operate the aircraft described on the reverse side: (1) except in accordance with the applicable FAR and in accordance with conditions and limitations which may be prescribed by the Administrator as part of this certificate; (2) over any foreign country without the special permission of that country.
E	Unless sooner surrendered, suspended, or revoked, this airworthiness certificate is effective for the duration and under the conditions prescribed in FAR Part 21, Section 21.181 or 21.217.

Figure 12-18. FAA Form 8130-7, Special Airworthiness Certificate.

on board the aircraft (14 CFR §91.203(a)(1)), but must also be “displayed at the cabin or cockpit entrance so that it is legible to the passengers or crew” (§91.203(b)). Since the ability to obtain this certificate is based upon the requirement to inspect the aircraft to determine that it conforms to type design and is in condition for safe operation, it can also be revoked by the FAA if either of those two requirements ceases to exist.

Aircraft Registration

Aircraft must be registered in the United States if the aircraft is not registered under the laws of a foreign

country and is owned by either a citizen of the United States, a foreign citizen lawfully admitted to the United States, or a corporation organized in and doing business under U.S. laws and primarily based in the United States. This registration is accomplished by the use of FAA Form 8050-1, Aircraft Registration Application. This is one of only a few FAA forms that are pre-printed, and cannot be obtained by downloading and computer printing. This form consists of three sheets, colored white, green, and pink. The white original and the green copy must be submitted to the FAA Aircraft Registration Branch (AFS-750). The pink copy serves

as the temporary authority to operate the aircraft until the official registration is received from AFS-750, and is valid for a maximum of 90 days. This form may be obtained from either the local Flight Standards District Office (FSDO) or by contacting: FAA Aircraft Registration Branch (AFS-750), P.O. Box 25504, Oklahoma City, OK 73125-0504.

In addition to the completed application form, the owner must also submit evidence of his or her ownership (such as a bill of sale) and a registration fee. A successful review of the application will result in the issuance of AC Form 8050-3, Certificate of Aircraft Registration. (Note the AC prefix.)

14 CFR §91.203(a)(2) requires that either the pink copy of the application or the actual certificate of registration be on board the aircraft during its operation.

If the registration is ever lost or damaged, it may be replaced by contacting the FAA Aircraft Registration Branch and providing them with the aircraft specific data, including make, model, N-number, and serial number. A replacement certificate fee and an explanation of the reason for the replacement certificate are also required.

Radio Station License

A radio station license is required if the aircraft is equipped with radios, and the aircraft is planned to be flown outside the boundaries of the United States. A radio station license is *not* required for aircraft that are operated domestically. (A major change occurred on February 8, 1996, when the telecommunications Act of 1996 was signed into law.)

The Federal Communications Commission (FCC) formerly required that any communication transmitter installed in aircraft be licensed. These FCC licenses were valid for 5 years. Note that this is *not* an FAA requirement. FAA inspectors who conducted ramp inspections and detected an expired radio station license were not required to notify the FCC, nor could they issue a violation to the owner/operator. Simply informing the operator of the expired radio station license was their only responsibility.

FSGA 96-06, a Flight Standards Information Bulletin (FSIB) for General Aviation (FSGA) titled "Elimination of Aircraft Radio Station Licenses" became effective on July 8, 1996. Although that FSIB had an effectivity of only 1 year, the elimination of the requirement for aircraft used only in domestic operations continues.

FAA Form 337 — Major Repair and Alteration

(Refer to current issue of AC 43.9-1, Instructions for Completion of FAA Form 337 (OMB No. 2120-0020), Major Repair and Alteration (Airframe, Powerplant, Propeller, or Appliance).) [Figure 12-19]

As the name clearly states, this form is to be used whenever major repairs or alterations are accomplished on an aircraft. (The only exception would be that 14 CFR part 43, appendix B, allows for a certificated repair station to return to service (RTS) an aircraft after a major *repair* by using a signed and dated work order and a signed maintenance release.)

Information in item 1 should be taken directly from the aircraft dataplate, except for the tail number which should be compared to the aircraft registration form.

Information in item 2 must reflect the name and address listed on AC Form 8050-3, Certificate of Registration.

Item 3 is used only when there is no existing approved data for the intended repair or alteration. In that case, the technician can request that the local FSDO Principal Maintenance Inspector (PMI) review the data and then grant a field approval which is shown by completing and signing this area. In many cases, this block will be blank because the technician has found, used, and made reference to data already approved by the FAA.

Item 4 should have "X" marked in either the Repair or the Alteration column.

Item 5 — If the repair or alteration is being done to the aircraft airframe, no entry is required since the data will be identical to that in item 1. However, if the repair or alteration is being done to an engine, a propeller, or other appliance, entries must include the appropriate make, model and serial number information.

Item 6 — Enter appropriate data as specified, and check the proper box in B. The technician is encouraged to carefully read the preprinted statement in subparagraph D prior to signing this section.

Item 7 must be completed by the IA or authorized individual from the repair station.

Item 8 (on the reverse side) is for the description of the work accomplished. It must include a reference to the approved data used to conduct the required maintenance.

 US Department of Transportation Federal Aviation Administration	MAJOR REPAIR AND ALTERATION (Airframe, Powerplant, Propeller, or Appliance)		Form Approved OMB No. 2120-0020 11/30/2007	Electronic Tracking Number
				For FAA Use Only
INSTRUCTIONS: Print or type all entries. See Title 14 CFR §43.9, Part 43 Appendix B, and AC 43.9-1 (or subsequent revision thereof) for instructions and disposition of this form. This report is required by law (49 U.S.C. §44701). Failure to report can result in a civil penalty for each such violation. (49 U.S.C. §46301(a))				
1. Aircraft	Nationality and Registration Mark		Serial No.	
	Make	Model	Series	
2. Owner	Name <i>(As shown on registration certificate)</i>		Address <i>(As shown on registration certificate)</i>	
			Address _____	
			City _____ State _____	
		Zip _____ Country _____		
3. For FAA Use Only				
3. For FAA Use Only				
4. Type		5. Unit Identification		
Repair	Alteration	Unit	Make	Model
<input type="checkbox"/>	<input type="checkbox"/>	AIRFRAME	_____	<i>(As described in Item 1 above)</i>
<input type="checkbox"/>	<input type="checkbox"/>	POWERPLANT		
<input type="checkbox"/>	<input type="checkbox"/>	PROPELLER		
<input type="checkbox"/>	<input type="checkbox"/>	APPLIANCE	Type	
			Manufacturer	
6. Conformity Statement				
A. Agency's Name and Address			B. Kind of Agency	
Name _____			U. S. Certificated Mechanic	
Address _____			Foreign Certificated Mechanic	
City _____ State _____			Certificated Repair Station	
Zip _____ Country _____			Certificated Maintenance Organization	
			C. Certificate No.	
D. I certify that the repair and/or alteration made to the unit(s) identified in item 5 above and described on the reverse or attachments hereto have been made in accordance with the requirements of Part 43 of the U.S. Federal Aviation Regulations and that the information furnished herein is true and correct to the best of my knowledge.				
Extended range fuel per 14 CFR Part 43 App. B <input type="checkbox"/>		Signature/Date of Authorized Individual		
7. Approval for Return to Service				
Pursuant to the authority given persons specified below, the unit identified in item 5 was inspected in the manner prescribed by the Administrator of the Federal Aviation Administration and is <input type="checkbox"/> Approved <input type="checkbox"/> Rejected				
BY	FAA Fit. Standards Inspector	Manufacturer	Maintenance Organization	Persons Approved by Canadian Department of Transport
	FAA Designee	Repair Station	Inspection Authorization	
Certificate or Designation No.		Signature/Date of Authorized Individual		

FAA Form 337 (10-06)

Figure 12-19. FAA Form 337, Major Repair and Alteration.

NOTICE

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

8. Description of Work Accomplished

(If more space is required, attach additional sheets. Identify with aircraft nationality and registration mark and date work completed.)

Nationality and Registration Mark

Date

Additional Sheets Are Attached

The form must be completed at least in duplicate, with the original provided to the owner/operator and a copy sent to the FAA within 48 hours of completing the maintenance and return to service. If the FAA Form 337 is used to document additional fuel tanks in the cabin or cargo, then an additional copy must be signed and in the aircraft at all times. Professional business sense would be to also make and retain a copy at the maintenance facility.

Records

Making Maintenance Record Entries

14 CFR §§43.9 and 43.11 require the technician to make appropriate entries of maintenance actions or inspection results in the aircraft maintenance record. 14 CFR §91.417 defines how long those records must be kept.

Whenever maintenance, preventive maintenance, rebuilding, or alteration work occurs on an aircraft, airframe, aircraft engine, propeller, appliance, or component part, a maintenance record entry must be created. The importance of compliance with this requirement cannot be overemphasized. Complete and organized maintenance logs for an aircraft can have significant (and usually positive) effect during the buy/sell negotiations of an aircraft. On the other hand, poorly organized and incomplete logs can have a detrimental effect upon the selling price of an aircraft.

Temporary Records — 14 CFR §91.417(a)(1) and (b)(1)

These are records that must be kept by the owner until the work is repeated, superseded, or 1 year has transpired since the work was performed. These are typically records referring to maintenance, preventive maintenance, alteration, and all inspections. They include a description of the work performed (or reference to the FAA-accepted data); the date of completion; and the name, signature and certificate number of the person doing the return to service (RTS).

Permanent Records — 14 CFR §91.417(a)(2) and (b)(2)

These records must be retained by the owner during the time he or she operates the aircraft. They are transferred with the aircraft at the time of sale. Typically, these are documents relating to total time in service, current status of life-limited parts, time since last overhaul, current inspection status, current status of applicable AD notes, and major alteration forms as required by 14 CFR §43.9.

Electronic Records

During the last 25 years, the field of aviation maintenance has seen a significant change in the documentation requirements for aircraft and related parts. Nowhere is that change seen as revolutionary as the introduction of electronic data and record retention. Just as the arrival of the personal computer placed the possibility of the power and versatility of a computer in the hands of the average person, it made it available to the maintenance technician. Initially some technicians developed their own programs for listing data (TCDS, AD notes, and so forth), but soon commercially available programs were developed. Basically these were developed by either one of the following two groups:

1. Computer literate persons who felt the aviation industry could benefit from the computer.
2. Aviation professionals who felt the aviation industry must benefit from the computer.

Some of those initial programs were either not very user friendly (if developed by computer wizards) or not very sophisticated (if developed by the maintenance technician).

Today there is a mixture of these various database programs. A review of the advertisement section in any current aviation maintenance magazine will offer the reader numerous options for electronic (computerized) maintenance records. Many of these programs offer a combination of the data research, such as ADs, SBs, STCs, and TCDS's, required to conduct proper maintenance and inspections and data recording (logbook entries, AD compliance history, length of component time in service, and so forth) desired to improve the efficiency of the technician.

Although some large shops and certified repair stations may have a separate group of people responsible for "records and research," the professional maintenance technician should be aware of the benefits of these systems. Some factors to consider when reviewing a system are:

- What is the typical aircraft size on which maintenance is being done? (i.e., less than 12,500 pounds, more than 12,500? Mixed?)
- Does the program have built-in templates for the aircraft you are working on?
- What FAA forms (if any) are available in the program?

- Does it have a user-friendly template to enter the data for the form, or must you enter directly onto the form?
- Can it calculate weight and balance data?
- Does it have adequate word search capabilities?
- Is it networkable?
- Are the updates sent via U.S. mail, or can you download from the Internet?
- What is the maximum number of aircraft that the system can handle?
- Can the system handle both single- and multiengine aircraft? Fixed and rotary wing? Piston and jet?
- Can an item removed from an aircraft be tracked?
- Is the data from this system exportable to other electronic formats?
- Can it forecast “items due” for maintenance or inspection?

Since no program can be considered the best, the technician should learn all he or she can about the numerous systems that exist. Exposure to the pros and cons of these different systems can be one of the benefits of attending various trade shows, maintenance seminars, or IA renewal sessions. Continuous learning and personal improvement should be the goal of every professional maintenance technician.

Light Sport Aircraft (LSA) Maintenance

The LSA category includes gliders, airplanes, gyroplanes, powered parachutes, weight-shift and lighter-than-air aircraft. There two general types of LSAs: Special (SLSA) and Experimental (ELSA). The SLSA are factory built and the ESLA are kit built. This new category of aircraft was added to the regulations in 2004. (Refer to 14 CFR §§21.190, 65.107, and 91.327, all dated July 27, 2004.)

Just as “industry standard” specifications have replaced many of the Military Standards to define products that are destined to be part of the Department of Defense inventory, so too have industry standards come into the FAA sights for documenting certain things. Quality is one example, where the Society of Automotive Engineers (SAE) has developed AS 9100 and AS 9110 as auditing standards for aerospace facilities and specifically repair stations. Likewise, ISO9001 is being adopted by the FAA as a system of measuring their

performance. Therefore, it was logical that when the FAA looked to develop the standards for this newest category of aircraft, they again looked to industry, and this time it was the American Society for Testing and Materials (ASTM). The ASTM developed a comprehensive list of consensus standards for use by manufacturers, regulators, maintenance facilities, LSA owners, and service providers. It is very unique that these standards are the first ones in over 100 years to solely address the issue of recreational aircraft use. It is also the first complete set of industry consensus standards covering the design, manufacture, and use of recreational aircraft that was developed by a non-government agency. The ASTM committee that developed these LSA standards did so to ensure the quality of products and services to support both the national and the international regulatory structures for LSAs. Over 20 standards have been generated, and more are being developed to cover this diversity of aircraft. This text only incorporates a review of F2483-05, Standard Practice for Maintenance and the Development of Maintenance Manuals for Light Sport Aircraft (LSA). That 6-page document is comprised of the following 12 sections:

1. Scope
2. Referenced Documents
3. Terminology
4. Significance and Use
5. Aircraft Maintenance Manual
6. Line Maintenance, Repairs and Alterations
7. Heavy Maintenance, Repairs and Alterations
8. Overhaul
9. Major Repairs and Alterations
10. Task-Specific Training
11. Safety Directives
12. Keywords

The scope of that document is basically twofold:

- To provide guidelines for the qualification necessary to accomplish various levels of maintenance on LSA.
- To provide the content and structure of maintenance manuals for aircraft and their components that are operated as LSAs.

Some additional definitions from section 3, Terminology, that will help to better understand the LSA concepts are:

Annual Condition Inspection is defined as a detailed inspection accomplished once a year in accordance with instructions provided in the maintenance manual supplied with the LSA. The purpose of this inspection is to look for any wear, corrosion, or damage that would cause the LSA not to be in condition for safe operation.

Heavy maintenance is any maintenance, inspection, repair, or alteration a manufacturer has designated that requires specialized training, equipment, or facilities.

Line maintenance is any repair, maintenance, scheduled checks, servicing, inspections, or alterations not considered heavy maintenance that are approved by the manufacturer and is specified in the manufacturer's maintenance manual.

LSA repairman—inspection is a U.S. FAA-certified LSA repairman with an inspection rating per 14 CFR part 65. This person is authorized to perform the 100-hour/annual inspection of the aircraft, which he or she owns.

LSA repairman—maintenance is a U.S. FAA-certified LSA repairman with a maintenance rating per 14 CFR part 65. This person is allowed to perform the required maintenance and can also accomplish the 100-hour/annual inspection.

Major repair, alteration, or maintenance is any repair, alteration, or maintenance for which instructions to complete the task are *excluded* from the maintenance manual.

Minor repair, alteration, or maintenance is any repair, alteration, or maintenance for which instructions to complete the task are *included* in the maintenance manual.

The 100-hour inspection is the same as the annual inspection, except for the interval of time. The requirements for whether or not the 100-hour inspection is applicable are exactly the same as the criteria for the standard 100-hour/annual required of non-LSA aircraft.

Aircraft Maintenance Manual

Although these manuals do not require any FAA approval, the regulations do require that the manual be developed in accordance with industry standards. This ASTM sets that standard by requiring:

- General specifications including capacities, servicing, lubrication, and ground handling must be listed.
- An inspection checklist for the annual condition or 100-hour inspection.
- A description of and the instructions for the maintenance, repair, and overhaul of the LSA engine.
- A description of and the instructions for the maintenance, repair, and alteration of the aircraft's primary structure.

Other items for which maintenance procedures must be provided are:

- Fuel systems,
- Propeller,
- Utility system,
- Instruments and avionics,
- Electrical system,
- Structural repair, and
- Painting and coatings,

The Inspection, Repair, and Alterations section must specifically list any special tools and parts needed to complete the task, as well as the type of maintenance action (line, heavy, or overhaul) necessary to accomplish the activity. Directly associated with that information is the requirement to specify the level of certification needed to do the job, i.e., LSA repairman, A&P, or repair station. The manual may make reference to existing FAA advisory circulars.

Line Maintenance, Repairs, and Alterations

The minimum level of certification necessary to accomplish line maintenance is LSA inspection. Some typical tasks considered to be line maintenance are:

- 100-hour/annual condition inspection.
- Servicing of fluids.
- Removing and replacing components when instructions to do so are provided in the maintenance manual.
 - Batteries
 - Fuel pump
 - Exhaust
 - Spark plugs and wires
 - Floats and skis

- Repair or alteration of components when specific instructions are provided in the maintenance manual.
 - Patching a hole in the fabric
 - Installation of a strobe light kit

Heavy maintenance, repairs, and alterations can only be accomplished by either a certified mechanic (A or P or A&P) or an LSA repairman—maintenance who has received additional “task specific” training. Some examples of this would be the removal and replacement of the following: complete engine, cylinder, piston and valve assemblies; primary flight controls; and landing gear.

Heavy repair of components or structure can be accomplished when instructions are provided in the maintenance manual or other service directed instructions. A few examples of this activity are:

- Repainting of control surfaces.
- Structural repairs.
- Recovering of a dope and fabric.

Heavy alterations of components can be accomplished when instructions are provided in the maintenance manual or other service directed instructions. Examples of this activity are initial installation of skis and installation of new additional pitot static instruments.

Overhaul of components can be performed only by the manufacturer (or someone authorized to perform) of the LSA or the component to be overhauled. An overhaul manual is required and must be a separate manual from the manufacturer’s maintenance manual. Items typically considered for overhaul are engines, carburetors, starters, generators, alternators, and instruments.

Major Repairs and Alterations

Another major difference between LSA maintenance and traditional aircraft maintenance is that FAA Form 337, Major Repair and Alteration, is *not required* to

document major repairs and alterations. Instead, any major repair or alteration that is accomplished after the LSA has gone through production acceptance testing must be evaluated relative to the applicable ASTM requirements. After this evaluation has been accomplished (either by the manufacturer or an entity approved by them), a written affidavit must be provided attesting that the LSA still meets the requirements of the applicable ASTMs.

The manufacturer (or other approved entity) must provide written instructions defining the level of certification necessary to perform the maintenance, and also include any ground test or flight testing necessary to verify that the LSA complies with the original LSA acceptance test standards, and is in condition for safe operation. Proper documentation of this maintenance activity is required to be entered in the LSA records, and is also defined by the manufacturer.

Task specific training is not required to be FAA approved. This is solely the responsibility of the manufacturer. Some examples of this are: an engine manufacturer’s overhaul school, or the EAA Sport Air fabric covering school.

Safety Directives are issued against an LSA or component, but are *not issued* by the FAA, but rather by the original aircraft manufacturer. (*Note:* if the LSA includes a product that is TC’d by the FAA, the manufacturer is required to issue a safety directive.)

Typical instructions within a Safety Directive are:

- List of tools required for the task.
- List of parts needed.
- Type of maintenance (line, heavy, overhaul).
- Level of certification needed.
- Detailed instructions and diagrams.
- Inspection and test methods.

Safety directives are considered to be mandatory except for experimental use LSAs.