

Task III.E: Airworthiness Requirements

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Lesson Overview

Objective

The student should develop knowledge of the elements related to airworthiness requirements as necessary based on their respective PTS.

Reference

Key Elements

- CFR 91.205 — Required Instruments
- CFR 91.213(d) — Deferral without MEL
- Required Inspections

Elements

- CFR 91.205 - Required instruments and equipment for day/night VFR
- Equipment List
- Kinds of Equipment List
- Type Certificate

- Airworthiness Directives
- Maintenance/Inspection requirements
- Appropriate record keeping
- Procedures and limitations for determining airworthiness of the airplane with inoperative instruments and equipment with and without an MEL
- Requirements and procedures for obtaining a special flight permit
- FAR 91.3 - Responsibility and Authority of the PIC
- FAR 91.7 - Civil Aircraft Airworthiness
- FAR 91.9 - Civil aircraft flight manual, marking, and placard requirements
- FAR 91.203 - Civil Aircraft: Certifications Required
- FAR 91.205 - Instrument and Equipment Requirements
- FAR 91.213(d) - Inoperative Instrument and Equipment
- FAR 91.400's - Maintenance, Preventative Maintenance, and Alterations (Subpart E)
- FAR 91.207 - Emergency Locator Transmitters (ELT)

Equipment

- White board
- Markers
- References
- iPad

Schedule

1. Discuss objectives
2. Review material
3. Development
4. Conclusion

Instructor Actions

1. Discuss lesson objectives
2. Present lecture
3. Questions
4. Homework

Student Actions

Participate in discussion Take notes

Completion Standards

The student can explain (and when necessary locate) the elements and documents related to airworthiness requirements.

Instructor Notes

Attention

Just as you would never scuba dive without your regulator operating properly or sky dive without the rip cord functioning, you should never fly an airplane without essential equipment working properly. Unlike in a car, we do not have the option to pull over to the side of the road in the case of a problem.

Overview

Review Objectives and Elements/Key ideas

What

Airworthiness requirements are the basis for deciding whether an aircraft is worthy of safe flight. They are requirements that must be met to ensure an aircraft is safe and legal to fly.

Why

In order for an airplane to be airworthy certain documents must be on board and current, certain inspections must be completed, and certain instruments must be functioning, otherwise the airplane is unfit for flight and therefore un-airworthy or illegal to fly. An un-airworthy aircraft cannot be flown. Determining airworthiness can be very complex. This lesson is designed to provide a basis to make a decision regarding whether or not the airplane is airworthy.

Lesson Details

Required instruments

Day VFR: TOMATO (F)FLAMES **Night VFR:** Day VFR and FLAPS

Day VFR

- Tachometer for each engine
- Oil pressure gauge for each engine
- Manifold pressure gauge for each engine
- Airspeed indicator
- Temperature gauge for each liquid-cooled engine
- Oil temperature gauge for each air-cooled engine
- Fuel gauge indicating the quantity of fuel in each tank
- Flotation gear (if operated for hire over water beyond power-off gliding distance from shore)
- Landing gear position indicator
- Altimeter
- Magnetic compass

- Emergency locator transmitter
- Safety belts/shoulder harnesses

Visual Flight Rules (Night)

All equipment required for VFR day flight, and also...

- Fuses
- Landing light (electric)
- Anti-collision lights
- Position lights
- Source of electricity for all installed electrical and radio equipment

Equipment list

Specifies all the required equipment approved for installation in the aircraft. Includes the weight and arm of each item, and all the equipment installed when the aircraft left the factory. Usually found in the weight and balance data.

Kinds of equipment list

Listing of the required equipment based on the type of flight intended.

Type certificate

Formal description of the aircraft, engine, or propeller. Lists limitations and information required for type certification including airspeed limits, weight limits, thrust limitations, etc. On FAA website.

Airworthiness directives

Means used to notify aircraft owners and other interested persons of unsafe conditions, and to specify the conditions under which the product may continue to be operated.

Two categories:

- Those of an emergency nature, requiring immediate compliance for further flight.
- Those of a less urgent nature, requiring compliance within a specific period of time.

Regulatory in nature, should be complied with unless a specific exemption is granted. Aircraft owner/operator's responsibility to ensure compliance with all pertinent ADs.

Compliance records [14 CFR Part 91]

Requires record to be maintained showing the status of applicable ADs. Many owners have a

chronological listing of the pertinent ADs in the back of their aircraft, engine, and propeller maintenance records.

Maintenance; inspection requirements [14 CFR Part 91]

Primary responsibility on owner/operator for maintaining aircraft in airworthy condition. After aircraft inspections are complete and all defects repaired, the PIC is responsible for determining whether the aircraft is in condition for safe flight.

Annual inspection

Any reciprocating-engine powered or single-engine-turbojet/turbo-propeller - powered small aircraft (<12,500 lbs) flown for business or pleasure, and not flown for compensation or hire, is required to be inspected at least annually, otherwise it cannot be flown.

Annual inspection must be done by an airframe and powerplant mechanic (A&P) who holds an Inspection Authorization (IA). Aircraft overdue for an annual inspection may be operated under a Special Flight Permit for the purpose of flying the aircraft to a location where the inspection can be performed.

All applicable ADs that are due must be complied with.

The annual inspection may be substituted for a required 100 hr inspection.

100-hour inspection

All aircraft under 12,500 lbs (except for turbo-powered) that are used to carry passengers for hire, or used for flight instruction for hire, must have received a 100-hr inspection. Must be performed by an FAA certificated A&P mechanic, and appropriately rated FAA certificated repair station, or by the aircraft manufacturer. An IA is not necessary. An annual inspection may be substituted for a required 100 hr inspection.

The 100-hr limit may be exceeded by not more than 10 hours while en route to reach a place where the inspection can be done. The excess time used must be included in computing the next 100 hours of time in service.

Altimeter system inspection [91.411]

Altimeter, encoding altimeter, and related system must be tested and inspected in the preceding 24 months before operated in controlled airspace under instrument flight rules.

Transponder inspection [91.413]

Before a transponder can be used under 14 CFR Part 91, section 91.125(a), it shall be tested and inspected within the preceding 24 months.

Static system [91.411]

Static system must be checked within the preceding 24 calendar months. Must keep record in the aircraft logbook (for IFR).

VOR

VOR must be checked within the preceding 30 days. Record must be kept in a bound logbook (for IFR).

ELT

If operations require an ELT, it must be inspected every 12 calendar months.

Appropriate record keeping [91.417]

100-hr/annual inspection and inspections required for instruments and equipment necessary for legal VFR/IFR flight are located in the aircraft and engine logbooks.

Removing or installing equipment not on equipment list

The AMT must change the weight and balance record to indicate the new empty weight and empty weight center of gravity. Equipment list must be revised to show which equipment is actually installed.

Repairs and Alterations

Major [14 CFR Part 43, Appendix A]

Must be approved for return to service on FAA Form 337 (Major repairs and major alterations) by an appropriately rated certificated repair station, an FAA certificated A&P mechanic holding an Inspection Authorization, or a representative of the Administrator.

Minor

May be approved for return to service with a proper entry in the maintenance records by an FAA certificated A&P mechanic or an appropriately certificated repair station.

Procedures and limitations for determining airplane airworthiness

If you find inoperative equipment prior to the flight...

- Cancel the flight
- Obtain maintenance prior to the flight
- Defer the item or equipment (not used during flight, follow POH procedures)

Deferring maintenance:

- Deferral provisions of 91.213(d)
- ☐ FAA-Approved MEL

Deferring maintenance without MEL

Pilot determines whether the inoperative equipment is required by type design, CFRs, or ADs. If not required, and the aircraft can be safely flown without it, the deferral may be made. Deactivate or remove the inoperative equipment and placard INOPERATIVE. If maintenance is required (always with removal) need certified maintenance personnel to do it.

May fly an aircraft in operations conducted under Part 91 with inoperative instruments and equipment without an approved MEL, provided the inoperative instruments are not part of the VFR-day type certification instruments and equipment prescribed in the applicable airworthiness regulations under which the aircraft was type certificated, indicated as required on the aircraft's equipment list, or on the kinds of operations equipment list for the kind of flight operation being conducted, required by 91.205 or any other rule of this part for the specific kind of flight operation being conducted, or required to be operational by an AD.

Deferring maintenance with MEL

Minimum Equipment List—a precise listing of instruments, equipment, and procedures that allows an aircraft to be operated under specific conditions with inoperative equipment. FAA-approved MEL includes only those items of equipment which the administrator finds may be inoperative and yet maintain an acceptable level of safety by appropriate conditions and limitations. Also allows for deferral of inoperative items/equipment, but the primary guidance is now the FAA-approved MEL issued to the specific operator and tail number.

Considered to be a supplemental type certificate and therefore becomes the authority to operate that aircraft in a condition other than originally type certificated.

If a failed component is not listed in the MEL as deferrable, then repairs are required to be performed prior to departure. If maintenance parts are not available at your location, a special flight permit can be obtained.

Special flight permit

An authorization that may be issued for an aircraft that may not currently meet applicable airworthiness requirement, but is safe for a specific flight.

- Flying an aircraft to a base where repairs, alterations, or maintenance are to be performed.
- Delivering or exporting an aircraft.
- Production flight testing new production aircraft.
- Evacuating aircraft from areas of impending danger.
- Conducting customer demonstration flights.

- To allow the operation of an overweight aircraft for flight beyond its normal range where adequate landing facilities or fuel is not available.

To obtain a special flight permit, contact the local FSDO or Designated Airworthiness Representative (DAR) for assistance and the necessary forms.

FARs

FAR 91.3—Responsibility and authority of the PIC

The PIC is directly responsible for, and is the final authority as to, the operation of the plane. In an in-flight emergency, the PIC may deviate from any rule of this part to the extent required, and upon the request of the Administrator, send a written report of the deviation to the Administrator.

- (a) The pilot in command of an aircraft is directly responsible for, and is the final authority as to, the operation of that aircraft.
- (b) In an in-flight emergency requiring immediate action, the pilot in command may deviate from any rule of this part to the extent required to meet that emergency.
- (c) Each pilot in command who deviates from a rule under paragraph (b) of this section shall, upon the request of the Administrator, send a written report of that deviation to the Administrator.

FAR 91.7—Civil aircraft airworthiness

No person may operate a civil aircraft unless it is in an airworthy condition.

Airworthiness Certificate:

- Authority and basis for issuance: states the aircraft must conform to the type certificate. The airplane cannot be changed from its type certificate; it must be in the condition it left the factory in. A supplemental type certificate is needed to change the airplane.
- Terms and conditions: states that the aircraft must be maintained in accordance with the FARs.

PIC is responsible for determining whether the aircraft is in condition for safe flight, and shall discontinue the flight when unairworthy mechanical, electrical, or structural conditions occur. (Visual inspection)

FAR 91.9—Civil aircraft flight manual, marking, and placard requirements

No person may operate a US-registered civil aircraft for which an airplane/rotorcraft flight manual is required unless the aircraft has a current, approved Airplane or Rotorcraft Flight Manual, or the manual provided for in 121.141(b). The weight and balance is included in the AFM and is part of the type certificate. It is therefore required.

No person may operate a US-registered civil aircraft for which an airplane/rotorcraft flight manual is not required, unless the aircraft has a current approved Airplane or Rotorcraft Flight Manual, approved manual material, markings, and placards, or any combination thereof.

The AFM is required in the airplane for airplanes registered after 1979. Not required for airplanes registered before 1979, unless the manufacturer submitted an AFM to the FAA, in which case it is required to be in the airplane.

Without the AFM, all placards, markings, etc. must be in the aircraft.

FAR 91.203—Civil aircraft: Certifications required

No person may operate a civil aircraft unless it has within it

- An appropriate and current airworthiness certificate
- An effective US registration certificate issued to its owner that is displayed at the cabin or cockpit entrance so that it is legible to passengers and crew

Except as provided in 91.715.

FAR 91.205—Instrument and equipment requirements

The bare minimum instruments and equipment required for day/night VFR flight and IFR flight.

Acronyms:

- VFR Day — TOMATOFFLAMES
- VFR Night — FLAPS
- IFR — GRABCARD

FAR 91.213(d)--Inoperative instrument and equipment

MEL—an FAA-approved listing of instruments/equipment that may be inoperative and the aircraft still be airworthy. Without an MEL—follow the flow provided in AC 91-67.

- Is it required by the aircraft's equipment list or the kinds of equipment list?
- Is it required by the VFR-day type certificate requirements prescribed in the airworthiness certification requirements?
- It is required by an AD?
- Is it required by FAR 91.205, 91.207, etc.
- If no...then the inoperative equipment must be repaired, replaced, removed at the next required inspection and placarded as inoperative.
- Finally, PIC decides whether the equipment creates a hazard for the anticipated flight.

FAR 91.400s—Maintenance, preventative maintenance, and alterations (Subpart E)

91.401—Rules governing maintenance, preventative maintenance, alterations of US-registered civil aircraft.

91.405—Maintenance required

Each owner or operator of an aircraft:

- Shall have that aircraft inspected as prescribed in Subpart E and shall, between required inspections, have discrepancies repaired as prescribed in Part 43.
- Shall ensure that maintenance personnel make appropriate entries in the aircraft maintenance records indicating the aircraft has been approved for return to service.
- Shall have any inoperative instrument/equipment, permitted to be inoperative by 91.213(d)(2) repaired, replaced, removed, or inspected at the next required inspection.
- Shall ensure that a placard has been installed as required by 43.11 when listed discrepancies include inoperative instruments or equipment.

91.409—Inspections

- Annual inspection
- 100hr inspection, if for rent or for hire

91.411—Altimeter system and altitude reporting equipment

Static pressure system and altimeter tests required for IFR flight (every 24 calendar months).

91.413—ATC transponder tests and inspections

Transponder tests and inspections required every 24 calendar months.

91.207—Emergency locator transmitters (ELT)

- Inspection required every 12 calendar months.
- Batteries must be replaced or recharged when the transmitter has been in use more than one cumulative hour, or when 50% of their useful life has expired.

Additional Notes:

A--Airworthiness certificate (FAA-issued) R--Registration (state and federal) R--Radio license (if flying out of the country) O--Operating handbook and limitations W--Weight and balance

A--Airworthiness directives V--VOR check every 30 days I--Inspections (annual, 100hr, progressive)

A--Altimeter/pitot static (24) T--Transponder (24) E--ELT (12)

If something is broken...

1. Check MEL, KOL
2. 91.205
3. ADs
4. Personal limitations

Deferring maintenance

- Placard, fix at next inspection

Special airworthiness certificate

- Ferry, repairs, etc
- Delivering new aircraft
- Production flight tests
 - Register aircraft, submit application to local FAA office

Recurring ADs — know what they are for your aircraft

Conclusion

Through the FARS mentioned here, we find that the PIC is the final authority as to the safety of the flight. Airworthiness requires conforming to the type certificate, as well as the required maintenance and inspections. To be airworthy, the documents required onboard are the airworthiness certificate, the registration, operating limitations (AFM), as well as the weight and balance (part of the type certificate). We have found the required equipment as well as the process for determining whether the airplane is airworthy in the case of inoperative equipment. Finally, the FARs provided the necessary inspections needed to maintain airworthiness.

ACS Requirements

1. To determine that the applicant exhibits instructional knowledge of the elements related to required airworthiness by describing:
2. Required instruments and equipment for day/night VFR.
3. Procedures and limitations for determining airworthiness of the airplane with inoperative instruments and equipment with and without a minimum equipment list (MEL).
4. Requirements and procedures for obtaining a special flight permit.
5. Airworthiness directives, compliance records, maintenance/inspection requirements, and appropriate records.
6. Procedures for deferring maintenance on aircraft without an approved MEL.