AIRFRAME & POWERPLANT MECHANICS

AIRFRAME TEST GUIDE

Written, Oral, and Practical

ALIGNS WITH

FAA-H-8083-31B & FAA-H-8083-31B-ATB

Airframe & Powerplant Mechanics Airframe Handbook

2027 EDITION

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HOW TO USE THIS TEST GUIDE

This book is designed to help you pass your FAA knowledge exams. But even more important, it is designed to help reinforce your understanding of the subjects which you have been studying in the classroom and shop. However, rather than this being the first book you pick up, it should be the last. When you take that route, you will find the questions in this book both easy and an excellent reinforcement to your studies.

The chapters in this test guide are organized to follow those of the FAA 8083-31B Airframe Handbook, which can be found here: www.actechbooks.com/ap-textbooks.html. The process we suggest is this: Beginning with Chapter 1, first learn from the handbooks and in the classroom. Only when you feel comfortable with each subject, is it time to prepare for your exam. This is the best time to open this Test Guide to confirm what you have learned or to reopen the Handbook to review those topics for which you need reinforcement. You will see that every question in this Test Guide includes its reference pages to that subject in the Handbook to make that process easy. Following this, is then the best time to use SkyPrep and take simulated practice exams for further confirmation that you are ready for the FAA Exam. See page ii for further information about SkyPrep.

ABOUT THE QUESTIONS

In 2011 FAA made the decision to no longer publish the actual test questions. Previous test guides where one could memorize the same questions as would be on your test are no more. Instead, questions in this and other available Test Guides are only examples of the type of question you will receive on your actual test.

AIRMAN CERTIFICATION STANDARDS (ACS)

As of August 2023 FAA has adopted the Airman's Certification Standards, replacing the older Practical Test Standards. The ACS identifies each topic which you are required to learn subdivided by knowledge, risk management, and practical skills. Each subject is given a learning code found in the ACS. The codes for each question are referenced in this book next to the question number. The complete list of codes is provided in the ACS, which can be downloaded for free below.

Free Download - www.actechbooks.com/test_standards/amt_acs.pdf

Or, if you prefer a printed copy of the ACS, please visit the following link.

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FAA-S-ACS-1

U.S. Department of Transportation

Federal Aviation Administration

Aviation Mechanic
General, Airframe, and Powerplant
Airman Certification Standards

November 1, 2021

The Administrator of the Federal Aviation Administration signed the interim final rule "Part 147, Aviation Maintenance Technician Schools" on March 9, 2022. The interim final rule incorporates this version of the Aviation Mechanic General, Airframe, and Powerplant Airman Certification Standards (FAA-S-ACS-1) by reference. For identification and document-control purposes, this ACS is dated November 1, 2021. However, this ACS is not enforceable until the effective date of the interim final rule. Upon publication, the interim final rule can be found on the Federal Register's website, www.federalregister.gov, and will direct the effective date of compliance with this ACS.

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VERSION 1

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AIRCRAFT STRUCTURES

CHAPTER 1

Major Structural Stresses, Fixed-Wing Aircraft, Wings, Empennage, Flight Control Surfaces, and Aircraft Structure Maintenance

QUESTIONS

1-1 AM.II.A.K17
What is meant when a component of an aircraft is said to be fail-safe?
A. It is strong enough to manage any conceivable load.
B. If the structure fails, other structures will assume the load.
C. Being non-structural Its failure would not critically endanger the aircraft.

1-2 AM.II.A.K17
Which type of stress does a stringer in a semi-monocoque fuselage absorb?
A. Shear
B. Tension
C. Torsion

1-3 AM.II.A.K17
Which type of skin material would most likely be found on a monocoque fuselage?
A. Fabric
B. Wood
C. Metal

1-4 AM.II.A.K17
Which of the following creates a critical need for frequent inspections on a pressurized fuselage?
A. Corrosion
B. Metal fatigue
C. Humidity and temperature changes

1-5 AM.II.A.K17
Which of the following wing design features will provide the greatest amount of lateral stability?
A. Sweepback
B. Dihedral
C. Cantilever

1-6 AM.II.A.K17
Which of the following wing components are positioned chordwise within a wing's structure?
A. Stringers and formers.
B. Ribs and stingers.
C. Ribs and formers.

ANSWERS

1-1 Answer B
Fail-safe means that should one portion of a complex structure fails, another part of the structure assumes the load of the failed member and so safe operation may continue. This fail-safe strategy exists on many structural aircraft components as it offers a reliable margin of safety with less weight than if an alternate structure were built so strong to carry the load on its own.
Ref: Airframe Handbook H-8083-31B-ATB, Chapter 1 Page 13

1-2 Answer B
Of the 5 stresses that may act on airframe parts, (tension, compression, torsion, shear, bending) horizontally installed stringers and longerons prevent tension and compression from bending the fuselage.
Ref: Airframe Handbook H-8083-31B-ATB, Chapter 1 Page 6-8

1-3 Answer C
A monocoque fuselage relies on the strength and stiffness of the skin to carry the primary loads in all directions. Thus metal or composites (or in rare cases, wood) would be the likely skin material of choice.
Ref: Airframe Handbook H-8083-31B-ATB, Chapter 1 Page 8

1-4 Answer B
Pressurized fuselages are constantly stretching and shrinking as the pressurization inside the fuselage cycles higher and lower with each flight. Thus frequent inspections are required for minute cracks caused by this constant flexing.
Ref: Airframe Handbook H-8083-31B-ATB, Chapter 1 Page 9

1-5 Answer B
Dihedral is the measure of the angle the span of the wing has to the fuselage. The higher this angle, the greater is the lateral stability of the aircraft. Cantilever is a construction method allowing the absence of external bracing. Sweepback provides benefits regarding critical mach numbers in high speed flight.
Ref: Airframe Handbook H-8083-31B-ATB, Chapter 1 Page 9

1-6 Answer C
The chordwise direction is from the leading to training edge of the wing; versus spanwise which is from the root to the tip. Ribs and formers are positioned chordwise and are mostly responsible for determining and forming the structure for the aerodynamic shape of the wing.
Ref: Airframe Handbook H-8083-31B-ATB, Chapter 1 Page 11

QUESTIONS

1-7 AM.II.A.K17
Which parts of a semi-monocoque fuselage prevent tension and compression from bending the fuselage?
A. Ribs and formers.
B. Longerons and stringers.
C. Bulkheads and skin.

1-8 AM.II.A.K17
The purpose of anti-drag wires within the structure of a wing is to add strength to the _____
A. trailing edge fittings.
B. spar.
C. ribs.

1-9 AM.II.A.K7
What would be meant by a wet stressed skin wing?
A. The internal wing structure is a box beam structural design.
B. The wing skin additionally serves as structure of the fuel tank.
C. A rubber bladder containing fuel is installed inside the wing.

1-10 AM.II.A.K7
The exhaust exit of a nacelle would typically be made of _____
A. titanium.
B. magnesium.
C. chrome/nickel.

1-11 AM.II.C.K11
Ailerons control which of an airplane's axes of rotation?
A. Longitudinal
B. Lateral
C. Vertical

1-12 AM.II.C.K9
To prevent in-flight flutter of a control surface such as an aileron or elevator, the center of gravity of the component is typically set _____
A. exactly on the hinge line.
B. slightly forward of its hinge line.
C. slightly aft of its hinge line.

ANSWERS

1-7 Answer B
In a semi-monocoque design, longerons extend across multiple frame members and help the skin support primary bending loads. Stringers are smaller longitudinal members which have some rigidity. Together, longerons and stringers work together to prevent tension and compression from bending the fuselage.
Ref: Airframe Handbook H-8083-31B-ATB, Chapter 1 Page 8-9

1-8 Answer C
Since ribs are laterally weak, drag and anti-drag wires are mounted between the ribs to reduce fore and aft forces in the chord direction.
Ref: Airframe Handbook H-8083-31B-ATB, Chapter 1 Page 14

1-9 Answer B
Fuel is often carried inside the wings of a stressed-skin aircraft. The joints in the wing are sealed with a special fuel resistant sealant enabling fuel to be stored directly inside the structure. This is known as wet wing design. Alternately, a fuel-carrying bladder or tank can be fitted inside a wing in a configuration known as a box beam structure.
Ref: Airframe Handbook H-8083-31B-ATB, Chapter 1 Page 16

1-10 Answer A
Titanium ansd stainless steel offer excellent heat resistant barriers and so are often used in high temperature areas such as firewalls and for the rear sections of a nacelle which are exposed to the engine's hot exhaust gasses.
Ref: Airframe Handbook H-8083-31B-ATB, Chapter 1 Page 18

1-11 Answer A
An aircraft can rotate in 3 directions: The rudder controls yaw or the vertical axis (nose goes left or right). The elevator controls pitch or the lateral axis (nose goes up or down). The ailerons control roll or the longitudinal axis (the left and right wings go up or down). Page 1-25 of the Airframe textbook shows these directions clearly.
Ref: Airframe Handbook H-8083-31B-ATB, Chapter 1 Page 24

1-12 Answer B
Primary control surfaces must be balanced around their center of gravity so they do not vibrate or flutter in the air stream. Balancing typically consists of assuring that the center of gravity of the movable surface is slightly forward of its hinge line.
Ref: Airframe Handbook H-8083-31B-ATB, Chapter 1 Page 24

ORAL EXAM

1-1(O). Name the three major categories of aircraft.

1-2(O). Name the five principal units that make up a fixed-wing aircraft.

1-3(O). Name the principal units that make up a helicopter airframe.

1-4(O). Name the five major stresses to which all aircraft are subjected.

1-5(O). Define fuselage.

1-6(O). Explain a monocoque fuselage.

1-7(O). Explain a semi-monocoque fuselage.

1-8(O). Explain the purpose of stringers as used the construction of a semi-monocoque fuselage.

1-9(O). What factors are taken into consideration when designing the wing structure of an aircraft?

1-10(O). What are nacelles and what purpose do they serve?

1-11(O). What is the empennage and which components does it house?

1-12(O). Name the primary flight control surfaces on a fixed-wing aircraft.

1-13(O). What is a stabilator?

1-14(O). Explain fuselage stations?

1-15(O). Define Buttock line or butt line (BL).

1-16(O). Define Water Line (WL).

1-17(O). Which components make up the rotor section of a helicopter.

1-18(O). Name the three basic classification of rotor blades.

1-19(O). Which section of a helicopter help to counteract the effects of torque produced by the main rotors?

ANSWERS

ORAL EXAM

1-1(O). Rotorcraft, glider, and lighter-than-air vehicles.
Ref: Airframe Handbook H-8083-31B-ATB, Chapter 1

1-2(O). Fuselage, wings, stabilizers, flight control surfaces, and landing gear.
Ref: Airframe Handbook H-8083-31B-ATB, Chapter 1

1-3(O). Fuselage, main rotor and related gearbox, tail rotor (on helicopters with a single main rotor), and the landing gear.
Ref: Airframe Handbook H-8083-31B-ATB, Chapter 1

1-4(O). Tension, compression, torsion, shear, and bending.
Ref: Airframe Handbook H-8083-31B-ATB, Chapter 1

1-5(O). The main structure or body of an aircraft that houses space for cargo, controls, accessories, passengers, and other equipment.
Ref: Airframe Handbook H-8083-31B-ATB, Chapter 1

1-6(O). A single-shell type of aircraft structure in which all of the flight loads are carried in the outside skin of the structure.
Ref: Airframe Handbook H-8083-31B-ATB, Chapter 1

1-7(O). A form of aircraft stressed skin structure. Most of the strength of a semi-monocoque structure is in the skin, but the skin is supported on a substructure of formers and stringers that give the skin its shape and increase its rigidity.
Ref: Airframe Handbook H-8083-31B-ATB, Chapter 1

1-8(O). They give the fuselage its shape and, in some types of structure, to provide a small part of fuselage strength.
Ref: Airframe Handbook H-8083-31B-ATB, Chapter 1

1-9(O). Wing designs must factor the aircraft's size and weight, the use of the aircraft, the desired speed in flight and at landing, and desired rate of climb.
Ref: Airframe Handbook H-8083-31B-ATB, Chapter 1

1-10(O). Nacelles are streamlined enclosures used primarily to house the engine and its components, usually with a round or elliptical profile reducing aerodynamic drag.
Ref: Airframe Handbook H-8083-31B-ATB, Chapter 1

1-11(O). The empennage is the tail section and usually consists the vertical and horizontal stabilizer, rudder, and elevator.
Ref: Airframe Handbook H-8083-31B-ATB, Chapter 1

1-12(O). Ailerons, elevators, and rudder.
Ref: Airframe Handbook H-8083-31B-ATB, Chapter 1

1-13(O). It is a flight control on the empennage of an airplane that acts as both a stabilizer and an elevator. The entire horizontal tail surface pivots and is moved as a unit.
Ref: Airframe Handbook H-8083-31B-ATB, Chapter 1

1-14(O). They are used to help locate components on an aircraft. They are numbered in inches from a reference or zero point known as the reference datum.
Ref: Airframe Handbook H-8083-31B-ATB, Chapter 1

ORAL EXAM

1-15(O). This is a vertical reference plane down the center of the aircraft from which measurements left or right can be made.
Ref: Airframe Handbook H-8083-31B-ATB, Chapter 1

1-16(O). This is the measurement of height in inches perpendicular from a horizontal plane usually located at the ground, cabin floor, or some other easily referenced location.
Ref: Airframe Handbook H-8083-31B-ATB, Chapter 1

1-17(O). The mast, hub, and rotor blades.
Ref: Airframe Handbook H-8083-31B-ATB, Chapter 1

1-18(O). Rigid, semi-rigid, or fully articulated.
Ref: Airframe Handbook H-8083-31B-ATB, Chapter 1

1-19(O). The tail boom and tail rotor, or antitorque rotor, counteract this torque effect.
Ref: Airframe Handbook H-8083-31B-ATB, Chapter 1

QUESTIONS

PRACTICAL EXAM

1-1(P). Given an actual aircraft, mock-up, or even a drawing of an aircraft identify the various structures as requested by the examiner.

1-2(P). Given an actual aircraft, mock-up, and a maintenance manual task locate the panels to be removed to complete the required maintenance.

1-3(P). Given an actual aircraft or mock-up complete an operational check of the primarily flight control surfaces and document any discrepancies.

1-4(P). Given an actual aircraft, mock-up complete an operational check of the secondary flight control surfaces and document any discrepancies.

1-5(P). Given a series of pictures, identify the various types of wing designs.