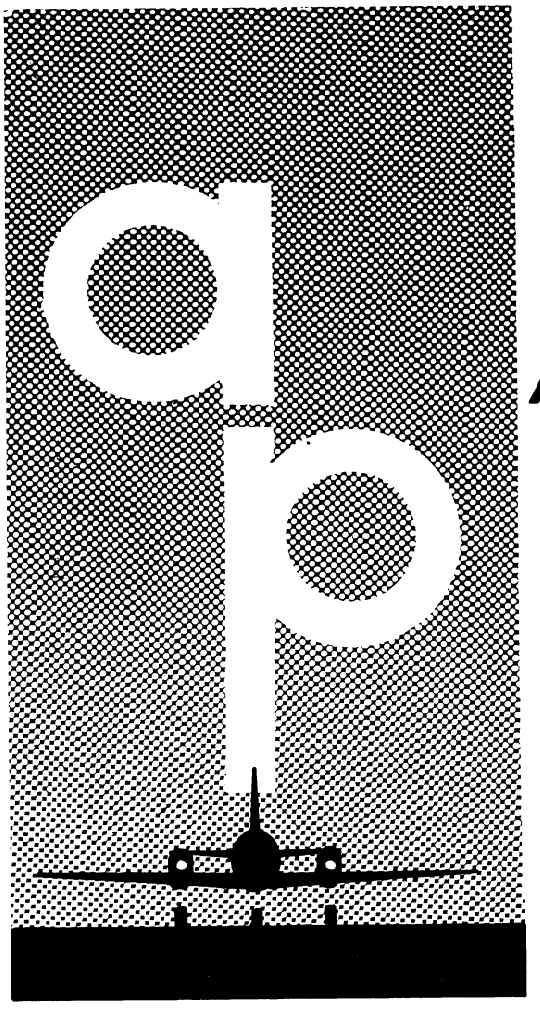

AC 65-2D

Airframe & Powerplant MECHANICS Certification Guide

U.S. DEPARTMENT OF TRANSPORTATION

FEDERAL AVIATION ADMINISTRATION

AIRFRAME AND POWERPLANT MECHANICS CERTIFICATION GUIDE

Revised
1976

U.S. DEPARTMENT OF TRANSPORTATION
FEDERAL AVIATION ADMINISTRATION

PREFACE

This guide was prepared by Flight Standards Service, Federal Aviation Administration, to provide information to prospective airframe and powerplant mechanics and other persons interested in the certification of mechanics. It contains information about the certificate requirements, application procedures, and the mechanic written, oral, and practical tests.

This guide supersedes AC 65–2C, Airframe and Powerplant Mechanics Certification Guide, dated 1973.

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INTRODUCTION

The requirements for a mechanic certificate and ratings, and the privileges, limitations, and general operating rules for certificated mechanics are prescribed in Federal Aviation Regulations Part 65—Certification: Airmen Other Than Flight Crewmembers. Any person who applies and meets the requirements is entitled to a mechanic certificate.

Briefly, the requirements for a mechanic certificate are concerned with age, language ability, experience, knowledge, and skill. The sections of this guide explain the procedure for either substantiating or demonstrating that each requirement has been met.

The sections that deal with the written test (to demonstrate knowledge) and the oral and practical tests (to demonstrate skill) describe the types of tests used and what they contain. The subject listings and the sample questions and projects should be helpful during preparation for the tests.

Portions of the Federal Aviation Regulations (FAR) concerning general eligibility and experience requirements for a mechanic certificate and ratings have been included. Since regulations are subject to amendment, applicants should be alert for changes that may have occurred since publication of this guide. Change information may be determined by referring to the most recent FAR Status Sheet mentioned in the Appendix, or by checking with an FAA Flight Standards district office. The FARs have been organized and printed in eleven volumes of interrelated Parts. Refer to the Appendix, FAR Status Sheet, for information about the FAR rearrangement.

FAA Flight Standards district offices are listed in the appendix and each office serves the geographical area in which it is located. Applicants should contact the most convenient office.

ELIGIBILITY REQUIREMENTS FOR CERTIFICATION

Mechanic certificate requirements can be classified as general eligibility requirements, knowledge requirements, experience requirements, and skill requirements. The following excerpts from FAR Part 65 pertain to eligibility for a mechanic certificate and rating(s).

"§ 65.71 Eligibility requirements: general.

(a) To be eligible for a mechanic certificate and associated ratings, a person must—

(1) Be at least 18 years of age;

(2) Be able to read, write, speak, and understand the English language, or in the case of an applicant who does not meet this requirement and who is employed outside of the United States by a U.S. air carrier, have his certificate endorsed 'Valid only outside the United States';

(3) Have passed all of the prescribed tests within a period of 24 months; and

(4) Comply with the sections of this subpart that apply to the rating he seeks.

(b) A certificated mechanic who applies for an additional rating must meet the requirements of § 65.77 and, within a period of 24 months, pass the tests prescribed by § § 65.75 and 65.79 for the additional rating sought.

"§ 65.75 Knowledge requirements.

(a) Each applicant for a mechanic certificate or rating must, after meeting the applicable experience requirements of § 65.77, pass a written test covering the construction and maintenance of aircraft appropriate to the rating he seeks, the regulations in this subpart, and the applicable provisions of Parts 43 and 91 of this chapter. The basic principles covering the installation and maintenance of propellers are included in the powerplant test.

(b) The applicant must pass each section of the test before applying for the oral and practical tests prescribed by § 65.79. A report of the written test is sent to the applicant.

"§ 65.77 Experience requirements.

Each applicant for a mechanic certificate or rating must present either an appropriate graduation certificate or certificate of completion from a certificated aviation maintenance technician school or documentary evidence, satisfactory to the Administrator, of—

(a) At least 18 months of practical experience with the procedures, practices, materials, tools, machine tools, and equipment generally used in constructing, maintaining, or altering airframes, or powerplants appropriate to the rating sought; or

(b) At least 30 months of practical experience concurrently performing the duties appropriate to both the airframe and powerplant ratings."

The documentary evidence specified in § 65.77 may take any of various forms, such as letters from present and former employers, military service records, business records, etc., as long as the FAA inspector or advisor who reviews it is able to determine that the type and amount of experience meets the requirements.

"§ 65.79 Skill requirements.

Each applicant for a mechanic certificate or rating must pass an oral and a practical test on the rating he seeks. The tests cover the applicant's basic skill in performing practical projects on the subjects covered by the written test for that rating. An applicant for a powerplant rating must show his ability to make satisfactory minor repairs to, and minor alterations of, propellers.

"§ 65.80 Certificated aviation maintenance technician school students.

Whenever an aviation maintenance technician school certificated under Part 147 of this

chapter shows to an FAA inspector that any of its students has made satisfactory progress at the school and is prepared to take the oral and practical tests prescribed by § 65.79, that student may take those tests during the final subjects of his training in the approved curriculum, before he meets the applicable experience requirements of § 65.77 and before he passes each section of the written test prescribed by § 65.75."

THE WRITTEN TESTS

The written tests required for a mechanic certificate or rating can be taken at FAA Flight Standards district offices and at some selected Flight Service Stations. Some Flight Standards district offices administer mechanic written tests at special locations by prior arrangement, and some Flight Service Stations often administer written tests after the normal workday and on weekends. Contact the local FAA district office for information about time and place where tests are administered.

Most FAA offices that administer written tests recommend that an appointment be made before the intended date of examination so that the appropriate personnel will be on hand to give the tests and to assure that adequate space is available.

An applicant must have the documentary evidence required by FAR 65.77 reviewed by an FAA inspector to confirm eligibility to take a written Airframe or Powerplant test. Those applicants found to be eligible for testing who are unable to take the test at that time may request the FAA inspector to issue an Airman Authorization for Written Test, FAA Form 8060–7.

When eligibility has been confirmed or the completed 8060–7 is presented and sufficient time exists (5 hours) to complete the test, the FAA office test monitor will issue a test booklet, a blank answer sheet, and all materials necessary to take the test. The applicant is not required to furnish any test or reference materials, nor permitted to use notes or take notes during the test.

Written tests for airframe and powerplant mechanic certification consist of three separate tests: (1) Aviation Mechanic General Test; (2) Aviation Mechanic Airframe, Section 1—Airframe Structures, and Section 2—Airframe Systems & Components; and (3) Aviation Mechanic Powerplant, Section 1—Powerplant Theory & Maintenance, and Section 2—Powerplant Systems & Components.

Applicants will not be required to take the Aviation Mechanic General Test required for Airframe and/or Powerplant certification if they can show that they have previously passed it. Proof of passing may be in the form of a mechanic certificate with an alternate rating or an Airman Written Test Report that shows a passing grade on the Aviation Mechanic General Test. If an Airman Written Test Report is used, the passing credit must have been earned within the preceding 24 months.

FAA mechanic written tests are made up of objective-type questions of the multiple-choice form. In this type of test, the applicant chooses the best of a number of possible answers to a question. Each of the FAA mechanic written test questions has one *best* answer and three wrong or unacceptable alternative answers. The tests do not contain questions designed to trick or mislead the applicant.

After completion of the test, the applicant's answer sheet is forwarded by the local FAA office to a central location for grading. The minimum passing grade for FAA tests is 70 percent. Written test grades are mailed directly to the applicant using the address entered by the applicant on the answer sheet at the time the test is taken. Five working days (exclusive of time en route in the mail) are normally required for answer sheets to be processed and grades reported.

Written Test Report

Written test grades are reported to applicants on AC Form 8080–2, Airman Written Test Report. The report indicates the numerical grade for each test section and an expiration date of each test section passed. AC Form 8080–2 is the only acceptable evidence of having passed any part of the written test or the entire test.

In addition to grade information, the computer-rendered AC Form 8080–2 provides a coded print-out of the subject areas for which questions were answered wrong. The subject area codes indicated on AC Form 8080–2 correspond to the subject headings indicated on pages 7 through 42 of this advisory circular; however, the number of questions missed cannot be determined by the number of codes listed on AC Form 8080–2.

When an applicant applies for the oral and practical test, the Airman Written Test Report must be surrendered.

If the Airman Written Test Report is lost or destroyed, a duplicate copy may be obtained by sending $2.00 (money order or check payable to FAA) to the Federal Aviation Administration, Airman Certification Branch, P.O. Box 25082, Oklahoma City, Oklahoma 73125. Give the title of the test, the place where it was administered, and the approximate date that the test was taken.

An applicant who fails a test, or any section thereof, may apply for a retest of the test section(s) failed as prescribed in FAR Part 65. The following excerpts from § 65.19 pertain to retesting after failure.

"§ 65.19 Retesting after failure.

An applicant who fails a written, oral, or practical test for a certificate and rating, or for an additional rating, under this Part may apply for retesting—

(a) After 30 days after the date he failed the test; or

(b) Upon presenting a statement from whichever of the following persons is applicable, certifying that he has given the applicant at least 5 hours of additional instruction in each of the subjects failed and now considers that the applicant is ready for retesting.....

(3) For the mechanic certificate—a certificated and appropriately rated mechanic or ground instructor, or a certificated repairman who is experienced in the subject failed."

AVIATION MECHANIC TEST CONTENTS

This listing of the subject material covered by the questions in the mechanic tests shows what the applicant should know and be able to do. Each listing contains major headings (identified by letters A, B, C, etc.) under which are listed one or more action lines. Each action line is made up of 3 elements: (1) the action, (2) the subject, and (3) the level. For instance, the major heading "C. Weight and Balance" in the General Test has two action lines:

(a) Weigh aircraft—Level 2.

(b) Perform complete weight and balance check and record data—Level 3.

The action lines tell what the end result or objective of the applicant's study and experience should be. Many action lines show more than one action and more than one subject.

The purpose of the level indicated for each action line is to help limit the amount of study that must be done or the skill that must be developed to pass the mechanic tests. Three levels have been identified. The higher the level, the more comprehensive the knowledge and skill required in that subject area. A Level 1 action line requires a less extensive knowledge of the subject and no skill demonstration to pass the mechanic tests. A Level 2 action line requires a fairly good understanding of the subject indicated, the theories and principles associated with it, and the ability to perform basic operations. Level 3, the highest level, requires a thorough knowledge of the subject and an understanding of how it relates to the total operation and maintenance of aircraft. The operations necessary to complete Level 3 items must be performed skillfully enough so that, if performed on an aircraft, the aircraft could be returned to service.

A detailed description of the meaning of each level is:

Level 1:

Know—basic facts and principles.

Be able to—find information and follow directions and written instructions.

No skill demonstration is required.

Level 2:

Know and understand—principles, theories and concepts.

Be able to—find and interpret information and perform basic operations.

A high level of skill is not required.

Level 3:

Know, understand, and apply—facts, principles, theories, and concepts. Understand how they relate to the total operation and maintenance of aircraft.

Be able to—make independent and accurate airworthiness judgments. Perform all operations to a return-to-service standard.

A fairly high skill level is required.

Following each action line is a list of statements that describe the specific subjects of mechanic test questions. They are intended to be used during study and while experience is being gained, to help direct the applicant's attention toward areas covered by the tests.

AVIATION MECHANIC

General Test

A. BASIC ELECTRICITY.

Measure capacitance and inductance.—Level 1:

The effect of inductive reactance in an electrical circuit.

The interrelationship of capacitive and inductive reactance.

The term that describes the combined resistive forces in an a.c. electrical circuit.

The unit of measurement for capacitance and inductance.

Calculate and measure electrical power.—Level 2:

Determine the power furnished by a generator to an electrical system consisting of various electrical units having specific load ratings.

Determine the power required by an electric motor that is operating at a specified efficiency and load.

Measure voltage, current, resistance, continuity, and leakage.—Level 3:

Use an ohmmeter to check for open or short circuits.

The test instruments used to check continuity.

The basic operating principle of d.c. electrical instruments.

The basic operating principles of a galvanometer.

Connect voltmeters and ammeters into an electrical circuit.

The purpose of a shunt resistor when used with an ammeter.

The meaning of prefixes such as micro, mega, kilo, and milli as used in expressing electrical quantities.

Determine the relationship of voltage, current, and resistance in electrical circuits.—Level 3:

Determine the current flow in an electrical circuit using variable resistance and voltage values.

Determine the power requirements of an electrical circuit when the voltage and resistance values are specified.

The current relationship in a parallel electrical circuit.

The unit of measurement used to express electrical power.

The principles of electromagnetic induction.

The characteristics of magnets and magnetic lines of force.

The factors that affect the voltage drop in an electrical conductor.

Determine the resistance of an electrical device from the wattage and voltage values specified.

Calculate the voltage drop across a resistor.

Read and interpret electrical circuit diagrams.—Level 3:

Trace electrical circuits using aircraft wiring diagrams.

Identify electrical system malfunctions by reference to circuit diagrams.

Identify the commonly used aircraft electrical symbols.

Inspect and service batteries.—Level 3:

Remove spilled electrolyte and treat all adjacent surfaces.

Remove and install a battery in an aircraft with a single-wire electrical system.

Connect batteries to a constant-current battery charger.

Determine the specific gravity of the battery electrolyte.

Perform a high-rate-discharge condition test of batteries.

The design factors that affect battery voltage and capacity.

The factors that determine battery charging rate on a constant voltage source.

The indications of a shorted battery cell.

The significance of battery capacity ratings.

The effects of increased internal resistance on battery operation.

The effects of connecting battery cells in series or parallel.

The relative advantages of lead-acid and nickel-cadmium batteries for use in aircraft.

The principles of battery construction.

Check battery electrolyte levels.

The relationship between battery state of charge and the temperature at which the electrolyte will freeze.

The purpose of and requirements for ventilating batteries and battery compartments in civil aircraft.

The effect of excessive charging rates on batteries.

B. AIRCRAFT DRAWINGS.

Use drawings, symbols, and schematic diagrams.—Level 2:

Interpret the various types of lines employed in blueprints and schematics.

Use schematic diagrams to analyze system malfunctions.

Extract a specific electrical circuit from a system drawing.

Know why dimensions are used and how they are shown on aircraft drawings.

Use installation diagrams to locate and identify components.

Draw sketches of repairs and alterations.—Level 3:

Illustrate a major repair or alteration.

Use dividers, compass, ruler, T-square, etc., in the development of sketches of repairs and alterations.

Use standard drafting procedures.

Use blueprint information.—Level 3:

The information presented in blueprint title blocks.

The common symbols used on aircraft blueprints.

Install and modify component parts by reference to blueprints.

Identify the changes made to a blueprint.

Use graphs and charts.—Level 3:

Determine electric cable size and current-carrying capacity.

Determine engine power requirements.

C. WEIGHT AND BALANCE.

Weigh aircraft.—Level 2:

Use aircraft specifications for weighing purposes.

Locate jacks and scales in the correct position.

Prepare aircraft for weighing.

Perform complete weight-and-balance check and record data.—Level 3:

Determine that the forward or rearward center-of-gravity (c.g.) limit is not exceeded on a specified aircraft.

The point of reference for all weight-and-balance measurements.

The procedure for computing "minimum fuel."

Locate the information that should be known to compute weight and balance.

The method of expressing additions or removals of equipment for weight-and-balance purposes.

Determine the fully loaded center of gravity of an aircraft.

Determine the "maximum authorized weight" of an aircraft.

The method of determining aircraft empty weight, when engine oil and hydraulic fluid are contained in supply tanks.

The effect on weight and balance of replacing a component with another of different weight and location.

Calculate the maximum cargo or baggage weight that can be carried by an aircraft.

The record requirements for weight-and-balance data.

The hazards of exceeding aircraft fore and aft center-of-gravity limits.

The critical conditions of helicopter load and balance.

Determine aircraft empty weight and empty weight center of gravity.

Define maximum gross weight.

Determine the moment of an item of equipment.

Account for tare weight when weighing an aircraft.

D. FLUID LINES AND FITTINGS.

Fabricate and install rigid and flexible fluid lines and fittings.—Level 3:

Single- and double-flare tubing.

Install Military Standard (MS) flareless fittings.

The significance of the identification stripes that appear on aircraft hose.

Fabricate and install beaded tubing.

Use lubricants and sealants in the assembly of lines and fittings.

Identify flexible hydraulic lines.

Install hose clamps.

Determine the bend radii for rigid tubing.

Fabricate aluminum tubing using standard AN flared tube fittings.

Route fluid lines in entryways and passenger, crew, or baggage compartments.

Repair metal tube lines.

Route fluid lines adjacent to electrical power cables.

Install rigid tubing.

Select tube-flaring tools.

Identify AN fitting materials from color designators.

The maximum reduction in original outside diameter allowed when bending aluminum alloy hydraulic lines.

The procedure to follow if scratches are detected on an aluminum alloy tube.

The storage requirements for hydraulic hose.

Install flexible hydraulic hose.

The lubricant used when assembling oxygen fittings.

E. MATERIALS AND PROCESSES.

Identify and select appropriate nondestructive testing methods.—Level 1:

The use of radiography in aircraft and component inspection.

The use of ultrasonic inspection methods for detecting cracks.

The applicability of magnetic particle inspection methods to engine crankshafts.

The method for detecting surface cracks in aluminum castings and forgings.

The technique for locating cracks in materials when only one side of the material is accessible.

Perform penetrant, chemical etching, and magnetic particle inspections.—Level 2:

The general procedure for performing magnetic particle inspection.

Demagnetize steel parts after magnetic particle inspection.

Clean parts in preparation for penetrant inspection.

The visual indications of a subsurface flaw or fracture during magnetic particle inspection.

Locate cracks and blowholes in welded assemblies.

The procedure for using dye penetrants.

Distinguish between heat-treated and non-heat-treated aluminum alloys when the identification marks are not on the material.

Perform basic heat-treating processes.—Level 2:

The types of aluminum alloys considered to be heat treatable.

Anneal copper tubing.

The steps in heat treatment of aluminum alloys.

The effects of various forms of heat treatment.

The effect of incorrect heat treatment on the corrosion-resistant properties of aluminum alloy.

Identify the degree of temper for aluminum alloy products from code designators.

The effect of heating a metal slightly above its critical temperature, and then rapidly cooling it.

The effect of strain hardening on the tensile strength of aluminum alloy.

The relationship between tensile strength and metal hardness.

Anneal a welded steel part.

Identify and select aircraft hardware and materials.—Level 3:

Identify aluminum alloys from code designators.

Identify steel from code designators.

The identification markings of AN standard steel bolts.

Identify aircraft cable.

The characteristics of a material that affect its ability to be hammered, rolled, or pressed into various shapes.

The SAE system of identifying steel.

Determine wrought aluminum alloy composition and condition by referring to aluminum codes.

Install self-locking nuts.

Determine the correct length bolt to use.

Determine correct torque values for tightening aircraft nuts and bolts.

Determine rivet composition, condition, shape, and dimension by referring to rivet code.

Identify materials suitable for use for firewalls and exhaust shrouds.

Install castle nuts.

The strength characteristics of type "A" rivets.

The characteristic of aluminum alloy rivet material that causes some rivets to require several days to reach their ultimate strength.

Determine that materials used in aircraft maintenance and repair are of the proper type and conform to the appropriate standards.

The characteristics of aluminum-clad sheet aluminum alloy.

Inspect and check welds.—Level 3:

The characteristics of a good weld.

The types of stress that welded joints can withstand.

The effect of welding over a previously brazed or soldered joint.

Perform precision measurements.—Level 3:

Use a micrometer and a caliper to make precise measurements.

Measure a small hole using a micrometer and a hole gage.

Read and interpret a vernier micrometer scale.

Use a dial indicator, V-blocks, and a surface plate to check alignment of a shaft.

F. GROUND OPERATION AND SERVICING.

Start, ground operate, move, service, and secure aircraft.—Level 2:

The procedure for extinguishing fires in the engine induction system during starting.

Use hand signals to direct aircraft movement.

Select and use external auxiliary power units for engine starting.

Tie down and secure aircraft for outside storage.

Protect aircraft fuel system from contamination during fueling operations.

Connect and operate an external source of hydraulic power.

Start and operate an engine equipped with a float-type carburetor.

Check a reciprocating engine for liquid lock.

Operate hand and electrical priming systems during engine starting.

Start and operate an engine equipped with a pressure injection carburetor.

Start and operate an engine equipped with an internal supercharger.

Identify and select fuels.—Level 2:

The effect of ethylene dibromide added to aviation gasoline.

The identifying color of various grades of aviation gasoline.

The characteristic of a fuel that affects its tendency to "vapor lock."

The significance of the numbers used to designate various grades of aviation gasoline.

The relative advantages of gasoline and kerosene for use as fuel for turbine engines.

Determine the type of fuel to be used with a specified aircraft.

The factors affecting the antiknock characteristics of fuel.

G. CLEANING AND CORROSION CONTROL.

Identify and select cleaning materials.—Level 3:

The effect of caustic cleaning products on aluminum structures.

The characteristics and use of chemical cleaners.

Clean aluminum and steel engine parts.

The type cleaner for use on high-strength metals.

The methods for cleaning turbine engine compressor blades.

Perform aircraft cleaning and corrosion control.—Level 3:

Protect tires and other rubber products from the deteriorating effects of cleaning materials.

The cause and corrective procedures for fretting corrosion.

Identify and control intergranular corrosion of heat-treated aluminum alloy.

Protect structure against dissimilar-metal corrosion.

Prevent and remove rust.

The effect of oily, dirty surfaces on the operation of high-performance aircraft.

Protect interior surfaces of closed steel and aluminum tubing against corrosion.

The methods of protecting aluminum alloy parts against corrosion.

Clean and protect battery compartments and adjacent areas.

Remove corrosion products such as metal flakes, scale powder, and salt deposits from aluminum.

Clean corrosion-resistant parts by blast cleaning methods.

Use paints and similar organic coatings for corrosion protection purposes.

H. MATHEMATICS.

Extract roots and raise numbers to a given power.—Level 1:

The method of determining the square or cube of a number.

The procedure for determining square root.

Determine areas and volumes of various geometrical shapes.—Level 2:

Calculate the area of rectangles, squares, triangles, circles and trapezoids.

Determine the volume of rectangles, cubes, and cylinders.

Compute the surface area of an airfoil.

Determine cylinder displacement of a reciprocating engine.

Solve ratio, proportion, and percentage problems.—Level 3:

Determine the ratio of two numbers.

Find what percent one number is of another.

Determine the rate percent of a given number.

Calculate the compression ratio of an engine.

Convert decimal numbers to their fractional equivalent.

Perform algebraic operations involving addition, subtraction, multiplication, and division of positive and negative numbers.—Level 3:

Locate the main-wheel weighing point with reference to the datum.

Determine the distance between the tail or nose gear and the main-wheel weight point.

Calculate the c.g. relative to the datum.

The effects of adding or removing equipment on the empty weight of the aircraft.

I. MAINTENANCE FORMS AND RECORDS.

Write descriptions of aircraft condition and work performed.—Level 3:

Describe the repairs made to an aircraft structure.

State aircraft condition based upon inspection.

Complete required maintenance forms, records, and inspection reports.—Level 3:

Enter the required information in the permanent maintenance records when a minor repair has been performed.

Prepare and properly dispose of FAA Form 337.

The minimum information required to be entered in the maintenance records after maintenance or alteration of aircraft.

Make record entries to indicate compliance with Airworthiness Directives.

The definition of "time in service" with respect to maintenance records.

The record requirements for returning aircraft to service after 100-hour inspection.

The requirement for maintaining a permanent record of aircraft maintenance.

The definition of "repair" as related to aircraft maintenance.

The requirements for a permanent maintenance record.

J. BASIC PHYSICS.

Use the principles of simple machines; sound, fluid, and heat dynamics.—Level 2:

The relationship between temperature and heat.

The methods of heat transfer.

The forces acting upon a body in circular motion.

The relationship between the pressure and the rate-of-flow of a liquid through an orifice.

The relationship between the pressure, volume, and temperature of an air mass.

The relationship of work, force, and power.

The effect of air density on engine power output.

The relationship between air velocity and pressure on the upper surface of an airfoil.

The effect of atmospheric temperature and humidity on airfoil lift.

The principles of transmission of power in a hydraulic system.

The relationship of pressure, area, and force.

K. MAINTENANCE PUBLICATIONS.

Select and use FAA and manufacturer's aircraft maintenance specifications, data sheets, manuals, and publications, and related Federal Aviation Regulations.—Level 3:

Determine the suitability of a propeller for use with a particular engine-airplane combination.

Determine the minimum diameter of a propeller type and model when used with a particular engine.

Locate aircraft leveling and weighing information.

Determine engine/propeller speed ratios.

The instrument markings required on a specified type and model aircraft.

The purpose and applicability of Technical Standard Orders.

The purpose and applicability of Supplemental Type Certificates.

Identify the useful load and empty weight c.g. of an aircraft by reference to data.

Use FAA Specifications and Type Certificate Data Sheets.

The applicability and requirements for aircraft airworthiness certificates

Determine the control surface movement limits of a specified aircraft.

Determine seat locations of an aircraft, using aircraft specifications.

Use aircraft listing to find information about aircraft of limited production.

The purpose and applicability of FAA Airworthiness Directives.

Use "Table of Limits" to determine condition of parts.

Read technical data.—Level 3:

Find specified information in technical reports and manuals.

L. MECHANIC PRIVILEGES AND LIMITATIONS.

Exercise mechanic privileges within the limitations prescribed by FAR 65.—Level 3:

The criteria for determining the classification (major, minor, or preventive maintenance) of airframe repairs and alterations.

The criteria for determining the classification (major, minor, or preventive maintenance) of powerplant repairs and alterations.

The criteria for determining the classification (major, minor, or preventive maintenance) of propeller repairs and alterations.

Return an aircraft to service after installation of an engine type other than that for which the aircraft was originally certificated.

The minimum age requirement for issuance of a mechanic certificate.

The privileges of a mechanic in relation to 100-hour and annual inspections.

The requirements for reporting change of address.

The duration or effective period of a mechanic certificate.

The requirements an applicant must meet for issuance of a mechanic certificate.

Determine the maintenance classification (major repair, minor repair, preventive maintenance) of landing gear tire removal, installation, and repair.

Determine the maintenance classification (major repair, minor repair, preventive maintenance) of servicing landing gear shock struts.

Determine the repair classification (major repair, minor repair, preventive maintenance) of repairs to steel tubing structures by welding.

Determine the repair classification (major repair, minor repair, preventive maintenance) of replacing the fabric on fabric-covered parts such as wings, fuselages, stabilizers, and control surfaces.

The recency-of-experience requirements for certificated mechanics.

The privileges of a mechanic regarding return to service of aircraft after major repairs.

Determine the maintenance classification (major repair, minor repair, preventive maintenance) of the replacement of aircraft components with new, rebuilt, or repaired components of similar design.

AVIATION MECHANIC AIRFRAME TEST

Section 1. Airframe Structures

A. WOOD STRUCTURES.

Service and repair wood structures.—Level 1:

The general requirements of scarf splice joints.

The repair procedure for elongated holes in wood spars.

The permissible wood substitutes for use in making repairs to wood structures.

The procedures for repairing wood rib capstrips.

The characteristics of glue used in aircraft construction and repair.

The procedure for sealing the inner surfaces of a wooden structure that is to be assembled by gluing.

The general characteristics of the wood commonly used in aircraft construction.

Identify wood defects.—Level 2:

Recognize acceptable and nonacceptable wood defects.

Inspect wood structures.—Level 2:

The effect of moisture content on wood size and strength.

The strength characteristics of wood structures.

The characteristics of plywood and laminated wood.

B. AIRCRAFT COVERING.

Select and apply fabric and fiberglass covering materials.—Level 1:

The factors to consider in selecting aircraft fabric.

The types of seams commonly used in aircraft fabric coverings.

The general requirements for making doped and lapped seams.

The meaning of the term "warp" as used in reference to aircraft textile products.

The precautions to observe when installing surface tape on control surfaces.

Inspect, test, and repair fabric and fiberglass.—Level 3:

Determine the condition of aircraft fabric.

Apply a doped-on patch to aircraft fabric.

Make a sewed repair to a fabric-covered surface.

The areas on a fabric-covered aircraft most susceptible to corrosion.

C. AIRCRAFT FINISHES.

Apply trim, letters, and touchup paint.—Level 1:

The requirements for registration markings.

The relative proportions of identification markings.

The use of color and ornamentation when applying registration marks.

Identify and select aircraft finishing materials.—Level 2:

The characteristics of butyrate and acetate dopes.

The types of thinners used with various types of paint and dope.

The characteristics of fabric rejuvenators.

The types of priming paints generally used on aircraft.

The type paint used to coat the insides of battery compartments.

Apply paint and dope.—Level 2:

The purpose of fungicidal dope in aircraft finishing.

The application of rejuvenator to repair an aged dope finish.

The products and methods used to dope-proof airframe structures.

The effect of atmospheric conditions on dope during its application.

Sand and rub aircraft finishes.

Apply primer to aluminum alloy parts.

Use and maintain a paint spray gun.

The purpose of brushing the first coat of dope instead of spraying.

Inspect finishes and identify defects.—Level 2:

The type of painting defect caused by moving the spray gun in an arc instead of a straight line.

The cause of runs and sags in aircraft finishes.

D. SHEET METAL STRUCTURES.

Install special rivets and fasteners.—Level 2:

Determine correct rivet length and diameter.

Install a hi-shear rivet.

The precautions concerning rivet fit.

Install deicer boot fasteners.

Install blind-type rivets.

The stresses that a rivet is designed to resist.

Inspect bonded structures.—Level 2:

The reason for using metal sandwich panels in high-speed aircraft construction.

The use of the metallic "ring" test to inspect for delamination damage of bonded structures.

Evaluate the extent of damage to a bonded structure and determine the type repair needed.

Inspect and repair plastics, honeycomb, and laminated structures.—Level 2:

Distinguish between transparent plastic and plate-glass enclosures.

Protect plastics during handling and repair operations.

Remove scratches and surface crazing from plastic enclosures.

Drill shallow or medium depth holes in plastic materials.

The effect of moisture entrapped in honeycomb structures.

Use a router to remove damaged area from honeycomb panels.

Clean honeycomb panels prior to patching.

Inspect, check, service, and repair windows, doors, and interior furnishings.—Level 2:

Clean transparent plastic window and windshield materials.

Inspection procedures and airworthiness requirements for safety belts.

The characteristics of acrylic plastic enclosure materials.

Maintain safety belts.

Secure transparent plastic enclosures to the aircraft structure.

Protect transparent plastic enclosure materials during handling and storage.

The physical characteristics of transparent plastic enclosure materials.

Form and shape acrylic plastic.

Repair shallow surface scratches in transparent plastic enclosures.

Inspect and repair sheet-metal structures.—Level 3:

Select and use twist drills.

Select and use a hand file for soft metals.

Prepare dissimilar metals for assembly.

Determine the type, size, and number of rivets for use in structural repairs.

Repair sheet-metal flight control surfaces.

The loads acting upon a semimonocoque fuselage.

The construction characteristics of monocoque and semimonocoque structures.

The construction characteristics of cantilever wing structures.

The types of loads carried by wing spars.

Drill holes in stainless steel.

Define bearing failure as related to sheet-metal structures.

Define shear failure.

Repair a hole in a stressed-skin metal wing.

Repair a section of damaged skin using a single-lap sheet splice.

Construct a watertight joint.

Countersink a hole.

Perform the dimpling process.

Select the correct rivet to accomplish a repair using a specified material.

Repair or splice stringers on the lower surface of a stressed-skin metal wing.

Determine the correct rivet layout and spacing for a specified repair.

Use proper riveting techniques.

Stop drill cracks in sheet metal.

Repair a slightly oversize hole.

Repair structural units, such as spars, engine supports, etc., that have been built from sheet metal.

Repair shallow scratches in sheet metal.

Determine the condition of a stressed-skin metal structure that is known to have been critically loaded.

Use a reamer.

Install conventional rivets.—Level 3:

Prepare sheet metal for installation of flush rivets.

Identify and select rivets.

Determine the correct rivet length and diameter.

Select and use the correct rivet set for specified rivet head styles.

Select and use bucking bars.

Remove rivets.

Determine the condition of a driven rivet.

Determine the circumstances under which 2117 rivets may be used to replace 2017 and 2024 rivets.

Define rivet tipping.

Determine the correct number of rivets to be used in making a structural sheet-metal repair.

Handle and install rivets that require heat treatment prior to use.

Adjust and use an air-operated riveting gun.

The circumstances under which type "A" rivets may be used in aircraft.

The mechanical properties of heat-treated rivets.

Hand form, lay out, and bend sheet metal.—Level 3:

Make a joggle or offset bend.

Bend sheet metal that requires the use of a large radius.

Determine the neutral axis of a bend.

Define bend radius.

Determine the amount of material required to make a specified bend.

Bend sheet metal to a specified angle.

Lay out and bend a piece of sheet metal using a minimum radius for the type and thickness of material specified.

Lay out a bend in relationship to metal "grain" to minimize the possibility of cracking.

Determine the flat layout dimensions of a component part to be formed by bending.

Form metal by bumping.

E. WELDING.

Weld magnesium and titanium.—Level 1:

The method of cleaning magnesium in preparation for welding.

The main function of a flux while welding magnesium.

The types of gases to use when gas-welding magnesium.

The use of butt joints when gas-welding magnesium.

Solder stainless steel.—Level 1:

The use of silver soldering as a method of bonding metals.

The preparation of stainless steel for soldering.

The methods of cleaning material after soldering.

Fabricate tubular structures.—Level 1:

The types of tubing splices.

The proper welding sequence to use when welding fuselage tubes.

The characteristics of a welded tubing joint.

The protection of the interior of tubular steel that is to be closed by welding.

The methods used to control distortion of steel tube structures during welding repairs.

The preparation of tube ends for welding.

Solder, braze, gas-, and arc-weld steel.—Level 2:

Use cleaning operations to prepare sheet steel for welding.

Adjust oxyacetylene welding torch to produce the type flame needed to weld a specified material.

Select and use filler rod.

The effect of excessive heat on metal.

Operate a portable welding set.

Select the correct size welding torch tip.

The precautions regarding welding over a previously brazed or soldered joint.

Solder a wire or cable to an electrical component.

Sweat-solder a lap joint.

Normalize a steel part after welding.

Identify steel parts considered to be repairable by welding.

The preheating required prior to welding.

Weld aluminum and stainless steel.—Level 2:

Use a filler rod when welding aluminum with oxyacetylene.

Use flux when welding aluminum.

The purpose and effect of using inert gas to shield the arc in certain types of welding.

F. ASSEMBLY AND RIGGING.

Rig rotary-wing aircraft.—Level 1:

The condition of flight that a properly rigged aircraft should maintain.

The relationship of thrust and drag of an aircraft during level unaccelerating flight.

The relationship of lift and weight of an aircraft during level unaccelerating flight.

The meaning of the term "angle of attack" of an airfoil.

The type of control movement used to induce forward flight in a helicopter.

The method of controlling vertical flight of a helicopter.

The movement of an aircraft about its axes during normal flight maneuvers.

The factors affecting stability of an aircraft about its axes.

The methods of maintaining directional control of a helicopter.

The cause and effect of rotor blade stall in helicopters operating at high speeds.

The cause of vertical vibration in a two-blade helicopter rotor system.

The preparations required prior to rigging.

The method of tracking helicopter main rotor blades.

Rig fixed-wing aircraft.—Level 2:

The condition of flight that a properly rigged aircraft should maintain.

The factors to consider when rigging vertical stabilizer of single-engine, propeller-driven aircraft.

The relationship of thrust and drag of an aircraft during level unaccelerating flight.

The effect of incorrect wing incidence angle.

The effect of dihedral on aircraft stability.

Use wing "wash-in" and "wash-out" to correct aircraft rigging.

The relationship of lift and weight of an aircraft during level unaccelerating flight.

The meaning of the term "angle of attack" of an airfoil.

The effect of flaps on aircraft landing speed and approach angle.

The meaning of the term "incidence angle" of an airfoil.

The movement of an aircraft about its axes during normal flight maneuvers.

The relationship between the center of pressure of a wing and its angle of attack.

The factors affecting stability of an aircraft about its axes.

The usual location of aircraft c.g. in relationship to center of lift.

The changes in lift and drag of the wings when an aircraft is rolled about its longitudinal axis.

The procedure for establishing wing angle of incidence prior to repairing wing attachment fittings.

Check alignment of structures.—Level 2:

Prepare fuselage for alignment check.

Check alignment of internally braced wing structure.

The significance and method of expressing reference positions.

Check alignment of assembled aircraft.

Assemble aircraft.—Level 3:

The methods of safetying aircraft screws, bolts, and nuts.

Assemble, adjust, and safety cable turnbuckles.

The correct method of inserting bolts in aircraft fittings.

Install and inspect swaged cable terminals and fittings.

Balance and rig movable surfaces.—Level 3:

The inspection requirements for cable-operated primary flight control systems.

Handle and make up control cables.

The corrosion protection requirements of control cables.

The effect of overtightening control cables.

The relationship between specified movements of the cockpit controls and the control surfaces.

The relationship between specified control movements during flight and the movement of the aircraft about its axes.

The movement of the controls, control surfaces, and the aircraft about its axes during normal flight maneuvers.

Balance control surfaces after repair.

The relationship between specified movements of the trim tab operating device and the trim tab.

Secure the cockpit flight controls in preparation for control surface rigging.

The effect of a worn pulley in a cable-operated control system.

The means used to reduce or prevent control surface flutter.

The purpose and operation of control surface locks.

The purpose and operation of differential controls.

The purpose and applicability of fairleads in a cable-operated control system.

Install and rig the cables in a flight control system.

Splice control cables using Nicopress sleeves.

The probable causes of control surface flutter.

The maintenance requirements of control surface trim tab systems.

The purpose of counterweights incorporated into the leading edges of some primary control surfaces.

The purpose and function of "spring tabs" and "servo tabs".

Measure control surface movement and adjust control stops.

The effect of temperature changes on control system cable tension.

Assemble, adjust, inspect, and safety push-pull tube-type flight control systems.

The types and characteristics of cables used in aircraft primary control systems.

Jack aircraft.—Level 3:

Determine maximum allowable jacking weight.

The use of correct capacity jacks.

Protect aircraft from damage during lifting and lowering operations.

Use ballast when jacking aircraft with engine removed.

The effects of wind when jacking aircraft.

G. AIRFRAME INSPECTION.

Perform airframe conformity and airworthiness inspections.—Level 3:

The maximum period of time an aircraft can be flown before an annual inspection is required.

Determine the condition of airframes, airframe systems, and components.

The primary purpose of inspection.

The maximum time an aircraft that carries passengers for hire or is used in flight instruction can be flown before being inspected.

Determine that an aircraft is in conformity with FAA Specifications.

Determine that applicable Airworthiness Directives have been complied with.

Conduct a thorough and detailed inspection of an aircraft.