



U.S. Department  
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**Federal Aviation  
Administration**

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# **AVIATION MECHANIC POWERPLANT**

## **Practical Test Standards**

**June 2003**

**FLIGHT STANDARDS SERVICE  
Washington, DC 20591**



**AVIATION MECHANIC  
POWERPLANT  
PRACTICAL TEST STANDARDS**

**2003**

**FLIGHT STANDARDS SERVICE  
Washington, D.C. 20591**



## NOTE

FAA-S-8081-28, Aviation Mechanic Powerplant Practical Test Standards (PTS) is to replace the oral and practical test guides currently used. Both testing procedures will be in effect until all examiners have been trained to administer the test in accordance with the PTS, or 2 years after the effective date of Order 8610.4J, Aviation Mechanic Examiner Handbook. After which time, **all** tests must be administered under the PTS guidelines. New examiners must use the PTS upon completion of initial training. Previously appointed examiners must transition to the PTS within 60 days after completion of recurrent training.

# Record of Changes

## Change 1: 8/8/2003

### Introduction

?? Performance Levels (pages 4 and 5)

- LEVEL 1—Z3b. Nondestructive changed to specified.
- LEVEL 1—PERFORMANCE STANDARD deleted.
- LEVEL 2—bullet 2: added additional text.
- LEVEL 2—PERFORMANCE STANDARD deleted.
- LEVEL 3—bullet 4: added additional text.
- LEVEL 3—Z3e. Verify changed to check.
- LEVEL 3—PERFORMANCE STANDARD deleted.

## FOREWORD

This Aviation Mechanic Powerplant Practical Test Standards book has been published by the Federal Aviation Administration (FAA) to establish the standards for the Aviation Mechanic Powerplant Practical Test. The passing of this practical test is a required step toward obtaining the Aviation Mechanic certificate with a Powerplant rating. **FAA inspectors and Designated Mechanic Examiners (DMEs) shall conduct practical tests in compliance with these standards.** Applicants should find these standards helpful in practical test preparation.

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# INTRODUCTION

The Flight Standards Service of the Federal Aviation Administration (FAA) has developed this practical test book document as a standard to be used by FAA inspectors and Designated Mechanic Examiners (DMEs) when conducting aviation mechanic practical tests. Applicants are expected to use this book when preparing for practical testing.

Information considered directive in nature is described in this practical test book in terms, such as “shall” and “must” indicating the actions are mandatory. Guidance information is described in terms, such as “should” and “may” indicating the actions are desirable or permissive, but not mandatory.

The FAA gratefully acknowledges the valuable assistance provided by the many individuals and organizations who contributed their time and experience in assisting with the development of these practical test standards.

This practical test standard may be downloaded from the Regulatory Support Division's, AFS-600, web site at <http://afs600.faa.gov>. Subsequent changes to this standard, in accordance with AC 60-27, Announcement of Availability: Changes to Practical Test Standards, will also be available on AFS-600's web site and then later incorporated into a printed revision.

This publication can be purchased from the Superintendent of Documents, U.S. Government Printing Office, Washington, DC 20402. The official online bookstore web site for the U.S. Government Printing Office is [www.access.gpo.gov](http://www.access.gpo.gov).

Comments regarding this document should be sent to:

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## Practical Test Standard Concept

Title 14 of the Code of Federal Regulations (14 CFR) specifies the subject areas in which knowledge and skill must be demonstrated by the applicant before the issuance of an Aviation Mechanic Certificate with a Powerplant rating. The CFRs provide the flexibility that permits the FAA to publish practical test standards containing knowledge and skill specifics in which competency must be demonstrated. The FAA will revise this book whenever it is determined that changes are needed.

"Knowledge" (oral) elements are indicated by use of the words  
*"Exhibits knowledge of...."*

"Skill" (practical) elements are indicated by the use of the words  
*"Demonstrates the ability to...."*

**Adherence to the applicable regulations, the policies set forth in the current revision of FAA Order 8610.4, Aviation Mechanic Examiner Handbook, and the practical test standards, is mandatory for the evaluation of aviation mechanic applicants.**

## Practical Test Book Description

This test book contains the following Aviation Mechanic Powerplant Practical Test Standards.

### **Section IV—Powerplant Theory and Maintenance** **Section V —Powerplant Systems and Components**

The Aviation Mechanic Powerplant Practical Test Standards include the subject areas of knowledge and skill for the issuance of an aviation mechanic certificate and/or the addition of a rating. The subject areas are the topics in which aviation mechanic applicants must have knowledge and/or demonstrate skill.

## Practical Test Standard Description

The REFERENCE identifies the publication(s) that describe(s) the subject area. Descriptions of the subject area are not included in the practical test standards, because this information can be found in references listed and/or in manufacturer or FAA-approved or acceptable data related to each subject area. Publications other than those listed may be used as references if their content conveys substantially the same information as the referenced publications. Except where appropriate, (e.g., pertinent CFRs) references listed in this document are NOT meant to supersede or otherwise replace manufacturer or other FAA-approved or acceptable data, but to serve as general information and study material sources.

**Information contained in manufacturer and/ or FAA-approved/acceptable data always takes precedence over advisory or textbook referenced data.** Written instructions given to applicants for the completion of assigned skill portions of the practical test standard may include service bulletins; airworthiness directives or other federal aviation regulations; type certificate data sheets or specifications; manufacturer maintenance manuals or other similar approved/ acceptable data necessary for accomplishment of objective testing.

## Reference List

<b>14 CFR part 43</b>	Maintenance, Preventive Maintenance Rebuilding and Alteration
<b>AC 43.13-1</b>	Acceptable Methods, Techniques and Practices—Aircraft Inspection and Repair
<b>AC 65-12</b>	Airframe and Powerplant Mechanics Powerplant Handbook
<b>AC 65-15</b>	Airframe and Powerplant Mechanics Airframe Handbook
<b>AGTP</b>	Aircraft Gas Turbine Powerplants, Jeppesen Sandersen, Inc.
<b>AP</b>	Aircraft Powerplants, Glencoe/ McGraw-Hill Publishing Co.
<b>JSPT</b>	A & P Technician Powerplant Textbook, Jeppesen Sandersen, Inc.

Each subject area has an objective. The objective lists the important knowledge and skill elements that must be utilized by the examiner in planning and administering aviation mechanic tests, and that applicants must be prepared to satisfactorily perform.

EXAMINER is used throughout this standard to denote either the FAA Inspector or FAA Designated Mechanic Examiner (DME) who conducts the practical test.

## Use of the Practical Test Standards

The FAA requires that all practical tests be conducted in accordance with the appropriate Aviation Mechanic Practical Test Standard, and the policies and procedures set forth in the current revision of FAA Order 8610.4. When using the practical test standards, the examiner must evaluate the applicant's knowledge and skill in sufficient depth to determine that the objective for each subject area element selected is met.

An applicant is not permitted to know before testing begins which selections in each subject area are to be included in his/her test (except the core competency elements, which all applicants are required to perform). Therefore, an applicant should be well prepared in *all* oral and skill areas included in the practical test standard.

## Change 1 (8/8/2003)

Further information about the requirements for conducting/taking the practical test is contained in FAA Order 8610.4

### Aviation Mechanic Practical Test Prerequisites

All applicants must have met the prescribed experience requirements as stated in 14 CFR part 65, section 65.77. (See FAA Order 8610.4 for information about testing under the provisions of 14 CFR part 65, section 65.80.)

### Examiner Responsibility

The examiner who conducts the practical test is responsible for determining that the applicant meets acceptable standards of knowledge and skill in the assigned subject areas within the appropriate practical test standard. Since there is no formal division between the knowledge and skill portions of the practical test, this becomes an ongoing process throughout the test.

The following terms may be reviewed with the applicant prior to, or during, element assignment.

1. "Inspect" means to examine by sight and/or touch (with or without inspection enhancing tools/equipment).
2. "Check" means to verify proper operation.
3. "Troubleshoot" means to analyze and identify malfunctions.
4. "Service" means to perform functions that assure continued operation.
5. "Repair" means to correct a defective condition.

### Performance Levels

The following is a detailed description of the meaning of each level.

#### Level 1

- Know basic facts and principles.
- Be able to find information and follow directions and written instructions.
- Locate methods, procedures, instructions, and reference material.
- Interpretation of information not required.
- No skill demonstration is required.

#### Example:

**Z3b.** Locate specified nondestructive testing methods. (Level 1)

## Level 2

Change 1 (8/8/2003)

- Know and understand principles, theories, and concepts.
- Be able to find and interpret maintenance data and information, and perform basic operations using appropriate data, tools, and equipment.
- A high level of skill is not required.

### Example:

**Z3c.** Detect electrical leakage in electrical connections, terminal strips, and cable harness (at least 10 will have leakage faults). (Level 2)

## 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 skill operations to a return-to-service standard using appropriate data, tools, and equipment. Inspections are performed in accordance with acceptable or approved data.
- A fairly high skill level is required.

### Example:

**Z3e.** Check control surface travel. (Level 3)

## Satisfactory Performance

The practical test is passed if the applicant demonstrates the prescribed proficiency in the assigned elements (core competency and other selected elements) in each subject area to the required standard. Applicants shall not be expected to memorize all mathematical formulas that may be required in the performance of various elements in this practical test standard. However, where relevant, applicants must be able to locate and apply necessary formulas to obtain correct solutions.

## Unsatisfactory Performance

If the applicant does not meet the standards of any of the elements performed (knowledge, core competency, or other skill elements), the associated subject area is failed, and thus the practical test is failed. The examiner or the applicant may discontinue testing any time after the failure of a subject area. In any case, the applicant is entitled to credit for only those subject areas satisfactorily completed. See the current revision of FAA Order 8610.4 for further information about retesting and allowable credit for subject areas satisfactorily completed.

Typical areas of unsatisfactory performance and grounds for disqualification include the following.

1. Any action or lack of action by the applicant that requires corrective intervention by the examiner for reasons of safety.
2. Failure to follow acceptable or approved maintenance procedures while performing projects.
3. Exceeding tolerances stated in the maintenance instructions.
4. Failure to recognize improper procedures.
5. The inability to perform to a return to service standard, where applicable.
6. Inadequate knowledge in any of the subject areas.

# SECTION IV—POWERPLANT THEORY AND MAINTENANCE

## A. RECIPROCATING ENGINES

REFERENCES: AC 65-12A; JSPT.

**Objective.** To determine that the applicant:

1. Exhibits knowledge of at least four of the following—
  - a. reciprocating engine theory of operation.
  - b. basic radial engine design, components, and/or operation.
  - c. firing order of a reciprocating engine.
  - d. probable cause and removal of a hydraulic lock.
  - e. valve adjustment on a radial engine.
  - f. purpose of master and/or articulating rods.
  - g. checks necessary to verify proper operation of a reciprocating engine.
  - h. induction system leak indications.
  - i. reciprocating engine maintenance procedures.
  - j. procedures for inspecting various engine components during an overhaul.
  - k. correct installation of piston rings and results of incorrectly installed or worn rings.
  - l. purpose/function/operation of various reciprocating engine components, including, but not limited to, any of the following: crankshaft dynamic dampers, multiple springs for valves, piston rings, and reduction gearing.
2. N/A
3. Demonstrates the ability to perform at least one of the following—
  - a. measure the valve clearance on a reciprocating aircraft engine when the lifters are deflated. (Level 2)
  - b. accomplish a compression test, and note all findings. (Level 3)
  - c. inspect engine control cables and/or push-pull tubes for proper rigging. (Level 3)
  - d. inspect ring gap, install piston rings on a piston, and install an aircraft engine cylinder. (Level 3)
  - e. dimensionally inspect an aircraft engine component. (Level 3)
  - f. replace/install one or more aircraft engine components. (Level 3)

## B. TURBINE ENGINES

REFERENCES: JSPT; AP.

**Objective.** To determine that the applicant:

1. Exhibits knowledge of at least four of the following—
  - a. turbine engine theory of operation.
  - b. checks necessary to verify proper operation.
  - c. turbine engine troubleshooting procedures.
  - d. procedures required after the installation of a turbine engine.
  - e. causes for turbine engine performance loss.
  - f. purpose/function/operation of various turbine engine components.
  - g. turbine engine maintenance procedures.
2. N/A
3. Demonstrates the ability to perform at least one of the following:
  - a. repair a turbine engine compressor blade by blending. (Level 3)
  - b. remove and/or install a turbine engine component. (Level 3)
  - c. determine cycle life remaining between overhaul of a turbine engine life limited component. (Level 2)
  - d. check rigging of a turbine engine inlet guide vane system. (Level 3)
  - e. measure compressor or turbine blade clearance. (Level 3)
  - f. troubleshoot a turbine engine. (Level 3)
  - g. locate and identify turbine engine components. (Level 2)
  - h. inspect turbine engine components. (Level 3)

**NOTE:** T. AUXILIARY POWER UNITS may be tested at the same time as AREA B. No further testing of auxiliary power units is required.

## C. ENGINE INSPECTION

\*Core competency element

REFERENCES: AC 43.13-1B; 14 CFR part 43.

**Objective.** To determine that the applicant:

1. Exhibits knowledge of at least four of the following—
  - a. the use of a type certificate data sheet (TCDS) to identify engine accessories.
  - b. requirements for the installation or modification in accordance with a supplemental type certificate (STC).
  - c. procedures for accomplishing a 100-hour inspection in accordance with the manufacturer's instruction.
  - d. compliance with airworthiness directives.
  - e. changes to an inspection program due to a change or modification required by airworthiness directive or service bulletin.
  - f. determination of life limited parts.
  - g. inspection required after a potentially damaging event, including but not limited to any of the following: sudden stoppage, overspeed, or overtemperature.
2. \*Demonstrates the ability to perform inspection of a reciprocating and/or turbine engine installation in accordance with the manufacturer's instructions. (Level 3)
3. Demonstrates the ability to perform at least one of the following—
  - a. inspect a turbine engine using a bore scope. (Level 3)
  - b. determine proper crankshaft flange run-out. (Level 3)
  - c. inspect an engine in accordance with applicable airworthiness directive. (Level 2)
  - d. inspect a turbine engine compressor section. (Level 3)
  - e. inspect a crankcase for cracks. (Level 3)
  - f. inspect a crankshaft oil seal for leaks. (Level 3)
  - g. engine conformity inspection. (Level 3)
  - h. engine airworthiness inspection. (Level 3)

**D. Reserved**

**E. Reserved**

**F. Reserved**

**G. Reserved**

# SECTION V—POWERPLANT SYSTEMS AND COMPONENTS

## H. ENGINE INSTRUMENT SYSTEMS

\*Core competency element

REFERENCES: AGTP; AC 65-15A.

**Objective.** To determine that the applicant:

1. Exhibits knowledge of at least four of the following—
  - a. troubleshoot a fuel flow and/or low fuel pressure indicating system.
  - b. the operation of a fuel flow indicating system and where it is connected to the engine.
  - c. the operation of a temperature indicating system.
  - d. the operation of a pressure indicating system.
  - e. the operation of an RPM indicating system.
  - f. required checks to verify proper operation of a temperature indicating system.
  - g. required checks to verify proper operation of a pressure indicating system.
  - h. required checks to verify proper operation of an RPM indicating system.
  - i. the operation of a manifold pressure gage and where it actually connects to an engine.
  
2. \*Demonstrates the ability to perform inspection of engine electrical and/or mechanical instrument systems to include at least one of the following (Level 3)—
  - a. temperature.
  - b. pressure.
  - c. RPM.
  - d. rate of flow.
  
3. Demonstrates the ability to perform at least one of the following—
  - a. verify proper operation and marking of an indicating system. (Level 2)
  - b. replace a temperature sending unit. (Level 3)
  - c. remove, inspect, and install fuel flow transmitter. (Level 3)
  - d. troubleshoot an oil pressure indicating system. (Level 3)
  - e. locate and inspect fuel flow components on an engine. (Level 2)
  - f. replace an exhaust gas temperature (EGT) indication probe. (Level 3)

- g. troubleshoot a manifold pressure gage that is slow to indicate the correct reading. (Level 2)

## I. ENGINE FIRE PROTECTION SYSTEMS

REFERENCES: AP; JSPT.

**Objective.** To determine that the applicant:

1. Exhibits knowledge of at least four of the following—
  - a. checks to verify proper operation of an engine fire detection and/or extinguishing system.
  - b. troubleshoots an engine fire detection and/or extinguishing system.
  - c. inspection requirements for an engine fire extinguisher squib and safety practices/precautions.
  - d. components and/or operation of an engine fire detection and/or extinguishing system.
  - e. engine fire detection and/or extinguishing system maintenance procedures.
2. N/A
3. Demonstrates the ability to perform at least one of the following:
  - a. check an engine fire detection and/or extinguishing system for proper operation. (Level 2)
  - b. accomplish weight and pressure inspection of an engine fire bottle, and verify hydrostatic inspection date. (Level 2)
  - c. repair an engine fire detector heat sensing loop malfunction. (Level 3)
  - d. check operation of firewall shut-off valve after a fire handle is pulled. (Level 2)
  - e. troubleshoot an engine fire detection or extinguishing system. (Level 2)
  - f. inspect an engine fire detection or extinguishing system. (Level 2)

## J. ENGINE ELECTRICAL SYSTEMS

REFERENCES: AP; JSPT.

**Objective.** To determine that the applicant:

1. Exhibits knowledge of at least four of the following—
  - a. generator rating and performance data location.
  - b. operation of a turbine engine starter-generator.
  - c. the procedure for locating the correct electrical cable/wire size needed to fabricate a replacement cable/wire.
  - d. installation practices for wires running close to exhaust stacks or heating ducts.
  - e. operation of engine electrical system components.
  - f. types of and/or components of D.C. motors.
  - g. inspection and/or replacement of starter-generator brushes.
  
2. N/A
  
3. Demonstrates the ability to perform at least one of the following—
  - a. flash a generator field. (Level 3)
  - b. install an engine driven generator or alternator. (Level 3)
  - c. use of an engine electrical wiring schematic. (Level 2)
  - d. accomplish the installation of a tach generator. (Level 3)
  - e. fabricate an electrical system cable. (Level 3)
  - f. repair a damaged engine electrical system wire. (Level 3)
  - g. replace and check a current limiter. (Level 3)
  - h. check/service/adjust one or more engine electrical system components.  
(Level 3)
  - i. troubleshoot an engine electrical system component.  
(Level 3)

## K. LUBRICATION SYSTEMS

REFERENCES: JSPT; AP.

**Objective.** To determine that the applicant:

1. Exhibits knowledge of at least four of the following—
  - a. differences between straight mineral oil, ashless-dispersant oil, and synthetic oil.
  - b. types of oil used for different climates.
  - c. functions of an engine oil.
  - d. identification and selection of proper lubricants.
  - e. servicing of the lubrication system.
  - f. the reasons for changing engine lubricating oil at specified intervals.
  - g. the purpose and operation of an oil/air separator.
  - h. reasons for excessive oil consumption without evidence of oil leaks in a reciprocating and/or turbine aircraft engine.
  
2. N/A
  
3. Demonstrates the ability to perform at least one of the following—
  - a. inspect an engine lubrication system to ensure continued operation. (Level 3)
  - b. inspect oil lines and filter/screen for leaks. (Level 3)
  - c. replace a defective oil cooler or oil cooler component. (Level 3)
  - d. replace a gasket or seal in the oil system, and accomplish a leak check. (Level 3)
  - e. adjust oil pressure. (Level 3)
  - f. change engine oil, inspect screen(s) and/or filter, and leak check the engine. (Level 3)
  - g. pre-oil an engine. (Level 2)

## L. IGNITION AND STARTING SYSTEMS

\*Core competency element

REFERENCE: AP.

**Objective.** To determine that the applicant:

1. Exhibits knowledge of at least four of the following—
  - a. troubleshooting a reciprocating and/or turbine engine ignition system.
  - b. replacement of an exciter box and safety concerns if the box is damaged.
  - c. troubleshooting a starter system.
  - d. checking a starter system for proper operation.
  - e. the operation of a pneumatic starting system.
  - f. reasons for the starter dropout function of a starter generator or pneumatic starter.
  - g. the purpose of a shear section in a starter output shaft.
  - h. purpose of checking a p-lead for proper ground.
  - i. inspection and servicing of an igniter and/or spark plug.
  - j. magneto systems, components, and operation.
  - k. function/operation of a magneto switch and p-lead circuit.
  - l. high and low tension ignition systems.
  
2. \*Demonstrates the ability to perform at least one of the following (Level 3)—
  - a. check engine timing.
  - b. check a magneto switch for proper operation.
  - c. inspect a turbine engine ignition system for proper installation.
  - d. inspect a starter/generator for proper installation.
  - e. inspect magneto points.
  
3. Demonstrates the ability to perform at least one of the following—
  - a. install a magneto, and set timing on an aircraft engine. (Level 3)
  - b. repair an engine ignition and/or starter system. (Level 3)
  - c. remove, inspect, and install turbine engine igniter plugs, and perform a functional check of the igniter system. (Level 3)
  - d. inspect generator or starter-generator brushes. (Level 3)
  - e. install brushes in a starter or starter-generator. (Level 3)
  - f. install breaker points in a magneto and internally time the magneto. (Level 3)
  - g. repair an engine direct drive electric starter. (Level 3)

- h. inspect and test an ignition harness with a high tension lead tester. (Level 3)
- i. inspect and/or service and install aircraft spark plugs. (Level 3)
- j. bench test an ignition system component. (Level 2)

## M. FUEL METERING SYSTEMS

REFERENCE: AP.

**Objective.** To determine that the applicant:

1. Exhibits knowledge of at least four of the following—
  - a. troubleshooting an engine that indicates high exhaust gas temperature (EGT) for a particular engine pressure ratio (EPR).
  - b. purpose of an acceleration check after a trim check.
  - c. reasons an engine would require a trim check.
  - d. purpose of the part power stop on some engines when accomplishing engine trim procedure.
  - e. procedure required to adjust (trim) a fuel control unit (FCU).
  - f. possible reasons for fuel running out of a carburetor throttle body.
  - g. indications that would result if the mixture is improperly adjusted.
  - h. procedure for checking idle mixture on a reciprocating engine.
  - i. possible causes for poor engine acceleration, engine backfiring or missing when the throttle is advanced.
  - j. types and operation of various fuel metering systems.
  - k. fuel metering system components.
2. N/A
3. Demonstrates the ability to perform at least one of the following—
  - a. remove and install the accelerating pump in a float-type carburetor. (Level 3)
  - b. check and adjust the float level of a float-type carburetor. (Level 3)
  - c. check the needle and seat in a float-type carburetor for proper operation. (Level 2)
  - d. check a fuel injection nozzle for proper spray pattern, and install a fuel injector nozzle. (Level 2)
  - e. check and adjust idle mixture. (Level 3)
  - f. install a turbine engine fuel nozzle. (Level 3)

- g. locate and identify various fuel metering system components. (Level 2)
- h. service a carburetor fuel screen. (Level 3)

## N. ENGINE FUEL SYSTEMS

### \*Core competency element

REFERENCES: AP; JSPT.

**Objective.** To determine that the applicant:

1. Exhibits knowledge of at least four of the following—
  - a. inspection requirements for an engine fuel system.
  - b. checks of fuel systems to verify proper operation.
  - c. troubleshooting an engine fuel system.
  - d. procedure for inspection of an engine driven fuel pump for leaks and security.
  - e. function and/or operation of one or more types of fuel pumps.
  - f. function and/or operation of one or more types of fuel valves.
  - g. function and/or operation of engine fuel filters.
2. \*Demonstrates the ability to perform at least one of the following (Level 3)—
  - a. check a fuel selector valve for proper operation.
  - b. inspect an engine fuel filter assembly for leaks.
  - c. inspect a repair to an engine fuel system.
3. Demonstrates the ability to perform at least one of the following—
  - a. check a fuel boost pump for proper operation. (Level 3)
  - b. repair fuel selector valve. (Level 3)
  - c. inspect a main fuel filter assembly for leaks. (Level 3)
  - d. check the operation of a remotely located fuel valve. (Level 3)
  - e. locate and identify a turbine engine fuel heater. (Level 2)
  - f. service an engine fuel strainer. (Level 3)
  - g. inspect an engine driven fuel pump for leaks and security, and perform an engine fuel pressure check. (Level 3)
  - h. repair an engine fuel system or system component. (Level 3)
  - i. troubleshoot a fuel pressure system. (Level 3)

## O. INDUCTION AND ENGINE AIRFLOW SYSTEMS

\*Core competency element

REFERENCES: JSPT; AP.

**Objective.** To determine that the applicant:

1. Exhibits knowledge of at least four of the following—
  - a. inspection procedures for engine ice control systems and/or carburetor air intake and induction manifolds.
  - b. operation of an alternate air valve, both automatic and manual heat systems.
  - c. troubleshooting ice control systems.
  - d. explain how a carburetor heat system operates and the procedure to verify proper operation.
  - e. effect(s) on an aircraft engine if the carburetor heat control is improperly adjusted.
  - f. causes and effects of induction system ice.
  - g. function and operation of one or more types of supercharging systems and components.
  
2. \*Demonstrates the ability to perform inspection of engine induction or airflow system to include at least one of the following (Level 3)—
  - a. engine ice control system.
  - b. induction manifolds.
  
3. Demonstrates the ability to perform at least one of the following—
  - a. repair a defective condition in a carburetor heat box. (Level 3)
  - b. check proper operation of an engine anti-ice system. (Level 3)
  - c. rig a carburetor heat box. (Level 3)
  - d. inspect an induction system. (Level 3)
  - e. replace an induction system manifold gasket and/or induction tube. (Level 3)
  - f. service an induction system air filter. (Level 3)
  - g. trouble shoot an engine malfunction resulting from a defective induction or supercharging system. (Level 3)

## P. ENGINE COOLING SYSTEMS

REFERENCES: AC 65-12A; AP.

**Objective.** To determine that the applicant:

1. Exhibits knowledge of at least four of the following—
  - a. required inspection on an engine cooling system.
  - b. operation of cowl flaps, and how cooling is accomplished.
  - c. how turbine engine cooling is accomplished.
  - d. cooling of engine bearings and other parts on turbine engines.
  - e. the importance of proper engine baffle and seal installation.
  - f. the operation of a heat exchanger.
  - g. the function and operation of an augmentor cooling system.
  - h. rotorcraft engine cooling systems.
2. N/A
3. Demonstrate the ability to perform at least one of the following—
  - a. inspect an engine cooling system. (Level 3)
  - b. check cowl flap operation and inspect rigging. (Level 3)
  - c. repair one or more cylinder cooling fins. (Level 3)
  - d. repair an engine pressure baffle plate. (Level 3)
  - e. inspect a heat exchanger. (Level 3)
  - f. troubleshoot an engine cooling system. (Level 3)
  - g. locate and identify rotorcraft cooling system components. (Level 2)

## Q. ENGINE EXHAUST AND REVERSER SYSTEMS

\*Core competency element

REFERENCES: AC 43.13-1B, AC 65-12A; AGTP.

**Objective.** To determine that the applicant:

1. Exhibits knowledge of at least four of the following—
  - a. exhaust leak indications and/or methods of detection.
  - b. thrust reverser system operation and components.
  - c. differences between a cascade and a mechanical blockage door thrust reverser.
  - d. hazards of exhaust system failure.
  - e. effects of using improper materials to mark on exhaust system components.
  - f. function and operation of various exhaust system components.
  
2. \*Demonstrates the ability to perform inspection of engine exhaust system and/or turbocharger system. (Level 3)
  
3. Demonstrates the ability to perform at least one of the following—
  - a. determine if components of an exhaust system are serviceable. (Level 2)
  - b. show the procedures to accomplish a pressurization check of an exhaust system. (Level 2)
  - c. repair one or more exhaust system components. (Level 3)
  - d. check engine exhaust system for proper operation. (Level 3)
  - e. replace one or more exhaust gaskets. (Level 3)
  - f. install an engine exhaust system. (Level 3)
  - g. check a turbocharger and waste gate system for proper operation. (Level 3)
  - h. troubleshoot and/or repair a turbine engine thrust reverser system and/or system component(s). (Level 3)

## R. PROPELLERS

### \*Core competency element

REFERENCES: AP; AC 43.13-1B.

**Objective.** To determine that the applicant:

1. Exhibits knowledge of at least four of the following—
  - a. propeller theory of operation.
  - b. checks necessary to verify proper operation of propeller systems.
  - c. procedures for proper application of propeller lubricants.
  - d. installation or removal of a propeller.
  - e. measurement of blade angle with a propeller protractor.
  - f. repairs classified as major repairs on an aluminum propeller.
  - g. reference data for reducing the diameter of a type certificated propeller.
  - h. operation of propeller system component(s).
  - i. propeller governor components and operation.
  - j. theory and operation of various types of constant speed propellers.
  - k. function and operation of propeller synchronizing systems.
  - l. function and operation of propeller ice control systems.
  
2. \*Demonstrates the ability to perform both of the following—
  - a. inspection of a propeller installation, and make a minor repair on an aluminum propeller. (Level 3)
  - b. determine what minor propeller alterations are acceptable using the appropriate type certificate data sheet. (Level 2)
  
3. Demonstrates the ability to perform at least one of the following—
  - a. service a constant speed propeller with lubricant. (Level 2)
  - b. use a propeller protractor to determine correct blade angle. (Level 3)
  - c. leak check a constant speed propeller installation. (Level 3)
  - d. install a fixed pitch propeller and check the tip tracking. (Level 3)
  - e. inspect a spinner/ bulkhead for defects and proper alignment and installation. (Level 3)
  - f. dye-penetrant inspection to determine the amount of propeller damage. (Level 2)

- g. inspect and/or adjust a propeller governor. (Level 3)
- h. inspect a wood propeller. (Level 3)
- i. troubleshoot a propeller system. (Level 3)

## **S. TURBINE POWERED AUXILIARY POWER UNITS**

REFERENCE: AP.

**Objective.** To determine that the applicant:

1. Exhibits knowledge of at least four of the following:
  - a. inspection to ensure proper operation of turbine driven auxiliary power unit.
  - b. replacement procedure for an igniter plug.
  - c. servicing an auxiliary power unit.
  - d. troubleshooting an auxiliary power unit.
  - e. function and operation of auxiliary power unit(s).

**NOTE:** Subject area T, AUXILIARY POWER UNITS, may be tested at the same time as AREA B, TURBINE ENGINES. No further testing of auxiliary power units is required.