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# Standard Guide for Aerospace/Aviation Powerplant Personnel Certification<sup>1</sup>

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## 1. Scope

1.1 The purpose of this guide is to address the basic fundamental subject knowledge, task performance, and task knowledge activities and functions for power plants professionals.

1.2 *This standard does not purport to address all of the safety concerns, if any, associated with its use. It is the responsibility of the user of this standard to establish appropriate safety, health, and environmental practices and determine the applicability of regulatory limitations prior to use.*

1.3 *This international standard was developed in accordance with internationally recognized principles on standardization established in the Decision on Principles for the Development of International Standards, Guides and Recommendations issued by the World Trade Organization Technical Barriers to Trade (TBT) Committee.*

## 2. Referenced Documents

2.1 *ASTM Standards:*<sup>2</sup>

F3060 Terminology for Aircraft

2.2 *Airlines for America (A4A) Standards:*<sup>3</sup>

ATA-100 Manufacturers' Technical Data

iSpec 2200 Information Standards for Aviation Maintenance

2.3 *FAA Standards:*<sup>4</sup>

AC 43.13-1B Acceptable Methods, Techniques, and Practices – Aircraft Inspection and Repair (with Change 1)

AC 43.13-2B Acceptable Methods, Techniques, and Practices – Aircraft Alterations

FAA-S-ACS-1 rev. Section III Airman Certification Standard (ACS)

<sup>1</sup> This guide is under the jurisdiction of ASTM Committee F46 on Aerospace Personnel and is the direct responsibility of Subcommittee F46.04 on Powerplant Endorsements.

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<sup>2</sup> For referenced ASTM standards, visit the ASTM website, [www.astm.org](http://www.astm.org), or contact ASTM Customer Service at [service@astm.org](mailto:service@astm.org). For *Annual Book of ASTM Standards* volume information, refer to the standard's Document Summary page on the ASTM website.

<sup>3</sup> Available from Airlines for America (A4A), 1275 Pennsylvania Ave NW Ste 1300, Washington, District of Columbia, 20004, <https://www.airlines.org/>.

<sup>4</sup> Available from Federal Aviation Administration (FAA), 800 Independence Ave., SW, Washington, DC 20591, <http://www.faa.gov>.

FAA-H-8083-30 Aviation Maintenance Technician Handbook – General

FAA-H-8083-30 Aviation Maintenance Technician Handbook – Powerplant Volume 1

FAA-H-8083-30 Aviation Maintenance Technician Handbook – Powerplant Volume 2

## 3. Terminology

3.1 See Terminology F3060.

3.2 See Table 1 for task and knowledge definitions relating to the education requirements for powerplants professionals.

## 4. Significance and Use

4.1 The guide is intended to be used to assess competencies of qualified individuals who wish to become certified as a Powerplant Technician through any certified program.

4.2 The guide is intended to be used in concert with a certification provider's structure and materials for management, exam delivery, and candidate preparation.

4.3 Each section is categorized into theory, inspection, maintenance/service, troubleshooting, repair, and overhaul with each of these categories having a relevant competency level assigned (reference Table 1).

## 5. Knowledge and Task Requirements

5.1 The following subject, performance, and task knowledge areas shall be assessed by levels (referenced in Table 1) of competency in the exam items.

5.2 *Reciprocating Engines (ATA 72R):*

5.2.1 *Reciprocating Engine Theory and Operation*—Knows and can identify the relationship of basic facts and state general principles about reciprocating engine theory and operation with respect to theory, inspection, maintenance/service, troubleshooting, repair, and overhaul of the below terms.

5.2.1.1 *Theory*—Level 1 can describe basic theory of operation, mounting, types, configurations, and construction of reciprocating engines (otto cycle, 2 cycle versus 4 cycle, spark versus compression ignition/diesel, opposed, radial, diesel, V, reduction gearbox, accessory gearbox, natural aspiration and induction, intake systems, forced induction, cooling systems, exhaust systems, engine indication, and fire indication/extinguishing).

**TABLE 1**

Level 1	<p>A familiarization with the principal elements of the subject.</p> <p>Objectives:</p> <ul style="list-style-type: none"> <li>The student should be familiar with the basic elements of the subject.</li> <li>The student should be able to give a simple description of the entire subject.</li> <li>The student should be able to locate methods, procedures, instructions, and reference material.</li> <li>The student should be able to use typical terms.</li> <li>No skill demonstration is required under this level.</li> </ul>
Level 2	<p>A general knowledge of the theoretical and practical aspects of the subject and an ability to apply that knowledge in a practical manner.</p> <p>Objectives:</p> <ul style="list-style-type: none"> <li>The student should be able to find and interpret applicable data and information.</li> <li>The student should be able to give a general description of the subject using, as appropriate, typical examples.</li> <li>The student should be able to use mathematical formulae in conjunction with physical laws describing the subject.</li> <li>The student should be able to read and understand sketches, drawings, and schematics describing the subject.</li> <li>A fundamental skill level is required.</li> </ul>
Level 3	<p>A detailed knowledge of theoretical and practical aspects of the subject. To know, understand, and apply facts, principles, theories, and concepts.</p> <p>Objectives:</p> <ul style="list-style-type: none"> <li>The student should be able to give a detailed description of the subject using theoretical fundamentals and specific examples.</li> <li>The student should be able to apply their knowledge in a practical manner using manufacturer's or other acceptable data.</li> <li>The student should be able to interpret results from various sources and measurements and apply corrective action where appropriate.</li> <li>Perform all skill operations to a return-to-service standard using appropriate data, tools, and equipment.</li> <li>The student should be able to perform inspections in accordance with acceptable or approved data.</li> <li>A high level of skill is required.</li> </ul>

5.2.1.2 *Inspection*—Level 1 can describe inspection principles and requirements of reciprocating engines (radial, and reciprocating engine operation and performance). Level 2 can describe inspection principles and requirements of reciprocating engines (reduction gearbox drive, accessory gearbox drive, natural aspiration and forced induction, cooling systems, exhaust systems, engine indication systems, and fire indication and extinguishing systems). Level 3 can describe inspection principles and requirements of reciprocating engines (opposed, diesel, V, engine mounting, and intake systems).

5.2.1.3 *Maintenance/Service*—Level 1 can describe maintenance and servicing requirements and procedures for reciprocating engines (radial, reciprocating engine operation and performance). Level 2 can describe maintenance and servicing requirements and procedures for reciprocating engines (reduction gearbox, accessory gearbox, natural aspiration and forced induction, cooling systems, exhaust systems, engine indication systems, and fire indication and extinguishing systems). Level 3 can describe maintenance and servicing requirements and procedures for reciprocating engines (opposed, diesel, V, engine mounting, and intake systems).

5.2.1.4 *Troubleshooting*—Level 1 can describe concepts and methods of fault isolation and troubleshooting for reciprocating engines (radial). Level 2 can describe concepts and methods of fault isolation and troubleshooting for reciprocating engines (reduction gearbox, accessory gearbox, natural aspiration and forced induction, cooling systems, exhaust systems, engine indication systems, and fire indication and extinguishing systems). Level 3 can describe concepts and methods of fault isolation and troubleshooting for reciprocating engines (opposed, diesel, V, engine mounting, intake systems, and engine performance).

5.2.1.5 *Repair*—Level 1 can describe methods and concepts of repair of reciprocating engines and components (radial). Level 2 can describe methods and concepts of repair of reciprocating engines and components (reduction gearbox, accessory gearbox, natural aspiration and forced induction, cooling systems, exhaust systems, engine indication systems,

and fire indication and extinguishing systems). Level 3 can describe methods and concepts of repair of reciprocating engines and components (opposed, diesel, V, engine mounting, intake systems, and engine performance).

5.2.1.6 *Overhaul*—Level 1 can describe methods and concepts for overhaul of reciprocating engines and components (radial). Level 2 can describe methods and concepts for overhaul of reciprocating engines and components (opposed, diesel, V, reduction gearbox, accessory gearbox, engine mounting, natural aspiration and forced induction, intake systems, cooling systems, exhaust systems, engine indication systems, and fire indication and extinguishing systems). Level 3 can describe methods and concepts for overhaul of reciprocating engines and components (engine performance).

5.2.2 *Reciprocating Engine Fuel and Control*—Knows and can identify the relationship of basic facts and state general principles about Reciprocating Engine Fuel and Control with respect to theory, inspection, maintenance/service, troubleshooting, and overhaul of the below terms.

5.2.2.1 *Theory*—Level 1 can describe basic theory of operation, mounting, rigging and adjustment, types, configurations, and construction of reciprocating engine fuel and control (fuel supply, carburetors, intake icing, cable engine controls, continuous flow fuel injection, atmospheric pressure effects, engine electronic controls, redundant power, indicating systems, engine communication systems, and component inputs and outputs).

5.2.2.2 *Inspection*—Level 2 can describe inspection principles and requirements of reciprocating engine fuel and control (engine fuel systems, carburetors, cable engine controls, continuous flow fuel injection, fuel supply, engine electronic controls, redundant power, component inputs and outputs, indicating systems, and engine communication systems).

5.2.2.3 *Maintenance/Service*—Level 2 can describe maintenance and servicing requirements and procedure for reciprocating engine fuel and control (airframe fuel supply, carburetors, cable engine controls, continuous flow fuel

injection, reciprocating engine electronic controls, redundant power, component inputs and outputs, indicating systems, and engine communication systems). Level 3 can describe maintenance and servicing requirements and procedure for reciprocating engine fuel and control (adjustment/rigging of carburetors, intake icing, and engine performance).

5.2.2.4 *Troubleshooting*—Level 2 can describe concepts and methods of fault isolation and troubleshooting for reciprocating engine fuel and control (carburetors, cable engine controls, continuous flow fuel injection, airframe fuel supply, atmospheric pressure effects, reciprocating engine electronic controls, redundant power, component inputs and outputs, indicating systems communication, and engine communication systems). Level 3 can describe concepts and methods of fault isolation and troubleshooting for reciprocating engine fuel and control (airframe fuel supply, carburetors, engine performance, and intake icing).

5.2.2.5 *Repair*—Level 2 can describe methods and concepts of repair of reciprocating engine fuel and control (carburetors, cable engine controls, continuous flow fuel injection, airframe fuel supply, atmospheric pressure effects, reciprocating engine electronic controls, redundant power, component inputs and outputs, indicating systems communication, and engine communications). Level 3 can describe methods and concepts of repair of reciprocating engine fuel and control (airframe fuel supply, carburetors, engine performance, and intake icing).

5.2.2.6 *Overhaul*—Level 1 can describe methods and concepts for overhaul of reciprocating engine fuel and control (engine electronic controls, redundant power, component inputs and outputs, indicating systems communications, and engine communications). Level 3 can describe methods and concepts for overhaul of reciprocating engine fuel and control (carburetors and engine performance).

5.2.3 *Reciprocating Engine Lubrication*—Knows and can identify the relationship of basic facts and state general principles about reciprocating engine lubrication with respect to theory, inspection, maintenance/service, troubleshooting, and overhaul of the below terms.

5.2.3.1 *Theory*—Level 1 can describe basic theory of operation, types, construction, adjustments, troubleshooting, and configurations of engine lubrication systems (types and uses of oils, wet and dry sump, cooling, filter types and media, and indicating systems).

5.2.3.2 *Inspection*—Level 1 can describe inspection principles and requirements of engine lubrication systems (inspecting filter media and use of sampling). Level 2 can describe inspection principles and requirements of engine lubrication systems (reciprocating engine lubrication systems, types and uses of oils, wet and dry sump, cooling, filter types and media, adjustments and effects, and indicating systems).

5.2.3.3 *Maintenance/Service*—Level 1 can describe maintenance and servicing requirements and procedures for engine lubrication systems (use of sampling). Level 2 can describe maintenance and servicing requirements and procedures for engine lubrication systems (reciprocating engine lubrication systems, types and uses of oils, wet and dry sump, cooling, filter types and media, adjustments and effects, and indicating systems).

5.2.3.4 *Troubleshooting*—Level 1 can describe concepts and methods of fault isolation and troubleshooting for engine lubrication systems (use of sampling). Level 2 can describe concepts and methods of fault isolation and troubleshooting for engine lubrication systems (reciprocating engine lubrication systems, types and uses of oils, wet and dry sump, cooling, filter types and media, adjustments and effects, and indicating systems).

5.2.3.5 *Repair*—Level 1 can describe methods and concepts of repair of engine lubrication systems (use of sampling). Level 2 can describe methods and concepts of repair of engine lubrication systems (reciprocating engine lubrication systems, types and uses of oils, wet and dry sump, cooling, filter types and media, adjustments and effects, and indicating systems).

5.2.3.6 *Overhaul*—Level 1 can describe methods and concepts for overhaul of engine lubrication systems (reciprocating engine lubrication systems, types and uses of oils, wet and dry sump, cooling, filter types and media, inspecting filter media, adjustments and effects, use of sampling, and indicating systems).

5.2.4 *Reciprocating Engine Electrical*—Knows and can identify the relationship of basic facts and state general principles about reciprocating engine electrical with respect to theory, inspection, maintenance/service, troubleshooting, and overhaul of the below terms.

5.2.4.1 *Theory*—Level 1 can describe basic theory of operation, mounting, rigging and adjustment, types, configurations, and construction of reciprocating engine electrical systems (reciprocating engine charging systems, reciprocating engine starting systems, and engine wire harness).

5.2.4.2 *Inspection*—Level 2 can describe inspection principles and requirements of reciprocating engine electrical systems (reciprocating engine charging systems, reciprocating engine starting systems, and engine wire harnesses). Level 3 can describe inspection principles and requirements of reciprocating engine electrical systems (reciprocating engine charging systems).

5.2.4.3 *Maintenance/Service*—Level 2 can describe maintenance and servicing requirements and procedure for reciprocating engine electrical systems (reciprocating engine charging systems).

5.2.4.4 *Troubleshooting*—Level 2 can describe concepts and methods of fault isolation and troubleshooting for reciprocating engine electrical systems (reciprocating engine charging systems, reciprocating engine starting systems, and engine wire harnesses). Level 3 can describe concepts and methods of fault isolation and troubleshooting for reciprocating engine electrical systems (reciprocating engine charging systems).

5.2.4.5 *Repair*—Level 2 can describe methods and concepts of repair of engine electrical systems (reciprocating engine charging systems, reciprocating engine starting systems, and engine wire harnesses). Level 3 can describe methods and concepts of repair of engine electrical systems (reciprocating engine charging systems).

5.2.4.6 *Overhaul*—Level 1 can describe methods and concepts for overhaul of engine electrical systems (reciprocating engine charging systems, reciprocating engine starting systems, engine wire harnesses, and reciprocating engine charging systems).

5.2.5 *Reciprocating Engine Ignition*—Knows and can identify the relationship of basic facts and state general principles about reciprocating engine ignition with respect to theory, inspection, maintenance/service, troubleshooting, and overhaul of the below terms.

5.2.5.1 *Theory*—Level 1 can describe basic theory of operation, mounting, rigging and adjustment, types, configurations, and construction of reciprocating engine ignition (magneto operation, magneto maintenance and adjustment, spark plugs, impulse coupling or shower of sparks, and electronic ignition systems).

5.2.5.2 *Inspection*—Level 2 can describe inspection principles and requirements of reciprocating engine ignition (spark plugs, impulse coupling or shower of sparks, and electronic ignition systems).

5.2.5.3 *Maintenance/Service*—Level 2 can describe maintenance and servicing requirements and procedures for reciprocating engine ignition systems (magneto operation, magneto maintenance and adjustment, spark plugs, impulse coupling or shower of sparks, and electronic ignition systems).

5.2.5.4 *Troubleshooting*—Level 2 can describe concepts and methods of fault isolation and troubleshooting for reciprocating engine ignition systems (magneto operation, magneto maintenance and adjustment, spark plugs, impulse coupling or shower of sparks, and electronic ignition systems).

5.2.5.5 *Repair*—Level 2 can describe methods and concepts of repair of reciprocating engine ignition systems (magneto operation, magneto maintenance and adjustment, spark plugs, impulse coupling or shower of sparks, and electronic ignition systems).

5.2.5.6 *Overhaul*—Level 1 can describe methods and concepts for overhaul of reciprocating engine ignition systems (magneto operation, magneto maintenance and adjustment, spark plugs, impulse coupling or shower of sparks, and electronic ignition).

### 5.3 *Turbine Engine (ATA 72T):*

5.3.1 *Turbine Engine Theory and Operation*—Knows and can identify the relationship of basic facts and state general principles about turbine engine theory and operation with respect to theory, inspection, maintenance/service, troubleshooting, and overhaul of the below terms.

5.3.1.1 *Theory*—Level 1 can describe basic theory of operation, mounting, rigging and adjustment, types, configurations, and construction of turbine engine theory and operation (turbojet, turbofan, turboprop, turboshaft, APU, inlet configuration, turbine engine ice and rain protection, compressor section, compressor types, surge and surge controls, sources and airframe uses of bleed air, engine use of air for cooling and sealing, diffuser section, combustion section, types of combustors, turbine section, multi-stage turbines, free and direct drive turbines, active tip clearance, turbine engine exhaust systems, regeneration/afterburning, accessory gearbox and drive, turbine engine indicating systems, turbine engine

fire indicating and extinguishing systems, inspection principles of turbine engines, performance of turbine engines, and rotorcraft power theory, configuration, and differences).

5.3.1.2 *Inspection*—Level 1 can describe inspection principles and requirements of turbine engines (turbojet). Level 2 can describe inspection principles and requirements of turbine engines (turbofan, turboprop, turboshaft, APU, inlet configuration, turbine engine ice and rain protection, compressor section, compressor types, surge and surge controls, sources and airframe uses of bleed air, engine use of air for cooling and sealing, diffuser section, combustion section, types of combustors, turbine section, multi-stage turbines, free and direct drive turbines, active tip clearance, turbine engine exhaust systems, regeneration/afterburning, accessory gearbox and drive, turbine engine indicating systems, turbine engine fire indicating and extinguishing systems, inspection principles of turbine engines, performance of turbine engines, and rotorcraft power theory, configuration, and differences).

5.3.1.3 *Maintenance/Service*—Level 1 can describe maintenance and servicing requirements and procedure for turbine engines (turbojet). Level 3 can describe maintenance and servicing requirements and procedure for turbine engines (turbojet, turbofan, turboprop, turboshaft, APU, inlet configuration, turbine engine ice and rain protection, compressor section, compressor types, surge and surge controls, sources and airframe uses of bleed air, engine use of air for cooling and sealing, diffuser section, combustion section, types of combustors, turbine section, multi-stage turbines, free and direct drive turbines, active tip clearance, turbine engine exhaust systems, regeneration/afterburning, accessory gearbox and drive, turbine engine indicating systems, turbine engine fire indicating and extinguishing systems, inspection principles of turbine engines, performance of turbine engines, and rotorcraft power theory, configuration, and differences).

5.3.1.4 *Troubleshooting*—Level 1 can describe concepts and methods of fault isolation and troubleshooting for turbine engines (turbojet). Level 3 can describe concepts and methods of fault isolation and troubleshooting for turbine engines (turbojet, turbofan, turboprop, turboshaft, APU, inlet configuration, turbine engine ice and rain protection, compressor section, compressor types, surge and surge controls, sources and airframe uses of bleed air, engine use of air for cooling and sealing, diffuser section, combustion section, types of combustors, turbine section, multi-stage turbines, free and direct drive turbines, active tip clearance, turbine engine exhaust systems, regeneration/afterburning, accessory gearbox and drive, turbine engine indicating systems, turbine engine fire indicating and extinguishing systems, inspection principles of turbine engines, performance of turbine engines, and rotorcraft power theory, configuration, and differences).

5.3.1.5 *Repair*—Level 1 can describe methods and concepts of repair of turbine engines (turbojet). Level 2 can describe methods and concepts of repair of reciprocating engine fuel and control (turbojet, turbofan, turboprop, turboshaft, APU, inlet configuration, turbine engine ice and rain protection, compressor section, compressor types, surge and surge controls, sources and airframe uses of bleed air, engine use of air for cooling and sealing, diffuser section, combustion