

COMPETENCY-BASED OCCUPATIONAL FRAMEWORK FOR REGISTERED APPRENTICESHIP

Airframe and Powerplant Mechanic

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The nonprofit Urban Institute is dedicated to elevating the debate on social and economic policy. For nearly five decades, Urban scholars have conducted research and offered evidence-based solutions that improve lives and strengthen communities across a rapidly urbanizing world. Their objective research helps expand opportunities for all, reduce hardship among the most vulnerable, and strengthen the effectiveness of the public sector.

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Competency-Based Occupational Frameworks

The Urban Institute, under contract with the US Department of Labor, has worked with employers, subject matter experts, labor unions, trade associations, credentialing organizations, and academics to develop Competency-Based Occupational Frameworks (CBOFs) for Registered Apprenticeship programs. These frameworks define the **purpose** of an occupation, the **job functions** that are carried out to fulfill that purpose, the **competencies** that enable the apprentice to execute those job functions well, and the **performance criteria** that define the specific knowledge, skills, and personal attributes associated with high performance in the workplace. This organizational hierarchy—job purpose, job functions, competencies, performance criteria—is designed to illustrate that performing work well requires more than just acquiring discrete knowledge elements or developing a series of manual skills. To perform a job well, the employee must be able to assimilate knowledge and skills learned in various settings, recall and apply that information to the present situation, and carry out work activities using sound professional judgment, demonstrating an appropriate attitude or disposition and achieving a level of speed and accuracy necessary to meet the employer’s business need.

The table below compares the terminology of Functional Analysis with that of traditional Occupational Task Analysis to illustrate the important similarities and differences. While both identify the key technical elements of an occupation, functional analysis includes the identification of behaviors, attributes, and characteristics of workers necessary to meet an employer’s expectations.

Framework Terminology	Traditional Task Analysis Terminology
Job Function: the work activities that are carried out to fulfill the job purpose	Job Duties: roles and responsibilities associated with an occupation
Competency: the actions an individual takes and the attitudes he/she displays to complete those activities	Task: a unit of work or set of activities needed to produce some result
Performance Criteria: the specific knowledge, skills, dispositions, attributes, speed, and accuracy associated with meeting the employer’s expectations	Subtask: the independent actions taken to perform a unit of work or activity

Although designed for use in competency-based apprenticeship, these Competency-Based Occupational Frameworks also support time-based apprenticeship by defining more clearly and precisely what an apprentice is expected to learn and do during the allocated time period.

CBOFs are comprehensive to encompass the full range of jobs that may be performed by individuals in the same occupation. As employers or sponsors develop their individual apprenticeship programs, they can extract from or add to the framework to meet their unique organizational needs.

Components of the Competency-Based Occupational Framework

Occupational Overview: This section of the framework provides a description of the occupation including its purpose, the setting in which the job is performed, and unique features of the occupation.

Work Process Schedule: This section includes the job functions and competencies that would likely be included in an apprenticeship sponsor's application for registration. These frameworks provide a point of reference that has already been vetted by industry leaders so sponsors can develop new programs knowing that they will meet or exceed the consensus expectations of peers. Sponsors maintain the ability to customize their programs to meet their unique needs, but omission of a significant number of job functions or competencies should raise questions about whether or not the program has correctly identified the occupation of interest.

Cross-Cutting Competencies: These competencies are common among all workers and focus on the underlying knowledge, attitudes, personal attributes, and interpersonal skills that are important regardless of the occupation. That said, while these competencies are important to all occupations, the relative importance of some versus others may change from one occupation to the next. These relative differences are illustrated in this part of the CBOF and can be used to design preapprenticeship programs or design effective screening tools when recruiting apprentices to the program.

Detailed Job Function Analysis: This portion of the framework includes considerable detail and is designed to support curriculum designers and trainers in developing and administering the program. The detail in this section may be confusing to those seeking a more succinct, higher-level view of the program. For this reason, we recommend that the Work Process Schedule be the focus of program planning activities, leaving the detailed job function analysis sections to instructional designers as they engage in their development work.

- a. **Related Technical Instruction:** Under each job function appears a list of foundational knowledge, skills, tools, and technologies that would likely be taught in the classroom to enable the apprentice's on-the-job training safety and success.
- b. **Performance Criteria:** Under each competency, we provide recommended performance criteria that could be used to differentiate between minimally, moderately, and highly competent apprentices. These performance criteria are generally skills based rather than knowledge based, but may also include dispositional and behavioral competencies.

Using the Competency-Based Occupational Framework to Develop a Registered Apprenticeship Program

When developing a registered apprenticeship program, the Work Process Schedule included in this CBOF provides an overview of the job functions and competencies an expert peer group deemed to be important to this occupation. The Work Process Schedule in this document can be used directly, or modified and used to describe your program content and design as part of your registration application.

When designing the curriculum to support the apprenticeship program—including on-the-job training and related technical instruction—the information the Detailed Job Functions section could be helpful. These more detailed job function documents include recommendations for the key knowledge and skills that might be included in the classroom instruction designed to support a given job function, and the performance criteria provided under each competency could be helpful to trainers and mentors in evaluating apprentice performance and insuring inter-rater reliability when multiple mentors are involved.

Airframe and Powerplant Mechanic Occupational Overview

Occupational Purpose and Context

Airframe and Power Plant apprentices diagnose, adjust, repair, or overhaul aircraft engines and assemblies, such as hydraulic, pneumatic, and electrical systems. They use hand and power tools and testing equipment to troubleshoot, repair, and maintain all parts of aircraft and powerplant systems. (Excludes “Avionics Technicians” 49-2091)

Potential Job Titles

Airframe and Powerplant Mechanic (A and P Mechanic), Aircraft Maintenance Director, Aircraft Maintenance Supervisor, Aircraft Maintenance Technician (Aircraft Maintenance Tech), Airframe Mechanic, Aircraft Restorer, Aircraft Technician, Aviation Maintenance Technician (AMT), Aviation Mechanic, Aircraft Engine Mechanic, Maintenance Planner, Structural Mechanic, Mechanical Engineer, Quality Control Inspector, Quality Engineer, Maintenance Programs Engineer, Tooling Engineer, Non-Destructive Testing Supervisor, and Project Engineer.

Attitudes and Behaviors

Airframe and Power Plant apprentices should have well developed critical thinking skills to solve problems quickly, be able to identify errors or inconsistencies, be able to stay focused and observe the work process despite distractions, be able to combine pieces of information to form general rules or conclusions which they should communicate clearly, and be able to arrange objects or actions in an order or pattern related to a specific rule or set of rules. Technicians must have a basic understanding of federal regulations like Federal Aviation Regulations (FARs), Airworthiness Directives (ADs) and CFR (Code of Federal Regulations) and understand basic manufacturer instructions like the Aircraft Maintenance Manual (AMM), Component Maintenance Manual (CMM), and Service Bulletins (SBs)

Technicians must be able to read, interpret, and follow instructions and procedures specified in manuals and technical documents. They must be able to follow procedures and regulations to maintain constancy when it comes to maintenance practices. Technicians must be detail oriented, dependable, analytical, persistent, and open to received feedback. They should demonstrate both independence and team-oriented

behavior. They must also be ethical, composed, and care for others, and must have a high level of integrity in the interest of safety. They must also demonstrate respect for authority of regulations.

Apprenticeship Prerequisites

A high school diploma, associate degree, or a postsecondary certificate is generally required. Or technical school certificate or repairmen experience with on the job training signed off by management.

Occupational Pathways

n/a

Certifications, Licensure, and Other Credential Requirements

Credential	Offered by	Before, During, or After Apprenticeship
Aerospace/Aircraft Assembly Maintenance Certification	National Center for Aerospace and Transportation Technologies	During or after
Airframe Rating Certificate	FAA	During
Powerplant Rating Certificate	FAA	During

Job Functions

Job Functions	Core or Optional
1. Conducts extensive work on aircraft interior (systems) and exterior (sheet metal and composite aircrafts)	Core
2. Capably constructs aircraft covering and finishes (sheet metal and composite aircrafts)	Core
3. Rebuilds or replaces airframe or its components	Core
4. Uses information to repair and replace engine equipment	Core
5. Examines powerplants for problems	Core
6. Tests aircraft or engine systems using test equipment	Core
7. Removes engine from aircraft and makes repairs	Core
8. Adjusts, repairs, electrical wiring, accessories and instruments	Core
9. Inspects, services, repairs pneumatic, hydraulic, or electrical systems	Core
10. Performs computerized systems maintenance	Core
11. Performs miscellaneous service duties	Core

Stackable Programs

This occupational framework is designed to link to the following additional framework(s) as part of a career laddering pathway.

Stackable Programs	Base or Higher Level	Stacks on Top of
1. n/a		

Options and Specializations

The following options and specializations have been identified for this occupation. The Work Process Schedule and individual job function outlines indicate which job functions and competencies were deemed by industry advisors to be optional. Work Process Schedules for Specializations are included at the end of this document.

Options and Specializations	Option	Specialization
n/a		

Levels

Industry advisors have indicated that individuals in this occupation may function at different levels, based on the nature of their work, the amount of time spent in an apprenticeship, the level of skills or knowledge mastery, and the degree of independence in performing the job or supervisory/management responsibilities.

Level	Distinguishing Features	Added Competencies	Added Time Requirements
n/a			

Work Process Schedule

WORK PROCESS SCHEDULE		ONET Code: 49-3011.00
Airframe and Powerplant Mechanic		RAPIDS Code: 0005R
Job Title: Airframe and Powerplant Mechanic		
Level:	Specialization:	
Stackable Program: __Yes __No		
Base Occupation Name: Airframe and Powerplant		
Company Contact:		
Address:	Phone:	Email:
Apprenticeship Type: <input checked="" type="checkbox"/> Competency Based <input type="checkbox"/> Time Based <input type="checkbox"/> Hybrid	Prerequisites: A high school diploma, associate degree, or a postsecondary certificate.	

Job Function 1: Conducts extensive work on aircraft interior (systems) and exterior (sheet metal and composite aircrafts)			
Competencies	Core or Optional	RTI	OJT
A. Repairs or replaces and assembles wings	Core		
B. Repairs or replaces fuselage and empennage assembly	Core		
C. Repairs or replaces and assembles landing gear	Core		
D. Repairs or replaces and assembles control cables	Core		
E. Repairs or replaces and assembles engine/propeller exterior	Optional		
F. Repairs or replaces and assembles fuel systems and batteries	Core		

Job Function 2: Capably constructs aircraft covering and finishes (sheet metal and composite aircrafts)			
Competencies	Core or Optional	RTI	OJT
A. Uses tools such as power shears, sheet metal brakes, and welders to construct coverings	Core		

B. Uses acetylene welding equipment, rivet gun, air and electric drills to construct finishes	Core		
C. Knows composite layup design, application and inspection	Core		
D. Understands repair patch theory, design, and construction, identifying corrosion and heat treatment application	Core		

Job Function 3: Rebuilds or replaces airframe or its components

Competencies	Core or Optional	RTI	OJT
A. Replaces aircraft landing gear systems	Core		
B. Installs hydraulic, pneumatic, or electrical systems	Core		
C. Replaces cabin atmosphere control systems	Core		

Job Function 4: Uses information to repair and replace engine equipment

Competencies	Core or Optional	RTI	OJT
A. Checks manuals for specifications needed to repair and replace reciprocating engines	Core		
B. Repairs and replaces turbine engines or electrical engines based on specifications outlined in manuals	Core		
C. Inspects the engine and checks manual for need to repair and replace equipment	Core		
D. Replaces worn or damaged fuel injectors, alternators, carburetors, superchargers, magnetos, etc. using hand tools, gages, testing equipment	Core		

Job Function 5: Examines powerplants for problems

Competencies	Core or Optional	RTI	OJT
A. Examines engine systems for cracked cylinders, oil leaks, sticking or burnt valves	Core		
B. Examines Instrument Systems, Fire Protection Systems, and Electrical Systems to determine need for repairs	Core		
C. Inspects turbine blades to detect cracks or breaks	Core		
D. Inspects fuel line and fuel injector	Core		

Job Function 6: Tests aircraft or engine systems using test equipment			
Competencies	Core or Optional	RTI	OJT
A. Uses and Ignition Analyzer to check engine functions	Core		
B. Uses compression checker to check engine	Core		
C. Uses distributor timer to ensure proper	Core		
D. Uses ammeter	Core		

Job Function 7: Removes engine from aircraft and makes repairs			
Competencies	Core or Optional	RTI	OJT
A. Performs operational check	Core		
B. Troubleshoots system	Core		
C. Removes engine from aircraft	Core		
D. Disassembles and inspects parts for wear, warping, or other defects	Core		
E. Makes repairs where necessary	Core		
F. Replaces defective parts	Core		
G. Reassembles and installs engine in aircraft	Core		
H. Uses nondestructive testing to identify internal component damage	Core		

Job Function 8: Adjusts, repairs, electrical wiring, accessories, and instruments			
Competencies	Core or Optional	RTI	OJT
A. Connects power and digital input/output wiring	Core		
B. Selects and appropriately connects sinking and sourcing inputs and outputs	Core		
C. Configures and connects a programming device to upload, download, and save a program	Core		
D. Changes preset timer and counter values and applies and removes forces from a program	Core		
E. Troubleshoots a machine or process by observing indicator lights and reviewing the software ladder diagram (relays, timers, and counters)	Core		
F. Adds a function to a machine or process that requires wiring of additional I/O and basic ladder logic programming	Core		
G. Troubleshoots by observing input and output conditions and monitoring the program in real time	Core		
H. Applies proper grounding techniques and identifies sources of electrical system opens and shorts	Core		

I. Properly installs and terminates wiring for low level analog signals	Core		
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Job Function 9: Inspects, services, repairs pneumatic and hydraulic systems or electrical system

Competencies	Core or Optional	RTI	OJT
A. Locates a machine according to a print	Core		
B. Levels a machine (noncritical machines +/- 1/8")	Optional		
C. Verifies circuit size and protection	Core		
D. Verifies proper voltage and phasing, grounding, and proper guards are in place	Core		
E. Installs proper mounts and raceways for adding a component (such as a sensor) or interlocking a machine	Core		
F. Properly sizes, installs, labels, and tests circuit conductors for adding a component or interlocking a machine	Core		
G. Properly lays out, cuts, drills, taps, and assembles a control station for an addition to a machine	Optional		
H. Connects compressed air to a machine from a supply header and verifies proper air pressures and volumes for a machine	Core		
I. Adds pneumatic or hydraulic components and lines to a machine	Core		
J. Fabricates hydraulic lines	Core		
K. Aligns and adjusts shafts, motors, belts, and chains on a machine	Core		
L. Verifies proper operation of all safety devices and circuits on a machine and checks and verifies circuits on a machine	Core		
M. Checks, lubricates, and powers up a machine	Core		
N. Verifies proper current draw of a machine and machine operation according to a sequence of operation	Core		

Job Function 10: Performs computerized systems maintenance

Competencies	Core or Optional	RTI	OJT
A. Inspects, repairs, and maintains computerized aircraft systems	Core		
B. Performs data downloads and software reloads	Core		

Job Function 11: Performs miscellaneous service duties			
Competencies	Core or Optional	RTI	OJT
A. Flushes crankcase cleaning screens	Core		
B. Greases parts to ensure proper usage next time	Core		
C. Checks brakes for any issues	Core		

Related Technical Instruction Plan

COURSE NAME	Course Number
	Hours
LEARNING OBJECTIVES	

COURSE NAME	Course Number
	Hours
LEARNING OBJECTIVES	

COURSE NAME	Course Number
	Hours
LEARNING OBJECTIVES	

COURSE NAME	Course Number
	Hours
LEARNING OBJECTIVES	

Cross-Cutting Competencies

COMPETENCY**		0	1	2	3	4	5	6	7	8
Personal Effectiveness	Interpersonal Skills									
	Integrity									
	Professionalism									
	Initiative									
	Dependability and Reliability									
	Adaptability and Flexibility									
	Lifelong Learning									
Academic	Reading									
	Writing									
	Mathematics									
	Science and Technology									
	Communication									
	Critical and Analytical Thinking									
	Basic Computer Skills									
Workplace	Teamwork									
	Customer Focus									
	Planning and Organization									
	Creative Thinking									
	Problem Solving and Decision Making									
	Working with Tools and Technology									
	Checking, Examining, and Recording									
	Business Fundamentals									
	Sustainable									
	Health and Safety									

** The names of the cross-cutting competencies come from the US Department of Labor’s Competency Model Clearinghouse, and definitions for each can be viewed at “Building Blocks Model,” DOL Competency Model Clearinghouse, accessed September 1, 2020,

<https://www.careeronestop.org/CompetencyModel/competency-models/building-blocks-model.aspx>.

Cross-cutting competencies identify transferable skills—sometimes called “soft skills” or “employability skills”—that are important for workplace success, regardless of a person’s occupation. Still, the relative importance of specific cross-cutting competencies differs from occupation to occupation. The cross-cutting competencies table, above, provides information about which of these competencies is most important to be successful in a particular occupation. This information can be useful to employers or intermediaries in screening and selecting candidates for apprenticeship programs, or to preapprenticeship providers who seek to prepare individuals for successful entry into an apprenticeship program.

The scoring system utilized to evaluate competency levels required in each cross-cutting skill aligns with the recommendations of the Lumina Foundation’s Connecting Credentials Framework. The framework can be found at “Connecting Credentials: A Beta Credentials Framework,” Lumina Foundation, accessed September 1, 2020, <http://connectingcredentials.org/wp-content/uploads/2015/05/ConnectingCredentials-4-29-30.pdf>.

Detailed Job Functions

Job Function 1: Conducts extensive work on aircraft interior (systems) and exterior (sheet metal and composite aircrafts)

Related Technical Instruction		
KNOWLEDGE	SKILLS	TOOLS and TECHNOLOGIES
<ul style="list-style-type: none"> • OSHA safety requirements • NIOSH safety requirements • EPA safety regulations • Common industrial hazards and effective mitigation strategies • Functions and specifications of equipment • Types of common equipment malfunctions • Total preventive maintenance techniques - predictive and preventive maintenance techniques • Aircraft Hardware and Precision Measuring Instruments • Fuel dump systems • Fuel management transfer, and defueling 	<ul style="list-style-type: none"> • Job safety analysis • Troubleshoot using inductive and deductive reasoning • Inspect, check, service, and repair landing gear, retraction systems, shock struts, brakes, wheels, tires, and steering systems. • Defueling • Inspect, check, service, troubleshoot, and repair aircraft fuel systems. • Create predictive and preventive maintenance plan • Follows Standard Operating Procedures (SOP) for task at hand 	<ul style="list-style-type: none"> • Repairs shock struts • Retraction systems • Landing gear • Brakes • Wheels • Tires • Steering systems • Fixed-pitch, constant-speed, and feathering propellers • Propeller governing systems

Competency A: Repairs or replaces and assembles wings	Core or Optional
PERFORMANCE CRITERIA	
1. Conducts review of wings to find malfunctions	Core
2. Properly repairs issues per industry standards	Core

Competency B: Repairs or replaces fuselage and empennage assembly	Core or Optional
PERFORMANCE CRITERIA	
1. Inspects, checks, troubleshoots, services and repairs oxygen systems	Core
2. Reviews fuselage and empennage for malfunctions and problems	Core
3. Properly repairs any issues per industry standards	Core

Competency C: Repairs or replaces and assembles landing gear	Core or Optional
PERFORMANCE CRITERIA	
1. Inspects, services, and repairs landing gear, brakes, wheels, tires, and steering systems	Core
2. Inspects, services, and repairs retraction systems	Core
3. Inspects, services, and repairs shock struts	Core

Competency D: Repairs or replaces and assembles control cables	Core or Optional
PERFORMANCE CRITERIA	
1. Conducts sitewide examination of control cables	Core
2. Properly identifies issues and malfunctions in cables	Core
3. Repairs control cables per industry standards	Core

Competency E: Repairs or replaces and assembles engine/propeller exterior	Core or Optional
PERFORMANCE CRITERIA	
1. Inspects, checks, troubleshoots, services, and repairs engine exhaust systems	Optional
2. Inspects, checks, services, and repairs fixed-pitch, constant-speed, and feathering propellers, and propeller governing systems	Optional
3. Repairs propeller control system components	Optional

Competency F: Repairs or replaces and assembles fuel systems and batteries	Core or Optional
PERFORMANCE CRITERIA	
1. Conducts review of fuel systems to find malfunctions	Core
2. Properly repairs issues with fuel systems per industry standards	Core
3. Inspect, check, service, and troubleshoot turbine-driven auxiliary power units	Core

Job Function 2: Capably constructs aircraft covering and finishes (sheet metal and composite aircrafts)

Related Technical Instruction		
KNOWLEDGE	SKILLS	TOOLS and TECHNOLOGIES
<ul style="list-style-type: none"> Aircraft finishes, fabric, and fiberglass coverings Sheet metal structures, Assembly and repair Aircraft welding 	<ul style="list-style-type: none"> Safely use hand and power tools Apply finishing materials Inspect finishes and identify defects 	<ul style="list-style-type: none"> Power shears Sheet metal brakes Welding torch Personal protective equipment (PPE) Rivet gun Air drills Electric drills

Competency A: Uses tools such as power shears, sheet metal brakes, and welders to construct coverings	Core or Optional
PERFORMANCE CRITERIA	
1. Follows proper safety procedures for using all tools	Core
2. Wears proper PPE while operating power tools	Core
3. Properly selects and applies fabric and fiberglass covering materials	Core
4. Inspects, test, and repairs fabric and fiberglass when necessary	Core

Competency B: Uses acetylene welding equipment, rivet gun, air and electric drills to construct finishes	Core or Optional
PERFORMANCE CRITERIA	
1. Applies proper welding technique (solder, gas weld and arc-weld) based on design specific material requirements	Core
2. Uses proper PPE for all welding equipment	Core
3. Properly selects and applies finishing materials	Core
4. Inspects finishes and identifies defects when necessary	Core

Competency C: Knows composite layup design, application and inspection	Core or Optional
PERFORMANCE CRITERIA	
1. Properly selects, installs and removes fasteners for composite structures	Core
2. Properly tests, repairs and inspects composite secondary structures	Core

Competency D: Understands repair patch theory, design, and construction, identifying corrosion and heat treatment application	Core or Optional
PERFORMANCE CRITERIA	
1. Inspects, checks, troubleshoots, services, and repairs heating machines and equipment	Core
2. Inspects aircraft and work area before beginning repairs	Core

Job Function 3: Rebuilds or replaces airframe or its components

Related Technical Instruction		
KNOWLEDGE	SKILLS	TOOLS and TECHNOLOGIES
<ul style="list-style-type: none"> • Aircraft Structural Assembly and Rigging • Aircraft Nonmetallics • Aircraft Electrical • Landing Gear Systems • Fuel, Ice and Rain Control and Fire Detection, Protection, and Extinguishing Systems 	<ul style="list-style-type: none"> • Install or replace components • Perform maintenance • Aircraft inspections 	<ul style="list-style-type: none"> • Landing gear • Retraction systems • Shock struts • Brakes • Wheels • Tires • Steering systems • Hydraulic and pneumatic power systems • Pressurization systems • Air cycle machines

Competency A: Replaces aircraft landing gear system		Core or Optional
PERFORMANCE CRITERIA		
1. Inspects landing gear, retraction systems, shock struts, brakes, wheels, tires, and steering systems before beginning work		Core
2. Services and repairs landing gear, retraction systems, shock struts, brakes, wheels, tires, and steering systems when necessary		Core

Competency B: Installs hydraulic, pneumatic, or electrical systems		Core or Optional
PERFORMANCE CRITERIA		
1. Repairs hydraulic and pneumatic power systems components		Core
2. Identifies and selects hydraulic fluids		Core
3. Inspects, checks, services, troubleshoots, and repairs hydraulic and pneumatic power systems		Core

Competency C: Replaces cabin atmosphere control systems		Core or Optional
PERFORMANCE CRITERIA		
1. Inspects, troubleshoots, services, and repairs heating, cooling, air conditioning, pressurization systems, and air cycle machines		Core
2. Inspects, troubleshoots, services, and repairs heating, cooling, air-conditioning, and pressurization systems		Core
3. Inspects, troubleshoots, services and repairs oxygen systems		Core

Job Function 4: Uses information to repair and replace engine equipment

Related Technical Instruction		
KNOWLEDGE	SKILLS	TOOLS and TECHNOLOGIES
<ul style="list-style-type: none"> • Reciprocating engines ignition systems • Reciprocating engine fuel, fuel metering, and induction systems • Reciprocating engine exhaust, cooling, and lubricating • Propellers and propeller governing systems • Reciprocating engine removal, overhaul, installation, and operation • Engine fire protection and engine instrument systems • Turbine engine lubrication, cooling, ignition, and fuel metering systems • Powerplant electrical • Turbine engine inspection, troubleshooting and maintenance 	<ul style="list-style-type: none"> • Engine Inspection, troubleshoot, and maintain • Turbine engine removal, overhaul, installation, and operation 	<ul style="list-style-type: none"> • Fuel injectors • Alternators • Carburetors • Superchargers • Magnetos

Competency A: Checks manuals for specifications needed to repair and replace reciprocating engines	Core or Optional
PERFORMANCE CRITERIA	
1. Reviews manufacturer specific repair and installation requirements	Core
2. Applies instructions to workplace specific needs	Core

Competency B: Repairs and replaces turbine engines or electrical engines based on specifications outlined in manuals	Core or Optional
PERFORMANCE CRITERIA	
1. Diligently Inspects and repairs radial engine	Core
2. Properly inspects and repairs turbine engines and turbine engine installations	Core
3. Properly inspects and repairs reciprocating engines and engine installations	Core

Competency C: Inspects the engine and checks manual for need to repair and replace equipment	Core or Optional
PERFORMANCE CRITERIA	
1. Perform powerplant conformity and air worthiness inspections	Core
2. Applies manual instructions accurately to workplace needs	Core

Competency D: Replaces worn or damaged fuel injectors, alternators, carburetors, superchargers, magnetos, etc. using hand tools, gages, testing equipment	Core or Optional
PERFORMANCE CRITERIA	
1. Repairs engine fuel metering system components	Core
2. Repairs engine fuel system components	Core
3. Overhauls carburetor when necessary	Core

Job Function 5: Examines powerplants for problems

Related Technical Instruction		
KNOWLEDGE	SKILLS	TOOLS and TECHNOLOGIES
<ul style="list-style-type: none"> • Reciprocating engines ignition systems • Reciprocating engine fuel, fuel metering, and induction systems • Reciprocating engine exhaust, cooling, and lubricating • Propellers and propeller governing systems • Reciprocating engine removal, overhaul, installation, and operation • Engine fire protection and engine instrument systems • Turbine engine lubrication, cooling, ignition, and fuel metering systems • Powerplant electrical • Turbine engine inspection, troubleshooting and maintenance 	<ul style="list-style-type: none"> • Engine Inspection, troubleshoot, and maintain • Turbine engine removal, overhaul, installation, and operation • Fuel, Ice and Rain Control and Fire Detection, Protection, and Extinguishing Systems 	<ul style="list-style-type: none"> • Pressure and R.P.M. Indicating systems • Electrical and mechanical fluid rate-of-flow indicating systems • Engine fire detection and extinguishing systems • Turbine engines • Reciprocating engines

Competency A: Examines engine systems for cracked cylinders, oil leaks, sticking or burnt valves	Core or Optional
PERFORMANCE CRITERIA	
1. Perform powerplant conformity and air worthiness inspections	Core
2. Follows manufacturer guidelines for engine maintenance	Core

Competency B: Examines Instrument Systems, Fire Protection Systems, and Electrical Systems to determine need for repairs	Core or Optional
PERFORMANCE CRITERIA	
1. Inspects, checks, services, troubleshoots, and repairs electrical and mechanical engine temperature, pressure, and R.P.M. indicating systems	Core
2. Troubleshoots, services, and repairs electrical and mechanical fluid rate-of-flow indicating systems	Core
3. Inspects, checks, services, troubleshoots, and repairs engine fire detection and extinguishing systems	Core
4. Repairs engine electrical system components	Core

Competency C: Inspects turbine blades to detect cracks or breaks	Core or Optional
PERFORMANCE CRITERIA	
1. Inspects, checks, services, and repairs turbine engines and turbine engine installations	Core
2. Repairs aluminum alloy propeller blades	Core

Competency D: Inspects fuel line and fuel injector	Core or Optional
PERFORMANCE CRITERIA	
1. Inspects, checks, services, troubleshoots, and repairs engine fuel systems	Core
2. Repairs engine fuel system components when necessary	Core

Job Function 6: Tests aircraft or engine systems using test equipment

Related Technical Instruction		
KNOWLEDGE	SKILLS	TOOLS and TECHNOLOGIES
<ul style="list-style-type: none"> • OSHA safety requirements • NIOSH safety requirements • EPA safety regulations 	<ul style="list-style-type: none"> • Monitoring engine systems 	<ul style="list-style-type: none"> • Ammeter • Compression checker • Distributer timer • Ignition analyzer

Competency A: Uses and Ignition Analyzer to check engine functions	Core or Optional
PERFORMANCE CRITERIA	
1. Properly stores and locates ignition analyzer	Core
2. Follows manufacturer guidelines for checking engine functions	Core

Competency B: Uses compression checker to check engine	Core or Optional
PERFORMANCE CRITERIA	
1. Properly manages and operates compression checker	Core
2. Follows proper safety procedure while working with engine	Core

Competency C: Uses distributor timer to ensure proper	Core or Optional
PERFORMANCE CRITERIA	
1. Properly used distributor timer per industry guidelines	Core

Competency D: Uses ammeter	Core or Optional
PERFORMANCE CRITERIA	
1. Follows proper safety procedure when working with electrical equipment	Core
2. Measures and tracks current using ammeter when necessary	Core

Job Function 7: Removes engine from aircraft and makes repairs

Related Technical Instruction		
KNOWLEDGE	SKILLS	TOOLS and TECHNOLOGIES
<ul style="list-style-type: none"> • Manufacturer and employer specifications • Reciprocating engine • Turbine engine • Electrical systems 	<ul style="list-style-type: none"> • Lift and move materials properly • Inspection of parts, equipment, safety devices, tools and production products • Identifying and reducing/eliminating potential hazards • Maintaining situational awareness • Performing risk assessment and risk mitigation activities • Clear thinking and speaking 	<ul style="list-style-type: none"> • Forklift • Hand tools • Production machinery

Competency A: Performs operational check	Core or Optional
PERFORMANCE CRITERIA	
1. Follows operational sequence instructions and diagrams	Core
2. Reviews operational sequence to ensure compliance	Core

Competency B: Troubleshoots system	Core or Optional
PERFORMANCE CRITERIA	
1. Notifies appropriate individuals when repairs are needed	Core
2. Properly devises methods of repairing systems	Core

Competency C: Removes engine from aircraft	Core or Optional
PERFORMANCE CRITERIA	
1. Uses proper safety procedure when moving large machine parts	Core
2. Removes engine without damaging the system	Core
3. Accurately follows engine removal procedure	Core

Competency D: Disassembles and inspects parts for wear, warping, or other defects	Core or Optional
PERFORMANCE CRITERIA	
1. Safely removes engine parts without damage	Core
2. Accurately identifies and examines engine parts	Core
3. Documents any need for repairs for future reference	Core

Competency E: Makes repairs where necessary	Core or Optional
PERFORMANCE CRITERIA	
1. Repairs engine parts according to industry standards	Core
2. Wears proper PPE when using tools to repair engine	Core
3. Documents all completed repairs	Core

Competency F: Replaces defective parts	Core or Optional
PERFORMANCE CRITERIA	
1. Identifies defective engine parts in need of replacement	Core
2. Documents and properly disposes of unneeded parts	Core
3. Conducts part replacements per industry standards	Core

Competency G: Reassembles and installs engine in aircraft	Core or Optional
PERFORMANCE CRITERIA	
1. Replaces engine in aircraft without damage	Core
2. Follows proper safety procedure when moving or lifting heavy parts	Core

Competency H: Uses nondestructive testing to identify internal component damage	Core or Optional
PERFORMANCE CRITERIA	
1. Displays knowledge of variety or nondestructive testing methods	Core
2. Employs testing methods to accurately determine functionality of the engine	Core
3. Documents findings and any internal component damage found	Core

Job Function 8: Adjusts, repairs, electrical wiring, accessories and instruments

Related Technical Instruction		
KNOWLEDGE	SKILLS	TOOLS and TECHNOLOGIES
<ul style="list-style-type: none"> Industry and manufacturer guidelines Common causes of errors Electronic fault and electrical system Electrical safety standards Grounding techniques Programming 	<ul style="list-style-type: none"> System checks Problem solving Restart procedure Interpret and respond to error messages Electrical repair 	<ul style="list-style-type: none"> Diagnostic tests Gauges Meters Transformers Circuit breakers

Competency A: Connects power and digital input/output wiring	Core or Optional
PERFORMANCE CRITERIA	
1. Accurately connects power source with wiring	Core
2. Follows proper safety procedures when working with electrical wiring	Core

Competency B: Selects and appropriately connects sinking and sourcing inputs and outputs	Core or Optional
PERFORMANCE CRITERIA	
1. Follows industry and manufacturer guidelines to select inputs and outputs for electrical systems	Core

Competency C: Configures and connects a programming device to upload, download, and save a program	Core or Optional
PERFORMANCE CRITERIA	
1. Accurately selects programming device for configuration	Core
2. Accurately uploads to device	Core
3. Properly downloads and saves new programming to device	Core

Competency D: Changes preset timer and counter values and applies and removes forces from a program	Core or Optional
PERFORMANCE CRITERIA	
1. Follows proper procedure when determining preset and counter values	Core
2. Follows industry standard procedure to remove forces from a program	Core

Competency E: Troubleshoots a machine or process by observing indicator lights and reviewing the software ladder diagram (relays, timers, and counters)	Core or Optional
PERFORMANCE CRITERIA	
1. Accurately determines if a machine needs work based on indicators	Core
2. Reads indicator lights correctly using software ladder diagram	Core
3. Displays understanding of software ladder diagram and its uses	Core

Competency F: Adds a function to a machine or process that requires wiring of additional I/O and basic ladder logic programming	Core or Optional
PERFORMANCE CRITERIA	
1. Accurately determines if a machine or process requires additional I/O	Core
2. Correctly adds functions to machines or processes that need them	Core

Competency G: Troubleshoots by observing input and output conditions and monitoring the program in real time	Core or Optional
PERFORMANCE CRITERIA	
1. Demonstrates understanding of input and output conditions and their meanings	Core
2. Follows proper maintenance procedure following monitored conditions	Core

Competency H: Applies proper grounding techniques and identifies sources of electrical system opens and shorts	Core or Optional
PERFORMANCE CRITERIA	
1. Follows electrical safety guidelines when working with grounding	Core
2. Displays understanding of sources of electrical systems when working	Core

Competency I: Properly installs and terminates wiring for low level analog signals	Core or Optional
PERFORMANCE CRITERIA	
1. Follows proper electrical safety procedure when working with live wiring	Core
2. Installs and terminates wiring in a neat and workmanlike manner	Core

Job Function 9: Inspects, services, repairs pneumatic, hydraulic, or electrical systems

Related Technical Instruction		
KNOWLEDGE	SKILLS	TOOLS and TECHNOLOGIES
<ul style="list-style-type: none"> Calculate and measure capacitance and inductance Proper voltage and phasing, grounding 	<ul style="list-style-type: none"> Lays out, cuts, drills, taps, and assembles a control station 	<ul style="list-style-type: none"> Drills Control systems Shafts, motors, belts, and chains on a machine

Competency A: Locates a machine according to a print	Core or Optional
PERFORMANCE CRITERIA	
1. Displays knowledge of print schematics	Core
2. Accurately selects machines for work based on prints	Core
3. Follows manufacturer and industry standards when working with machines	Core

Competency B: Levels a machine (noncritical machines +/- 1/8")	Core or Optional
PERFORMANCE CRITERIA	
1. Designs a level sensing control circuit which uses a capacitive proximity sensor	Optional

Competency C: Verifies circuit size and protection	Core or Optional
PERFORMANCE CRITERIA	
1. Follows proper safety procedure when working with electrical circuits	Core
2. Accurately monitors circuit size before beginning work on circuit	Core

Competency D: Verifies proper voltage and phasing, grounding, and proper guards are in place	Core or Optional
PERFORMANCE CRITERIA	
1. Demonstrates knowledge and understanding of proper voltage for safety and efficacy	Core
2. Follows industry standard procedure to ensure proper voltage, phasing, grounding and guards in place	Core

Competency E: Installs proper mounts and raceways for adding a component (such as a sensor) or interlocking a machine	Core or Optional
PERFORMANCE CRITERIA	
1. Selects proper size raceways for wiring needs	Core
2. Installs raceways in neat and orderly manner	Core
3. Ensures that wiring and raceways allow for proper functioning of machine components through troubleshooting and testing	Core

Competency F: Properly sizes, installs, labels, and tests circuit conductors for adding a component or interlocking a machine	Core or Optional
PERFORMANCE CRITERIA	
1. Documents all installed components and marks with labels for future referral	Core
2. Follows proper safety measures when testing electrical components	Core
3. Ensures functionality of components through rigorous testing	

Competency G: Properly lays out, cuts, drills, taps, and assembles a control station for an addition to a machine	Core or Optional
PERFORMANCE CRITERIA	
1. Follows industry standard procedure when laying out control station	Optional

Competency H: Connects compressed air to a machine from a supply header and verifies proper air pressures and volumes for a machine	Core or Optional
PERFORMANCE CRITERIA	
1. Follows proper safety procedure and wears proper PPE when working with compressed air	Core
2. Verifies air pressure using industry standard testing methods	Core

Competency I: Adds pneumatic or hydraulic components and lines to a machine	Core or Optional
PERFORMANCE CRITERIA	
1. Accurately selects pneumatic and hydraulic components to add to machine	Core
2. Follows proper safety procedure when installing components	Core

Competency J: Fabricates hydraulic lines	Core or Optional
PERFORMANCE CRITERIA	
1. Wears proper PPE while working	Core
2. Documents changes made to machines	Core

Competency K: Aligns and adjusts shafts, motors, belts, and chains on a machine	Core or Optional
PERFORMANCE CRITERIA	
1. Displays knowledge of various components of machine	Core
2. Accurately aligns and test components for functionality	Core

Competency L: Verifies proper operation of all safety devices and circuits on a machine and checks and verifies circuits on a machine	Core or Optional
PERFORMANCE CRITERIA	
1. Prioritizes safety of machine and of workers	Core
2. Reviews manufacturer specific instructions for safety of operation	Core
3. Rigorously verifies functionality of circuits on machines	Core

Competency M: Checks, lubricates, and powers up a machine	Core or Optional
PERFORMANCE CRITERIA	
1. Wears proper PPE when working with machine parts that could be dangerous	Core
2. Powers up machines according to manufacturer specific guidelines	Core
3. Checks for functionality of machine once powered up	Core

Competency N: Verifies proper current draw of a machine and machine operation according to a sequence of operation	Core or Optional
PERFORMANCE CRITERIA	
1. Follows industry standard operation procedure when verifying current draw	Core
2. Notates finding of all checks on currents for future reference	Core

Job Function 10: Performs computerized systems maintenance

Related Technical Instruction		
KNOWLEDGE	SKILLS	TOOLS and TECHNOLOGIES
<ul style="list-style-type: none"> • Computerized systems • Programming • Industry guidelines 	<ul style="list-style-type: none"> • Documentation • Repair computerized systems per industry guidelines 	<ul style="list-style-type: none"> • Diagnostic tests

Competency A: Inspects, repairs, and maintains computerized aircraft systems	Core or Optional
PERFORMANCE CRITERIA	
1. Conducts sitewide review of computerized systems	Core
2. Properly notes and records needed repairs to computerized systems	Core
3. Conducts repairs to computerized systems per industry guidelines	Core

Competency B: Performs data downloads and software reloads	Core or Optional
PERFORMANCE CRITERIA	
1. Accurately reviews data and software need	Core
2. Updates system to meet industry standards for recent software reloads	Core

Job Function 11: Performs miscellaneous service duties

Related Technical Instruction		
KNOWLEDGE	SKILLS	TOOLS and TECHNOLOGIES
<ul style="list-style-type: none"> • FAA maintenance specifications • Manufacturer maintenance specifications 	<ul style="list-style-type: none"> • Reading datasheets and manuals • Reading and understanding technical data 	<ul style="list-style-type: none"> • Cleaning materials • Diagnostic tests

Competency A: Flushes crankcase cleaning screens	Core or Optional
PERFORMANCE CRITERIA	
1. Identifies and selects cleaning materials	Core
2. Correctly cleans components per manufacturer and FAA specifications	Core

Competency B: Greases parts to ensure proper usage next time	Core or Optional
PERFORMANCE CRITERIA	
1. Handles all parts according to manufacturer and FAA maintenance guidelines	Core
2. Correctly selects maintenance method for each specific part	Core

Competency C: Checks brakes for any issues	Core or Optional
PERFORMANCE CRITERIA	
1. Inspects breaks before use or maintenance	Core
2. Properly troubleshoots and repairs any mechanical issues with breaks	Core

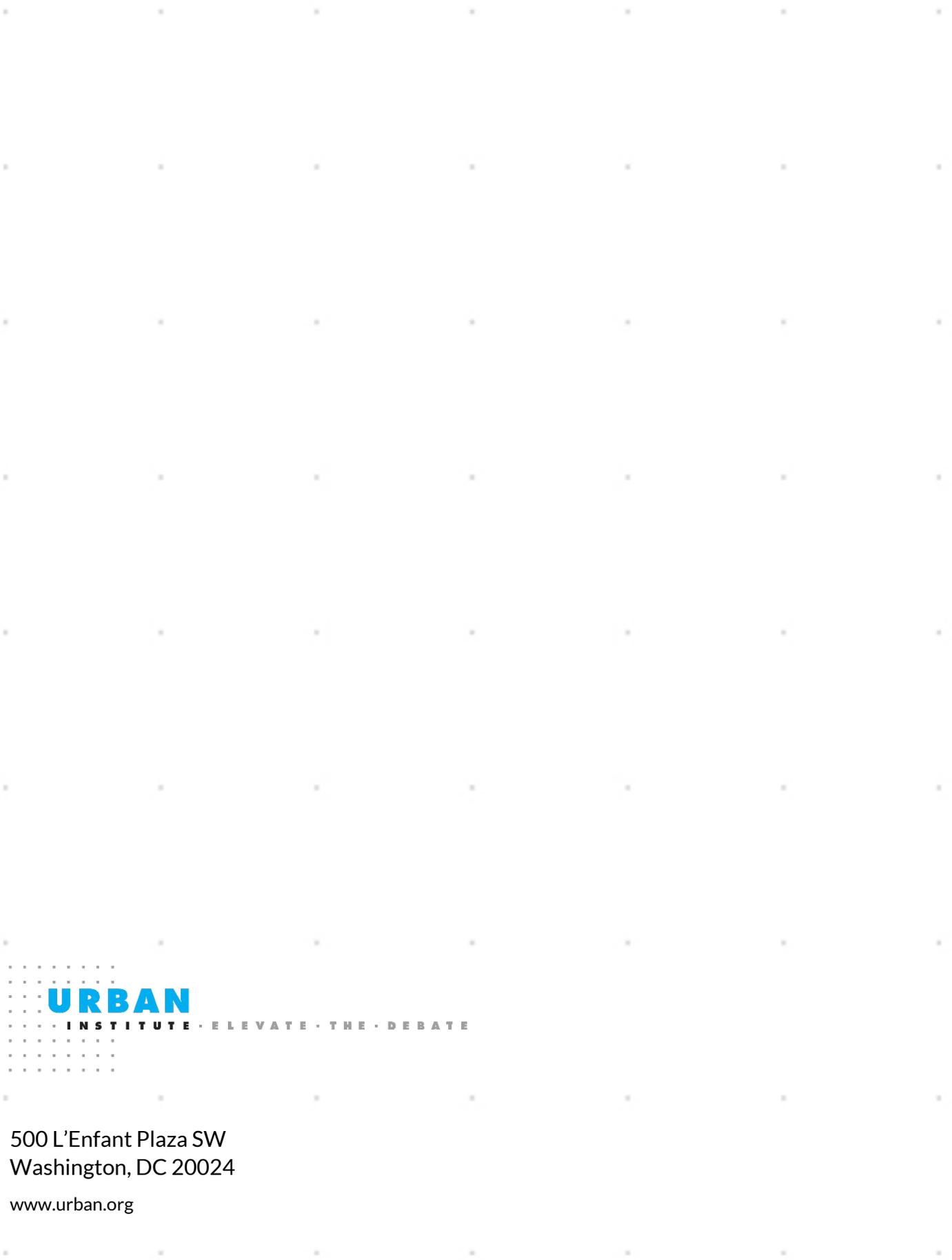
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