BULLETIN 2002 - 20 **Date: September 16, 2002**

U.S. Department of Labor Employment and Training Administration Office of Apprenticeship Training, Employer and Labor Services (OATELS) Washington, D.C. 20210	Distribution: National Office All Field Tech SD+RD+SAC+; Lab.Com	Subject: Revised Apprenticeable Occupation- Airframe and Powerplant Mechanic Code: 200
Symbols: DSNIP/FG		Action: Immediate

PURPOSE: To inform the Office of Apprenticeship Training, Employer and Labor Services (OATELS), Bureau of Apprenticeship and Training (BAT) Staff of a revision to an apprenticeable occupation:

Airframe and Powerplant Mechanic
RAIS Code: 0005
O*NET Code: 49-3011.01
Training Term: 5000 hours
Type of Training: Time - based

BACKGROUND: The United Services Military Apprenticeship Program (USMAP) initiated the apprenticeability request for this occupation. This occupation has been previously recognized as apprenticeable with a prescribed training term of 8000 hours.

Airframe and Powerplant Mechanic with a 5000-hour training term will be added to the list of occupations recognized as apprenticeable by the Office of Apprenticeship Training, Employer and Labor Services when the list is reissued.

ACTION: BAT staff should review and retain a copy of this bulletin, including all attachments, as a source for developing apprenticeship standards and/or providing technical assistance.

Attachment

WORK PROCESS SCHEDULE
(Aviation Maintenance Mechanic)
RAIS CODE: 0005 O*NET CODE: 49-3011.01

DESCRIPTION: Services, repairs, and overhauls aircraft and aircraft engines to ensure airworthiness: Repairs, replaces, and rebuilds aircraft structures, such as wings and fuselage, and functional components including, rigging, surface controls, and plumbing and hydraulic units, using hand-tools, power tools, machine machines, and equipment such as shears, sheet metal brakes, welding equipment, rivet gun, and drills. Reads and interprets manufacturers' and airline's maintenance manuals, service bulletins, and other specifications to determine feasibility and method of repairing or replacing malfunctioning or damaged components. Examines engines for cracked cylinders and oil leaks, and listens to operating engine to detect and diagnose malfunctions, such as sticking or burned valves. Inspects turbine blades to detect cracks or breaks. Tests engine operation, using testing equipment such as ignition analyzer, compression checker, distributor timer, and ammeter, to locate source of malfunction. Replaces or repairs worn or damaged components, such as carburetors, alternators, and magnetos, using hand tools, gauges, and testing equipment. Removes engine from aircraft, using hoist or forklift truck. Disassembles and inspects parts for wear, warping, or other defects. Repairs or replaces defective engine parts and reassembles and installs engine in aircraft. Adjusts, repairs, or replaces electrical wiring system and aircraft accessories. Performs miscellaneous duties to service aircraft, including flushing crankcase, cleaning screens, greasing moving parts, and checking brakes.

SKILL AREA	**HOURS**
A. GENERAL TASKS	**1100**

1. BASIC ELECTRICITY (100)
Calculate and measure capacitance and inductance; calculate and measure electrical power; measure voltage, current, resistance, and continuity; determine the relationship of voltage, current, and resistance in electrical circuits; read and interpret aircraft electrical circuit diagrams, including solid state devices and logic functions; inspect and service batteries.

2. AIRCRAFT DRAWINGS (100)
Use aircraft drawings, symbols, and system schematics; draw sketches of repairs and alterations; use blueprint information; use graphs and charts.

3. WEIGHT AND BALANCE (20)
Weigh aircraft; perform complete weight-and-balance check and record data**.**

4. FLUID LINES AND FITTINGS (25)
Fabricate and install rigid and flexible fluid lines and fittings.

5. MATERIALS AND PROCESSES (50)
Identify and select appropriate non-destructive testing methods; perform dye penetrant, eddy current, ultrasonic, and magnetic particle inspections; perform basic heat-treating processes; identify and select aircraft hardware and materials; inspect and check welds; perform precision measurements.

6. GROUND OPERATION AND SERVICING (150)
Start, ground operate, move, service, and secure aircraft and identify typical ground operation hazards; identify and select fuels.

7. CLEANING AND CORROSION CONTROL (145)
Identify and select cleaning materials, inspect, identify, remove, and treat aircraft corrosion and perform aircraft cleaning.

8. MATHEMATICS (75)
Extract roots and raise numbers to a given power; determine areas and volumes of various geometrical shapes; solve ratio, proportion, and percentage problems; perform algebraic operations involving addition, subtraction, multiplication, and division of positive and negative numbers.

9. MAINTENANCE FORMS AND RECORDS (125)
Write descriptions of work performed including aircraft discrepancies and corrective actions using typical aircraft maintenance records; complete required maintenance forms, records, and inspection reports.

10. BASIC PHYSICS (70)
Use and understand the principles of simple machines; sound, fluid, and heat dynamics; basic aerodynamics; aircraft structures; and theory of flight.

11. MAINTENANCE PUBLICATIONS (70)
Demonstrate ability to read, comprehend, and apply information contained in FAA and manufacturer'' aircraft maintenance specifications, data sheets, manuals, publications, and related Federal Aviation Regulations, Airworthiness Directives, and Advisory materials, read technical data.

12. MECHANIC PRIVILEGES AND LIMITATIONS (70)
Exercise mechanic privileges within the limitations prescribed by FAR 65.

13. AVIATION SAFETY (100)
Fuels, lubricants, or hydraulic fluids; flammable cements, rosins, sealants, paints and thinners; fluids under pressure; compressed gasses, including oxygen; batteries; aviation ordnance and pyrotechnics; electrical and electronic circuits; operating radio transmitters and radar systems; hazardous noise sources.

	HOURS
B. AIRFRAME STRUCTURES	**800**

1. AIRCRAFT COVERING (100)
Select and apply fabric and fiberglass covering materials; inspect, test, and repair fabric and fiberglass.

2. AIRCRAFT FINISHES (100)
Apply trim, letters, and touchup paint; identify and select aircraft finishing materials; apply finishing materials; inspect finishes and identify defects.

3. SHEET METAL AND NON-METALLIC STRUCTURES (200)
Select, install, and remove special fasteners for metallic, bonded, and composite structures; inspect bonded structures; inspect, test, and repair fiberglass, plastics, honeycomb, composite, and laminated primary and secondary structures; inspect, check, service, and repair windows, doors, and interior furnishings; inspect and repair sheet-metal structures; install conventional rivets, form, lay out, and bend sheet metal.

4. WELDING (150)
Weld magnesium and titanium; solder stainless steel; fabricate tubular structures; solder, braze gas-and arc-weld steel, weld aluminum and stainless steel.

5. ASSEMBLY AND RIGGING (150)
Rig rotary-wing aircraft; rig fixed-wing aircraft; check alignment of structures; assemble aircraft components, including flight control surfaces; balance, rig and inspect movable primary and secondary flight control surfaces; jack aircraft.

6. AIRFRAME INSPECTION (100)
Perform airframe conformity and airworthiness inspections.

C. AIRFRAME SYSTEMS AND COMPONENTS 1200

1. AIRCRAFT LANDING GEAR SYSTEMS (100)
Inspect, check, service and repair landing gear, retraction systems, shock struts, brakes, wheels, tires, and steering systems.

2. HYDRAULIC AND PNEUMATIC POWER SYSTEMS (100)
Repair hydraulic and pneumatic power system components; identify and select hydraulic fluids; inspect, check, service, troubleshoot, and repair hydraulic and pneumatic power systems.

3. CABIN ATMOSPHERE CONTROL SYSTEMS (100)
Inspect, check, troubleshoot, service, and repair heating, cooling, air conditioning, pressurization systems, and air cycle machine; inspect, check, troubleshoot, service, and repair heating, cooling, air-conditioning, and pressurization systems; inspect, check, troubleshoot, service and repair oxygen systems.

4. AIRCRAFT INSTRUMENT SYSTEMS (150)
Inspect, check, service, troubleshoot, and repair electronic flight instrument systems and both mechanical and electrical heading, speed, altitude, temperature, pressure, and position indication systems to include the use of built-in test equipment; install instruments and perform a static pressure systems leak test.

5. COMMUNICATION AND NAVIGATION SYSTEMS (150)
Inspect, check, and troubleshoot autopilot, servos and approach coupling systems; inspect, check, and service aircraft electronic communication and navigation systems, including VHF, passenger address interphones and static discharge devices, aircraft VOR, ILS, LORAN, Radar beacon transponders, flight management computers and GPWS; inspect and repair antenna and electronic equipment installations.

6. AIRCRAFT FUEL SYSTEMS (100)

Check and service fuel dump systems; perform fuel management, transfer and defueling; inspect, check, and repair pressure-fueling systems; repair aircraft fuel system components; inspect and repair fluid quantity indicating systems; troubleshoot, service, and repair fluid pressure and temperature warning systems; inspect, check, service, troubleshoot, and repair aircraft fuel systems.

7. AIRCRAFT ELECTRICAL SYSTEMS (150)

Repair and inspect aircraft electrical system components; crimp and splice wiring to manufacture's specifications; and repair pins and sockets of aircraft connectors; install, check, and service airframe electrical wiring, controls, switches, indicators and protective devices; inspect, check, troubleshoot, service, and repair alternating and direct current electrical systems; inspect, check, and troubleshoot constant speed and integrated speed drive generators.

8. POSITION AND WARNING SYSTEMS (125)

Inspect, check, and service speed and configuration warning systems, electrical brake controls, and anti-skid systems; inspect, check, troubleshoot, and service landing gear position indicating and warning systems.

9. ICE AND RAIN CONTROL SYSTEMS (125)

Inspect, check, troubleshoot, service and repair airframe ice and rain control systems.

10. FIRE PROTECTION SYSTEMS (100)

Inspect, check, and service smoke and carbon monoxide detection systems; inspect, check, troubleshoot, and repair aircraft fire detection and extinguishing systems.

D. POWERPLANT THEORY AND MAINTENANCE 600

1. RECIPROCATING ENGINES (100)

Inspect and repair a radial engine; overhaul reciprocating engine; inspect, check, service, and repair reciprocating engines and engine installations; install, troubleshoot, and remove reciprocating engine.

2. TURBINE ENGINES (250)

Overhaul turbine engine; inspect, check, service, and repair turbine engines and turbine engine installations; install, troubleshoot, and remove turbine engines

3. ENGINE INSPECTION (250)

Perform powerplant conformity and airworthiness inspections.

E. POWERPLANT SYSTEMS AND COMPONENTS 1300

1. ENGINE INSTRUMENT SYSTEMS (100)

Troubleshoot, service, and repair electrical and mechanical fluid rate-of-flow indicating systems; inspect, check, service, troubleshoot, and repair electrical and mechanical engine temperature, pressure, and R.P.M indicating systems.

2. ENGINE FIRE PROTECTION SYSTEMS (100)

Inspect, check, service, troubleshoot, and repair engine fire detection and extinguishing systems.

3. ENGINE ELECTRICAL SYSTEMS (100)

Repair engine electrical system components; install, check, and service engine electrical wiring, controls, switches, indicators, and protective devices.

4. LUBRICATING SYSTEMS (100)

Identify and select lubricants; repair engine lubrication system components; inspect, check, service, troubleshoot, and repair engine lubrication systems.

5. IGNITION AND STARTING SYSTEMS (100)

Overhaul magneto and ignition harness; inspect, service, troubleshoot, and repair reciprocating and turbine engine ignition systems and components; inspect, service, troubleshoot, and repair turbine engine electrical starting systems; inspect, service, and troubleshoot turbine engine pneumatic starting systems.

6. FUEL METERING SYSTEM (100)

Troubleshoot and adjust turbine engine fuel metering systems and electronic engine fuel controls; overhaul carburetor; repair engine fuel metering system components; inspect, check, service, troubleshoot, and repair reciprocating and turbine engine fuel metering systems.

7. ENGINE FUEL SYSTEMS (100)

Repair engine fuel system components; inspect, check, service, troubleshoot, and repair engine fuel systems.

8. INDUCTION AND ENGINE AIRFLOW SYSTEMS (100)

Inspect, check, troubleshoot, service, and repair engine ice and rain control systems; inspect, check, troubleshoot, service, and repair heat exchangers, supercharger and turbine engine airflow and temperature control systems; inspect, check, service, and repair carburetor air intake and induction manifolds.

9. ENGINE COOLING SYSTEMS (100)

Repair engine cooling system components; inspect, check, troubleshoot, service, and repair engine-cooling systems.

10. ENGINE EXHAUST SYSTEM COMPONENTS (100)

Repair engine exhaust system components; inspect, check, troubleshoot, service, and repair engine exhaust systems; troubleshoot and repair engine thrust reverser systems and related components.

11. PROPELLERS (100)

Inspect, check, service, and repair propeller synchronizing and ice control systems; identify and select propeller lubricants; balance propellers; repair propeller control systems components; inspect, check, service, and repair fixed-pitch, constant-speed, and feathering propellers and propeller governing systems; install, troubleshoot, and remove propellers; repair aluminum alloy propeller blades.

12. UNDUCTED FANS (100)
Inspect and troubleshoot unducted fan systems and components.

13. AUXILIARY POWER UNITS (100)
Inspect, check, service and troubleshoot turbine-driven auxiliary power units.

GENERAL (1100)
AIRFRAMES (2000)
POWERPLANTS (1900)

TOTAL HOURS **5000**

AIRFRAME AND POWERPLANT
MECHANIC
RAIS Code: 0005 O*NET Code: 49-3011.01

Related Technical Instruction	Approximate Hours
1. Crew Resource Management	**16**
2. Maintenance Resource Management	**7**
3. High Altitude Pressure Chamber and Underwater Egress	**25**
Oxygen and oxygen equipment	
Rapid decompression and night visual problem trainer	
Underwater egress trainer	
4. Aircraft hydraulic systems	**21**
Hydraulics	
System components and their common faults	
Associated safety precautions	
Hydraulic system schematics and fluid flow	
Hydraulic contamination	
Hydraulic Seals	
Stock number, part number, nomenclature, and manufacture date of seals	
Inspection of seals for defects, cuts, punctures, and abrasions	
Removal and installation of seals and backup rings	
Hydraulic Electrical	
Hydraulic system electrical schematics, current flow, and control circuitry	
5. Aircraft fuel systems	**11**
Safety precautions associated with fuel system maintenance	
Fuel system components and their function	
Fuel quantity system schematics, components and their functions	
Fuel system fuel flow	
Fuel system current flow and multiple fuel quantity indication	
6. Landing Gear Systems	**4**
Landing gear system components and their function	
Landing gear system fluid flow	
Landing gear system current flow	
Sequence of electrical and mechanical events during landing gear system operation	
7. Aircraft Brake Systems	**7**
Systems	
Types of aircraft brake systems and their distinguishing characteristics	
Brake system components and their function	
Aircraft brake systems safety precautions	
Sequence of mechanical, hydraulic, and electrical events for normal and emergency brake system operation	

Brake Anti Skid
- Anti skid system purpose
- Anti skid system components and their function
- Anti skid system operation

8. Helicopter Power Train Systems **9**

Rotary wing power train system components and their function
Rotary wing power train main gearbox sections
Main gearbox oil system components
Rotor head components and their function
Gearbox indicating system purpose

9. Aircraft Propeller Systems **7**

T56 Controls/Propellers

- C-130 engine control throttle positions and their corresponding definitions
- Temperature datrum system operation
- Powerplant and propeller operation when the Fire Emergency system is activated
- Assemblies and sections of a Hamilton Standard propeller
- Function of the propeller governor during over speed and under speed conditions
- Alpha and Beta ranges of propeller operation

10. Aircraft Powerplant Systems **76**

Basic Engines
- Basic engine major sections
- Axial and centrifugal flow compressors
- Accessory section components
- Turboprop, turbo shaft, and turbofan engine distinguishing characteristics
- Auxiliary powerplants

T56 Powerplant
- T56-A-15 sections
- T56-A-15 power section assemblies
- T56-A-15 compressor section
- Propeller brake functions
- Compressor stall avoidance system
- Oil system components and functions

T700 Engines
- T700 basic modules
- T700 engine accessory module
- T700 engine inlet particle separator components and functions
- Operating parameters sensed by Hydromechanical Unit for fuel flow metering
- Hydromechanical Unit controlled components
- Digital Electronic Control Unit control parameters

LTS101 Engines
- LTS101 modules
- Power turbine control anticipator system
- LTS101 compressor
- LTS101 engine airflow
- Accessory reduction gearbox module components

Torque meter system
Inlet airflow modulation system operation
Gas producer speed and power turbine speed sensors
Measured gas temperature thermocouples

ATF3 Turbofan Engine
ATF3 modules
ATF3 compressors
ATF3 internal components
Normal and manual fuel scheduling
Engine fuel flow control
Permanent Magnet Generator
Surge control components

Engine Component Replacement
Common hand tool usage
Precision measuring equipment
Safety locking devices
Safety equipment and procedures
Seal installation
Hardware installation
Corrosion inspection and preventive maintenance

Aircraft Pressurization
Aircraft pressurization components and operation
Aircraft pressurization equipment maintenance and safety

11. Aircraft Environmental Control Systems **8**
Air Cycle Air Condition System
Air cycle air condition system components and operation
Air cycle air condition system maintenance and safety

Vapor Cycle System
Vapor cycle air conditioning system components and operation

12. Aircraft Start Systems **4**
Engine Start and Ignition
Operation of a basic jet engine
Engine start system starters
Ignition system components and functions

13. Flight Control Systems **17**
Aerodynamics
Newton’s law and Bernoulli’s principle
Main rotor flap
Rotor blade hunt
Tail rotors
Autorotation
Airfoils and associated terms
Forces affecting lift

Fixed Wing Flight Controls
- Flight control surfaces, components and their functions/effects
- Flight control electrical components
- Trim system current flow
- Flight control system maintenance and safety

Rotary Wing Flight Controls
- Flight control parts and functions
- Flight control movement sequencing
- Flight control inputs and results
- Flight control system maintenance and safety

14. Aircraft Engine Electrical/Electronic Controls **154**

Shop Safety

Basic DC Circuits
- Calculate voltage, current, and resistance using Ohm's Law
- Circuit valves in series circuits
- Circuit values in parallel circuits
- Isolate series circuit faults
- Isolate parallel circuit faults
- Voltage and current in series parallel circuits
- Isolate series parallel circuit faults

Introduction to Electricity
- Basic electrical experiments/applications
- Mathematic calculations
- Basic electric circuit properties, principles, and schematics
- Resistor types
- Circuit control and protection components and schematic symbols

Introduction to AC
- Alternating current properties and principles
- AC generator properties, principles, and schematic symbols

Inductance
- Properties, principles, and schematic symbols

Capacitance
- Properties, principles, and schematic symbols

Transformers
- Calculate, measure, and isolate circuits

Relays and AC Circuits
- Isolate relay circuits

Diodes and Diode Circuits
Isolate diode circuits

Electric Troubleshooting Procedures
Fundamental electrical circuit troubleshooting techniques
Voltmeter readings
Schematics and publications
Checks, Causes, Flowcharting
Troubleshooting application

15. Aircraft Anti-ice/De-ice Systems **7**

Bleed air anti-ice components and functions
Electrical heat anti-ice components and functions
Electrical heat de-ice components and functions
Ant-ice and de-ice maintenance and safety

16. Aircraft Fire Protection Systems **4**
Detection components and schematics
Detection and prevention system maintenance and safety

17. Aircraft Flotation Systems **4**
Flotation system diagrams and components
Flotation system electrical/mechanical schematics
Flotation system sequence of operations

18. Aircraft Rescue Hoist Systems **5**
Hoist system components and their function
Inspect Aircraft Stainless Steel Cable Assemblies

19. Aircraft Structural Material Identification **4**
Material thickness, alloy type, and heat treatments
Alloy characteristics, uses, and designations
Sheet metal heat treatment processes
Metal working processes

20. Safety Wire and Shear Wire **22**
Securing devices safety precautions
Single strand safety wire procedures
Double strand safety wire procedures
Cotter pin installation
“Break-away” wire installation
Cannon plug safety wiring

21. Repair Damaged and Broken Aircraft Electrical Wires, Cables, and Connectors **25**
Soldering – Wire Harness Fabrication
Safety precautions
Preparation of wiring and material
Solder and desolder wires to cups, hooks, and turrets

Soldering – Multipin Connectors
- Proper tools
- Connector assembly and disassembly
- Pin insertion and extraction
- Connector testing

Soldering – Wiring Harness Repair
- Repair procedures
- Raychem environmental splices
- Shielding terminations
- Terminal lugs
- Harness testing

Soldering – Coaxial Cable
- Coaxial preparation and tools
- Connector Installation
- Cable TDR and megger testing

22. Aircraft Electrical Circuit Test Equipment and Fault Isolation **7**

Multimeter Measurements
- Digital and analogy meter usage and operation
- Electrical circuit current
- Electrical circuit resistance

23. Aircraft Structures Corrosion Control **18**

Corrosion types and terms
Corrosion tools and procedures

24. Aircraft Structural Repair **155**

Rivet Joint Layout
- Single and multiple row patterns
- Procedures and formulas
- Material identification and application

Pneumatic Riveting
- Rivet sizing and application
- Specifications, tolerances, and methods
- Removal and replacement of defective rivets

Fasteners
- Identification. Turnlock fastener, Cherrymax rivet, Plate Nut, Hi-Lok, Pin rivet, Channel Nut
- Application. Hi-Lok, Pin rivet, Huckrimp, Blind rivet, Turnlock
- Replacement. Turnlock fastener, Cherrymax rivet, Plate Nut, Hi-Lok, Channel Nut

Aircraft Construction
- Fixed wing major airframe sections and components
- Rotary wing major airframe sections and components
- Stresses
- Structural types and construction
- Fuselage structural members
- Wing rib types and structural components
- Fuselage and wing stations

Basic Drawings
- Types
- Interpreting
- Standard lines

Solid Rivet Identification
- Part number identification
- Material identification
- Application

Power Tools
- Proper utilization of drill press, pneumatic drill, and bench grinder
- Safety precautions and equipment
- Maintenance

Sheet Metal Forming and Bending
- 90 degree bends
- Brake finger alignment/use

Aircraft Skin Repair
- Structural damage evaluation
- Lap patch fabrication
- General damage repair types
- Scratch burnishing
- Crack repair
- Metal types
- Cut, Trim, Deburr, Burnish, and Chamfer metal/metal edges
- Filler tolerances

Precision Measuring Instruments
- Vernier Caliper
- Outside and Depth Micrometers
- Cable Tensiometer
- Universal Propeller Protractor

25. Paint and Sealant Application **20**

Remove defective sealants
Prepare and apply sealants
Prepare aluminum surfaces and coatings
Apply coatings
Assembly, disassembly, and usage of paint guns

26. Composite Repair **31**

Scarf procedures
Cutting fabric
Mixing resin and catalyst
Fabric lay-up sequence and orientation
Material application

27. Non-Destructive Inspection **15**

Cleaning
Application and removal of penetrant, cleaner, and developer
Black Light inspection
Eddy Current set-up and use

28. Stainless Steel Cable Fabrication **9**

Flight Control Cable Inspection
- Cable type and parts identification
- Cable components and function
- Adjustment and securing of cable assemblies

Cable Assembly Fabrication
- Cut, Swage, and Pull Test

29. Shop Safety **3**

Personal protective equipment
Removal of burrs, chips, and metal cuttings
Safety publications
Emergency procedures
Location of first aid and emergency equipment

TOTAL HOURS **695**