

STRANDS AND STANDARDS

AVIATION MAINTENANCE 2



Course Description

Aviation Maintenance 2 prepares students to demonstrate the theories, principles, skills, and risks associated with physics, human factors, aircraft materials, hardware, processes, fundamentals of electricity and electronics, ground operations and servicing, and inspection concepts and techniques. These courses are designed to meet Federal Aviation Administration (FAA) requirements for licensing as an airframe and powerplant mechanic.

The strands and standards identified in this document align with industry through the Federal Aviation Administration (FAA) Airman Certification Standards (ACS).

Intended Grade Level	9-12
Units of Credit	0.5
Core Code	40.09.00.00.002
Concurrent Enrollment Core Code	--
Prerequisite	--
Skill Certification Test Number	--
Test Weight	--
License Area of Concentration	CTE and/or Secondary Education 6-12
Required Endorsement(s)	
Endorsement 1	Aviation - Maintenance
Endorsement 2	--
Endorsement 3	--

STRAND 1

Students will be able to perform physics principles in relation to aviation maintenance.

Standard 1

Students will apply knowledge of various physics concepts.

- Matter and energy.
- Work, power, force, and motion.
- Simple machines and mechanics.
- Heat and pressure.
- Bernoulli's Principle.
- Newton's Law of Motion.
- Gas law and fluid mechanics.
- Theory of flight (aerodynamics).
- Standard atmosphere and factors affecting atmospheric conditions.
- Primary and secondary aircraft flight controls.
- Additional aerodynamic devices (vortex generators, wing fences, and stall strips).
- Relationship between temperature, density, weight, and volume.
- Force, area, or pressure in a specific application.

Standard 2

Students will identify, assess, and mitigate risks associated with calculations and mathematics relating to aviation maintenance.

- Use of performance/testing data, and changes in aircraft and engine performance due to density altitude.
- Effect a repair can have on a flight surface.
- Measurement errors related to use of units of measure (e.g., Celsius vs. Fahrenheit).

Performance Skills

- Convert temperature units (e.g., from Celsius to Fahrenheit).
- Determine density and pressure altitude
- Calculate force, area, or pressure in a specific application.
- Demonstrate the mechanical advantage of various types of levers (inclined planes on paper, indicating the mechanical advantage).
- Identify changes in pressure and velocity as a fluid passes through a venturi.
- Calculate horsepower.

STRAND 2

The student will investigate human factors as it relates to performing aircraft maintenance.

Standard 1

Students will assess and identify key aspects of safety in a work environment.

- Describe the importance of safety and organizational factors that impact the workplace.
- Identify and explain human error principles and types of human errors.
- List the steps associated with a safety event investigation.
- Identify human performance and limitations, and describe physical and social environments impacts.
- Explain the importance of teamwork, leadership, professionalism and integrity within the work environment.
- Describe the importance of communication/reporting of hazards.
- List the risks associated with shift and task turnover, and describe the conditions/preconditions for unethical and unsafe acts.

Standard 2

Students will identify, assess, and mitigate risks associated with labor hazards in the aviation maintenance industry.

- Selective reporting of hazards and not including all potential hazards when performing maintenance.
- Fatigue management and fitness for duty, including non-invasive, condition-monitoring technologies to determine worker fitness for duty.

Performance Skills

- Simulate the completion of a Malfunction or Defect Report.
- Perform an effective shift turnover for continuity of work.
- Locate reference source information regarding human factors errors associated with the performance of aircraft maintenance.

STRAND 3

Students will use aircraft materials, hardware, and processes.

Standard 1

Students will investigate aircraft materials, hardware, tools and welding processes.

- Materials commonly used in aircraft and their applications. Material heat treatment and metalworking processes, and forces placed on materials (e.g., tension, compression, torsion, bending, strain, and shear).
- Identify hardware and hardware markings commonly used in aircraft (e.g., bolts, nuts, screws, pins, washers, turnlock fasteners, cables, cable fittings, and rigid line couplings).
- Recognize torquing tools, principles, and procedures, and understand the relationship between torque and fastener preload.
- Understand the principles of safety wire techniques and safety clip requirements.
- Be aware of precision measurement tools, principles, and procedures.
- Characteristics of acceptable welds, unacceptable welds, and procedures for weld repairs. Become familiar with soldering preparation, types of solder, and flux usage.

Standard 2

Student will identify, assess, and mitigate risks associated with aircraft materials, hardware, and processes.

- Use of personal protective equipment (PPE).
- Improper torque techniques.
- Reuse of hardware or suspected unapproved parts (SUPS).
- Torquing techniques on critical fasteners.

Performance Skills

- Identify aircraft materials and hardware based on manufacturer's markings. Select and install aircraft bolts. Properly torque aircraft hardware. Install safety wire on nuts, bolts, and turnbuckles.
- Inspect and check welds.
- Check calibration and make precision measurements with an instrument that has a Vernier scale. Use a precision measurement device to check the concentricity of a shaft.
- Identify aircraft control cable components. Fabricate a cable assembly using a swaged-end fitting using proper tooling.
- Distinguish between heat-treated and non-heat-treated aluminum alloys. Determine the suitability of materials for aircraft repairs. Select the correct aluminum alloy for a structural repair. Identify rivets by physical characteristics.

STRAND 4

Students will apply ground operation and servicing concepts.

Standard 1

Students will illustrate aircraft ground operations and safety procedures.

- Aircraft towing and securing procedures (engine starting, ground operation, and aircraft taxiing procedures). Airport operation area and ATC communications (runway incursion prevention).
- Types/classes of fire extinguishers and procedures.
- Aircraft oil, hydraulic and pneumatic, and deicing servicing procedures.
- Oxygen system servicing procedures.
- Characteristics of aviation gasoline and turbine fuels (basic types and means of identification, commonly used fuel additives, approved grades/types, fueling/defueling procedures, hazardous materials, PPE, and Safety Data Sheets (SDS)).
- Tooling, hardware, material handling and parts protections. The effects of foreign object damage related to airframe and power plant.

Standard 2

Students will identify, assess, and mitigate risks associated with ground operations and servicing.

- Fueling/defueling ungrounded aircraft or using improper equipment. Misfueling and using incorrect or contaminated fuel.
- Oxygen system servicing.
- Engine start/run-up without using a checklist. Engine starting and operation while troubleshooting or adjusting engine controls. Ground operation of an aircraft engine with cowling removed contrary to manufacturer instructions.
- Ground operation of aircraft near other aircraft or ground support equipment.

Performance Skills

- Perform a foreign object damage control procedure.
- Prepare an aircraft for towing and use hand signals for the movement of aircraft.
- Identify different grades of aviation fuel. Select an approved fuel for an aircraft. Prepare an aircraft for fueling. Inspect an aircraft fuel system for water and foreign object debris (FOD) contamination.
- Identify procedures for extinguishing fires in an engine induction system.
- Connect external power to an aircraft using the correct voltage. Follow a checklist to start up or shut down an aircraft reciprocating or turbine engine.
- Locate and explain procedures for securing a turbine-powered aircraft and reciprocating-powered aircraft after engine shutdown and properly secure an aircraft.

STRAND 5

Students will identify and demonstrate the fundamentals of electricity and electronics through various theories and devices.

Standard 1

Students will understand General Electrical Theory by differentiating between specific electrical laws and theories.

- Ohm's Law
- Kirchhoff's Laws
- Watt's Law
- Faraday's Law
- Lenz's Law
- Right-hand motor rule
- Electron theory (conventional flow vs. electron flow).

Standard 2

Students will explore concepts in General Electrical Theory.

- Magnetism.
- Capacitance and inductance in a circuit.
- Voltage.
- Current.
- Resistance.
 - Impedance
 - Resistance in series and in parallel
 - Total resistance
- Power.
- Circuit continuity.
- Electrostatic discharge.
- Electrical circuit drawings.
- Complex/combined circuits.

Standard 3

Students will demonstrate the use of DC Theory, circuits and measurements

- Direct current (DC) electrical circuits.
- Electrical measurement tools, principles, and procedures - DC Circuits
- Series circuits. Parallel circuits - DC
- Motors - DC

Standard 4

Students will demonstrate the use of AC Theory and circuits

- Alternating current (AC) electrical circuits.
- Electrical measurement tools, principles, and procedures - AC Circuits
- Series circuits. Parallel circuits - AC
- Motors - AC

Standard 5

Students will investigate circuit control, power regulation, and protection devices.

- Controlling devices, including switches and relays.
- Protective devices (fuses, circuit breakers, and current limiters).
- Resistor types and color coding.
- Transformers.
- Voltage regulation

Standard 6

Students will analyze the functioning, use, and handling of aircraft batteries.

Standard 7

Students will illustrate Electronic Circuit Theory and its components.

- Semiconductors (diodes, transistors, and integrated circuits).
- Digital logic (RAM, ROM, NVRAM, logic gates, inverter, rectifier, flip flop, and binary numbers).

Standard 8

Students will identify, assess, and mitigate risks associated with the maintenance and handling of aviation electronics.

- Handling, storage, working with/around, and inspection of different types of batteries (i.e., lead acid, NiCad, lithium ion, gel cell).
- High-voltage circuits (e.g., strobe lighting).

Performance Skills

- Read and interpret aircraft electrical circuit diagrams, and symbols, including solid-state devices and logic functions.
- Identify symbols used in electrical and electronic schematic diagrams (e.g., grounds, shields, resistors, capacitors, fuses, circuit breakers, batteries, diodes, transistors, and integrated circuits).
- Perform circuit continuity test. Measure voltage, current, and resistance. Measure voltage drop across a resistor. Test a switch or relay, fuse or circuit breaker.
- Troubleshoot a circuit. Demonstrate how to test for short-circuit and open-circuit conditions. Determine or measure for open electrical circuits.
- Inspect and service an aircraft battery.

STRAND 6

Students will identify and apply inspection concepts and techniques.

Standard 1

Students will inspect and test an aircraft using applicable materials, hardware, calibrations, and processes.

- Calibration and tool accuracy requirements. Tools, including calipers, micrometers, and gauges.
- Nondestructive Testing (NDT) procedures and methods.
- Aircraft inspection methods and tools for materials, hardware, and processes. Aircraft inspection programs (e.g., progressive, 100-hour, annual, AD's, and other FAA-approved inspections).

Standard 2

Students will identify, assess, and mitigate risks associated with inspection concepts and techniques.

- Identify the risks associated with not demagnetizing a component following a magnetic particle inspection.
- Calibration of precision measuring equipment.
- Proper selection of inspection techniques.
- Damage prevention to aircraft components and test equipment when using an ohmmeter.

Performance Skills

- Use measurement gauges (Vernier calipers and micrometers).
- Perform a visual inspection.
- Perform a dye penetrant inspection.
- Identify NDT methods for composite, surface metal, and subsurface metal defects.
- Perform a tap test on a composite component.
- Inspect aircraft for compliance with an AD.

STRAND 7

Students will understand the importance of career readiness skills as it relates to participation in TSA (Technology Student Association), SkillsUSA, or any other related CTSO in aviation-related fields.

Performance Skills

The following aviation workplace skills should be discussed, taught, re-enforced, and modeled throughout the strands and standards of the course:

- Communication
- Teamwork
- Critical and Creative Thinking
- Problem Solving
- Dependability