

# STRANDS AND STANDARDS

## AIRCRAFT SYSTEMS



### Course Description

Aircraft Systems will give students the knowledge to take and pass the FAA written exam and prepare them for flight. Some of the areas of study will include science of flight, aircraft engine systems, fueling systems, pressurization, electrical systems, hydraulic and pneumatic systems, and aircraft control systems and weight distribution.

<b>Intended Grade Level</b>	11-12
Units of Credit	Minimum 0.5
Core Code	40.11.00.00.042
Concurrent Enrollment Core Code	40.11.00.13.042
Prerequisite	Private Pilot
Skill Certification Test Number	--
Test Weight	--
<b>License Area of Concentration</b>	CTE and/or Secondary Education 6-12
<b>Required Endorsement(s)</b>	
Endorsement 1	Aviation - Flight
Endorsement 2	Aviation - Maintenance
Endorsement 3	--

## STRAND 1

Students will be able to understand the science of flight.

### Standard 1

Students will relate the physics involved in flight.

- General characteristics of matter
- Matter of measurement
- Fluids (behavior of air)
- Machines
- Work, energy, and power
- Friction
- Force and motion of bodies
- Vibration
- Resonance
- Systems

### Standard 2

Students will classify Aircraft engine types and their construction.

- The heat engine.
- Comparison of aircraft power plants (reciprocating vs. turbine engines).
- Types of reciprocation engines.
- Reciprocating engine design and construction.
- Engine components.

### Standard 3

Students will demonstrate reciprocating engine theory of operation

- Reciprocating gasoline engine operating principles
- Operating cycles
- Four-stroke cycle
- Engine power and efficiency
- Absolute and gauge pressure

## Performance Skills

Understand and explain the science of flight.

- Flight physics
- Aircraft engine types and construction
- Reciprocating engine theory of operation

## STRAND 2

Students will be able to understand and explain aircraft engine systems.

### Standard 1

Students will explain how engine lubrication and cooling systems function in an aircraft.

- Principles of engine lubrication
- Requirements and characteristics of reciprocating engine lubricants
- Internal lubrication
- System operation maintenance
- Engine cooling system (air-cooled systems vs. oil-cooled systems)
- Engine temperature control

### Standard 2

Students will apply knowledge of the propeller and governor systems.

- Propeller types & principles
- Propeller operations
- Constant-speed propellers vs. Fixed Pitch propellers
- Governor principles
- Unfeathering
- Propeller synchronization
- Propeller ice control systems (de-icing vs. anti-icing)

## Performance Skills

Understand and explain aircraft engine systems.

- Engine lubrication and cooling systems.
- Propeller and governor systems.

## STRAND 3

Students will demonstrate proper procedures in handling the aircrafts engine and interior comfort.

### Standard 1

Students will compare and classify aircraft fuels and fuel systems.

- Fuel types (100LL, Jet Fuel, AvGas, and MOGas).
- Fuels for reciprocating engines.
- Fuel metering systems and their associated gauges.
- Aircraft float carburetor.
- Carburetor icing and heating.
- Fuel injection systems.

## Standard 2

Students will identify and explain power management in an aircraft.

- RPM and MAP.
- Effect of air density on power output.
- Engine operations.
- Propeller-starting.
- Stopping procedure.

## Standard 3

Students will compare supercharging and turbocharging systems

- Turbocharging
- Turbo compound systems for reciprocating engines.

## Standard 4

Students will identify pressurization and high altitude operations.

- Altitude physiology.
- The atmosphere.
- Respiration and circulation.
- Hypoxia.
- Oxygen equipment.
- Hyperventilation.
- Dysbarism.
- Trapped gases.
- Cabin pressurization and decompression.
- Cabin pressurization systems.

## Performance Skills

Understand and demonstrate proper procedures in handling the aircrafts engine and interior comfort.

- Fuels and fuel systems.
- Power management.
- Supercharging and turbocharging.
- Pressurization and high altitude operations.

## STRAND 4

Students will be able to explain aircraft electrical systems.

### Standard 1

Students will demonstrate aircraft electrical principles.

- Electron flow.
- Units of electrical measure.
- Pressure.
- Metric prefixes and powers of ten.
- Static electricity.
- Electromagnetic fields.
- Distribution of electrical charges.
- Magnetism.
- Electromagnetics.
- Sources of electrical energy.
- Electromagnetic induction.
- Mechanical power in electrical circuits.
- Advantages of alternating current over direct current.
- Alternating current and its generation.

### Standard 2

Students will demonstrate the functions of aircraft electrical components.

- Modern battery system configurations.
- Battery servicing.
- Control of aircraft DC generators.
- Circuit control devices (circuit breakers and fuses).
- Inverters and diodes.
- Half-wave and full-wave rectifier.
- Transformers.

### Standard 3

Students will diagram aircraft electrical systems.

- Series and parallel circuits.
- Voltage and current measuring instruments / ammeters and load meters.
- The aircraft electrical system.
- Electrical system installation.
- Ignition system.
- Electrical circuit of the magneto.

## Performance Skills

Understand and explain aircraft electrical systems.

- Electrical principles.
- Electrical components.
- Aircraft electrical systems.

## STRAND 5

**Students will explain aircraft hydraulic and pneumatic systems.**

### Standard 1

Students will analyze aircraft hydraulic systems and landing gear.

- History of fluid power applications.
- Basic laws of fluid power.
- Fluid statics and dynamics.
- Hydraulic fluids.
- Hydraulic system components.
- Evolution of the aircraft hydraulic system.
- The power pack.
- Aircraft landing gear.
- Nose wheel steering and shimmy dampers.
- Aircraft brakes, wheels, tires and tubes.

### Standard 2

Students will demonstrate knowledge of pneumatic and de-icing systems.

- Pneumatic systems.
- Ice controls (de-icing vs. anti-icing).
- Rain control systems.

## Performance Skills

Understand and explain aircraft hydraulic and pneumatic systems.

- Hydraulic systems and landing gear.
- Pneumatic and de-icing systems.

## STRAND 6

Students will be able to understand and explain aircraft control systems and proper weight distribution.

### Standard 1

Students will identify aircraft structures and flight controls.

- Evolution of aircraft structures.
- Stresses and structure.
- Materials for aircraft construction.

### Standard 2

Students will identify and interpret the purpose of aircraft flight controls.

- Flight controls.
- Auxiliary lift devices.
- Control systems for large aircraft.

### Standard 3

Students will investigate weight and balance principles of an aircraft.

- Weight and balance.
- Adverse-loaded center of gravity.
- Balance changes after an alteration.

### Standard 4

Students will show and explain the purpose of inspections and pilot maintenance.

- Aircraft inspections.
- Pilot accomplished maintenance.
- Maintenance forms and records.

### Standard 5

Students will demonstrate knowledge of aircraft instrument systems.

- Classification of instruments.
- Pitot-static systems.
- Vacuum & pneumatic pump system instruments (gyro).
- New types of rate gyros.
- The magnetic compass.
- Electronic Flight Instrument System (EFIS).
- Engine Indicating and Crew Alerting System (EICAS).
- Flight data computer and Air Data Attitude Heading Reference System (ADAHRS).

## Performance Skills

Understand and explain aircraft control systems and proper weight distribution.

- Aircraft structures and flight controls.
- Weight and balance, inspections and pilot maintenance.
- Aircraft instrument systems.

## 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