



**MERCER**  
COUNTY COMMUNITY COLLEGE

## COURSE OUTLINE

<b>Course Number</b> AVI 131	<b>Course Title</b> Commercial Pilot I	<b>Credits</b> 3
<b>Hours: 3</b> Lecture	<b>Pre-requisite: MAT115</b> <b>Corequisite: MAT115</b>	<b>Implementation</b> Fall 2023

### **Catalog description:**

Essentials to pass the Federal Aviation Administration private pilot examination. Subjects include introduction to airplane systems, airports, communications and air traffic control, weight and balance, meteorology, Federal Aviation Regulations, aeronautical charts, radio navigation, Aeronautical Information Manual, flight computer, medical factors of flight and cross-country flying.

### **General Education Category:** **Not GenEd**

### **Course coordinator:**

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### **Required texts & Other materials:**

1. Private Pilot Manual by Jeppesen Sanderson – Latest Edition (ISBN 0884876608)
2. Private Pilot FAA Knowledge Test Prep by Irvin N. Gleim – Latest Edition (978-1-61854-447-6)

#### Optional:

1. Student Pilot's Flight Manual by William K. Kershner (ISBN 978-1-61854-447-6)
2. Pilot's Handbook of Aeronautical Knowledge by FAA (Free to download)
3. Federal Aviation Regulations / Aeronautical Information Manual (FAR/AIM) by FAA (2023 by ASA ISBN 1644252112)

Downloads available at [https://www.faa.gov/regulations\\_policies/handbooks\\_manuals](https://www.faa.gov/regulations_policies/handbooks_manuals)

### **Course Student Learning Outcomes (SLO):**

#### ***Upon successful completion of this course the student will be able to explain:***

1. Applicable Federal Aviation Regulations for private pilot privileges, limitations, and flight operations; [Supports ILGs #1, #4, and #9; PLOs #1, #4, and #6]
2. Accident reporting requirements of the National Transportation Safety Board; [Supports ILGs #1, #4, #5, and #9; PLOs #1, #4, #5, and #6]
3. Applicable subjects of the "Aeronautical Information Manual" and the appropriate FAA advisory circulars; [Supports ILGs #1, #4, and #9; PLOs #1, #4, and #6]
4. Aeronautical charts for VFR navigation using pilotage, dead reckoning, and navigation systems;
5. Radio communication procedures; [Supports ILGs #1, #2, #4, and #11; PLOs #1, #4, and #5]
6. Recognition of critical weather situations from the ground and in flight, windshear avoidance, and the procurement and use of aeronautical weather reports and forecasts; [Supports ILGs #1, #3, #4, #10, and #11; PLOs #1, #4, #5, and #6]
7. Safe and efficient operation of aircraft, including collision avoidance, and recognition and avoidance of wake turbulence; [Supports ILGs #1, #2, #3, #4, and #11; PLOs #1, #4, and #6]
8. Effects of density altitude on takeoff and climb performance; [Supports ILGs #1, #2, #4, and #11; PLOs #1, #4, and #5]

9. Weight and balance computations; [Supports ILGs #1, #2, #4, and #11; PLOs #1, #4, and #5]
10. Principles of aerodynamics, powerplants, and aircraft systems; [Supports ILGs #1, #2, #3, #4, and #11; PLOs #1, #4, and #5]
11. If the course of training is for an airplane category or glider category rating, stall awareness, spin entry, spins, and spin recovery techniques; [Supports ILGs #1 and #4; PLOs #1, #4, #5, and #6]
12. Aeronautical decision making and judgment; and [Supports ILGs #1, #4, #5, #9, #10, and #11; PLOs #1, #4, #5, and #6]
13. Preflight action that includes - [Supports ILGs #1, #2, #4, and #11; PLOs #1, #4, and #5]
  - a. How to obtain information on runway lengths at airports of intended use, data on takeoff and landing distances, weather reports and forecasts, and fuel requirements; and
  - b. How to plan for alternatives if the planned flight cannot be completed or delays are encountered.

**Course-specific Institutional Learning Goals (ILG):**

**Institutional Learning Goal 1. Written and Oral Communication in English.** Students will communicate effectively in both speech and writing.

**Institutional Learning Goal 2. Mathematics.** Students will use appropriate mathematical and statistical concepts and operations to interpret data and to solve problems.

**Institutional Learning Goal 3. Science.** Students will use the scientific method of inquiry, through the acquisition of scientific knowledge.

**Institutional Learning Goal 4. Technology.** Students will use computer systems or other appropriate forms of technology to achieve educational and personal goals.

**Institutional Learning Goal 5. Social Science.** Students will use social science theories and concepts to analyze human behavior and social and political institutions and to act as responsible citizens.

**Institutional Learning Goal 9. Ethical Reasoning and Action.** Students will understand ethical frameworks, issues, and situations.

**Institutional Learning Goal 10. Information Literacy:** Students will recognize when information is needed and have the knowledge and skills to locate, evaluate, and effectively use information for college level work.

**Institutional Learning Goal 11. Critical Thinking:** Students will use critical thinking skills understand, analyze, or apply information or solve problems.

**Program Learning Outcomes for Aviation Technology (PLO)**

1. Demonstrate the knowledge and skills required to obtain the private and commercial certificates and instrument rating, including aeronautical technical skills and decision-making, while demonstrating safety as their primary focus
4. Demonstrate effective and correct written and verbal communication
5. Research and present information pertinent to their aviation discipline individually and in teams
6. Demonstrate an awareness of the ethical and professional issues associated with the aviation industry, including the importance of becoming a life-long learner in the aviation world

## **Units of study in detail – Unit Student Learning Outcomes:**

### **Class 1**      **Course Introduction, 50 minutes**

#### **Learning Objectives**

The objective of this lesson is for the student to be informed through oral and written material what is expected of him/her to successfully complete the private ground instruction course.

#### **Lesson Content**

Student Expectations

A. The student is expected to understand:

1. Class Attendance Policy
2. Assignment Procedures
3. Testing Center Procedures
4. Absence Policy
5. Student Supplies and Text Requirements:
  - a) Text – Private Pilot Manual
  - b) E6B Computer or Equivalent
  - c) Plotter and/or Dividers
  - d) FAR/AIM – Current Edition
6. Pass the Private Pilot Computer Exam at the Completion of the Course (there is a fee for this exam)
7. Review Classroom Conduct Statement

#### **Lesson Completion Requirements**

The student will obtain all course handout material, proper text and associated equipment. The student will also understand his/her responsibilities for course completion.

#### **Next Assignment**

Introduction to the Airplane

## **Unit 1 Introduction to the Airplane, 250 minutes (SLOs 10 and 11)**

### **Learning Objectives**

The objective of this lesson is to gain an understanding of the varieties and components of aircraft and engines, theories of flight and basic aeronautics, and aircraft performance factors.

### **Lesson Objective**

- A. The student will be able to:
  1. Distinguish between different varieties of aircraft
  2. Define the major components of the airplane and engine
  3. Define the forces acting on the aircraft
  4. Explain the basic theory of lift
  5. Define terms related to basic aeronautics
  6. Define direct factors of basic aeronautics, such as: The Three Axis, Aircraft Stability, Torque Effect, Why the Aircraft Turns, Functions of the Primary and Secondary Flight Controls and the Principles Behind Them, and the Relationship Between Load Factors and Stall Speeds
  7. Define different factors affecting aircraft performance, such as Effects of Temperature, Density Altitudes, Gross Weight, and Humidity
  8. Read and interpret aircraft performance charts and be able to make informed decisions during pre-flight regarding determining runway lengths and direction, fuel required for safe flight, and alternatives if needed

### **Lesson Content**

Introduction to the Airplane

- A. The Airplane
  1. Varieties of Aircraft
    - a) Lighter-than-air
    - b) Gliders
    - c) Rotorcraft
    - d) Airplane
  2. Airplane Components
    - a) Wings
    - b) Fuselage or Body
    - c) Tail Assembly or Empennage
    - d) Landing Gear
    - e) Power Plant
- B. Aerodynamics
  1. Bernoulli's Principle
    - a) Venturi Principle
  2. Newton's Principle
    - a) Laws of Action and Reaction
  3. Airfoils
    - a) Leading Edge
    - b) Trailing Edge
    - c) Chord Line
    - d) Camber
    - e) Relative Wind
    - f) Angle of Attack

- g) Angle of Incidence
- 4. The Four Forces
  - a) Lift
  - b) Drag
  - c) Thrust
  - d) Gravity
- 5. The Stall
  - a) Factors Affecting the Stall Speeds and Characteristics
    - 1) Gross weight
    - 2) Flaps
    - 3) Angle of bank
    - 4) Load factor/ V-G Diagram
    - 5) Frost, snow, ice
    - 6) Turbulence
    - 7) Loading
    - 8) CG location
  - b) Types of Stalls
    - 1) Approach to landing (power off) stalls
    - 2) Takeoff and departure stalls (power on)
    - 3) Accelerated stalls
    - 4) Cross control stalls
    - 5) Elevator, trim tab stalls
  - c) Recovery Procedures for Stalls
  - d) Stall Awareness
  - e) Spins
    - 1) Spin awareness
    - 2) Spin entry
    - 3) Spin recovery techniques
- 6. Planform
  - a) Aspect Ratio
  - b) Straight Wing
  - c) Tapered Wing
  - d) Elliptical Wing
  - e) Swept Back Wing
  - f) Delta Wing
  - g) Wash-in and Wash-out
  - h) Stall Strips
- 7. Flaps
  - a) Plain Flap
  - b) Slotted Flap
  - c) Split Flap
  - d) Fowler Flap
- 8. The Three Axes
  - a) Longitudinal Axis
  - b) Lateral Axis
  - c) Vertical Axis
- 9. Aircraft Stability
  - a) Longitudinal Stability
  - b) Lateral Stability
  - c) Directional Stability
- 10. Turning Effects
  - a) Torque
  - b) Precession

- c) Asymmetrical Thrust
  - d) Spiraling Slipstream
11. Why the Aircraft Turns

- a) Lift
- b) Gravity
- c) Centrifugal Force
- d) Resultant Forces
- e)

C. **Lesson Completion Requirements**

D. The student must pass the unit test at the College Testing Center with a minimum grade of 84%.

E. **Next Assignment**

F. Airplane Systems

## **Unit 2 Airplane Systems, 150 minutes (SLO 10)**

### **Learning Objectives**

In order for a pilot to be fully competent in an airplane, it is necessary that he understand the aircraft systems. The student must be familiar with the operation of the systems which provide fuel, electricity, power and control of the aircraft on the ground and in flight.

### **Lesson Content**

#### Airplane Systems

- A. Flight Control Systems
  - 1. Ailerons
  - 2. Elevator and Stabilators
  - 3. Rudders
  - 4. Trim Systems
    - a) Trim Tab
    - b) Adjustable Stabilizer
    - c) Movable Tail
  
- B. Flight Instruments
  - 1. The Magnetic Compass
    - a) Magnetic Principles
    - b) Compass Construction
    - c) Deviation
    - d) Magnetic Dip
    - e) Turning Errors
    - f) Acceleration and Deceleration Errors
    - g) Turns Using the Magnetic Compass
  - 2. Outside Air Temperature Gauge
  - 3. Glass Cockpits
  - 4. Pilot-Static Pressure Instruments
    - a) Pitot-Static System
    - b) Airspeed Indicator
    - c) Altimeter
  - 5. Gyro Instruments
    - a) Gyroscopic Principles
    - b) Sources of Power for Gyro Operations
    - c) Attitude Gyro
    - d) The Directional Gyro
    - e) Turn-and-Slip Indicator
    - f) Turn Coordinator
    - g) Using the Flight Instruments in Combination
  
- C. The Reciprocating Engine and Related Systems
  - 1. The Reciprocating Engine
    - a) Cooling Engine
    - b) Cylinder Block Arrangements
    - c) Engine Power Cycle
    - d) Detonation
    - e) Pre-ignition
    - f) Ignition System
      - 1) Operation
      - 2) Magnetos
      - 3) Battery

- 4) Starter
  - 5) Spark plugs
  - 6) Carburetor
  - 7) Ignition switch
  - g) Lubrication System
  - h) Throttle
  - 2. Aircraft Propellers
    - a) Fixed-pitch Propellers
    - b) Constant-speed Propellers
- D. Airplane Fuel Systems
- 1. Types of Fuel Systems
    - a) Gravity-type Fuel Systems
    - b) Fuel Injection Systems
      - 1) Continental
      - 2) Textron Lycoming
  - 2. Fuel Supply Systems
    - a) Fuel Tanks
    - b) Fuel Tank Vent and Overflow Drains
    - c) Fuel Quantity Gauge
    - d) Fuel Selector Valves
    - e) Fuel Strainer
    - f) Primer
    - g) Fuel Pressure Gauge
  - 3. Engine Fuel System
    - a) Carburetor System
    - b) Mixture Control
    - c) Carburetor Heat System
  - 4. Refueling
    - a) Using Proper Fuel
- E. Electrical Systems
- 1. Alternator/Generator
  - 2. Ammeter
  - 3. Master Switch
  - 4. Fuses/Circuit Breakers

**Lesson Completion Requirements**

The student must pass the unit test at the College Testing Center with a minimum grade of 84%.

**Next Assignment**

Airplane Performance



### **Unit 3      Airplane Performance, 150 minutes (SLOs 8 and 9)**

#### **Learning Objectives**

The student must be able to determine the performance and capabilities of the aircraft under various conditions and ensure the safety and completion of a flight at all times.

#### **Lesson Content**

- A. Basic Airplane Performance
  - 1. Effects of Temperature and Altitude
  - 2. Density Altitude and Aircraft Performance
    - a) Density Altitude Graph
  - 3. Take-off and Landing Performance and Determining Needed Runway Length
    - a) Density Altitude
    - b) Headwind
    - c) Tailwind
    - d) Airplane Gross Weight
    - e) Runway Gradient and Type of Surface
    - f) Air Turbulence
    - g) Humidity
  - 4. Performance Charts
    - a) Take-off Performance Tables
    - b) Take-off Performance Graphs
    - c) Climb Performance Tables
    - d) Cruise Performance Tables
    - e) Cruise Performance Graphs
    - f) Landing Performance Tables
    - g) Landing Performance Graphs
    - h) Wind Component Chart
    - i) Time, Fuel, Distance Charts
    - j) Range
    - k) Endurance
    - l) Airspeed Calibration
    - m) Fahrenheit/Celsius Conversion
    - n) Stall Speeds
    - o) Glide Distances
  - 5. Wake Turbulence
    - a) Procedures for Operating Near Wake Turbulence

#### **Lesson Completion Requirements**

The student must pass the unit test at the College Testing Center with a minimum grade of 84%.

#### **Next Assignment**

Weight & Balance

## **Unit 4      **Weight & Balance, 150 minutes (SLO 9)****

### **Learning Objectives**

This unit has been prepared to acquaint the student with the importance of keeping within authorized weight and balance limits and to show how to check and control aircraft loading.  
*The student will be able to...*

1. Recognize the importance of weight and its effect on an aircraft.
2. Recognize the importance of balance and its effect on an aircraft.
3. Define the fundamental principles of weight and balance on an aircraft.
4. Calculate weight and balance problems on any aircraft which he/she is authorized to fly, by one of three methods:
  - a. Computation method
  - b. Graph method
  - c. Table method

### **Lesson Content**

#### **Weight & Balance**

- A. Weight and Balance Theory
  1. The Importance of Weight
    - a) Maximum Gross Weight
    - b) Empty Weight
    - c) Useful Load
    - d) Load Factor
    - e) Checking Gross Weight
  2. The Importance of Balance
    - a) Center of Gravity
    - b) Center of Gravity Range Forward and Aft
    - c) Datum Location
    - d) Effects of Forward Center of Gravity
  3. Weight and Balance Principles
    - a) Fulcrum
    - b) Arm
    - c) Moment
    - d) Equal Weights and Distances from Fulcrum
    - e) Distance = Arm
    - f) Weight x Arm = Moments
- B. Weight and Balance Calculation
  1. Computation Method
    - a) Sample Problems
  2. Graph Method
    - a) Sample Problems
  3. Table Method
    - a) Sample Problems
  4. Adding, Removing and Shifting Weight

### **Lesson Completion Requirements**

The student must pass the unit test at the College Testing Center with a minimum grade of 84%.

### **Next Assignment**

Airports, Radio Communications, ATC & Airspace

## **Unit 5      Airports, Radio Communications, ATC & Airspace, 225 minutes (SLO 5)**

### **Learning Objectives**

The student must be able to:

1. Recognize and identify airport features, such as: runway numbering, active runways, taxiways, parking areas, field elevation, wind direction indications, airport lighting, and airport traffic patterns.
2. Recognize and use the communication systems aboard the aircraft. The student must know the proper use of the microphone, proper radio phraseology, proper frequency utilization, and characteristics and limitations of radio signals.
3. Identify and become totally familiar with the Air Traffic Control system which includes airport terminal facilities, en route VFR communications, and emergency procedures.
4. Understand flight operations and be able to utilize appropriate collision avoidance procedures.
5. Be aware of wake turbulence, its causes and characteristics, and safe avoidance of it.
6. Be aware of the airspace they are flying in and the restrictions of that airspace

### **Lesson Content**

Airports, Radio Communications, ATC & Airspace

#### A. Airports

1. Runway Numbering, Airport Elevation
2. Runway Markings
  - a) Basic runway markings
  - b) Non-precision instrument runway markings
  - c) Precision instrument runway markings
  - d) Displaced threshold
  - e) Deceptive areas
  - f) Overrun, stopway, and blastpad areas
  - g) Closed runway markings
3. Taxiways
  - a) Runway boundary lines, non-movement boundary area
  - b) ILS Hold line, Taxiway edge line
4. Parking Areas
5. Wind Direction Indicators
  - a) Wind socks
  - b) Tetrahedron
  - c) Wind tee
6. Airport Lighting
  - a) Runway lights
  - b) Threshold lights
  - c) Taxiway lights
  - d) Rotating beacons
  - e) Approach lights
  - f) VASI system
  - g) PAPI's types, tri-color, pulsating system
  - h) Pilot controlled lighting
7. Airport Traffic Pattern
  - a) Takeoff leg
  - b) Crosswind leg
  - c) Downwind leg

- d) Base leg
- e) Final approach
- f) Traffic pattern entry
- g) Traffic pattern departure
- h) Segmented circle

## B. Radio Communications

### 1. Communication Systems

- a) VHF communications equipment
- b) Tuning
- c) Using the microphone
- d) Radio phraseology, phonetic alphabet
- e) Frequency utilization
- f) Characteristics and limitations of radio signals
- g) Light gun signals and their meaning
- h) Radio station license
- i) Restricted radio telephone operator permit

## C. Air Traffic Control

### 1. Airport Terminal Facilities

- a) Automatic terminal information service
- b) Clearance delivery
- c) Control tower
- d) Ground control
- e) Approach and departure control

### 2. En Route VFR Communications

- a) Flight service stations
- b) Air route traffic control centers
- c) Unicom
- d) Multicom

### 3. Emergency Procedures

- a) Communications
- b) Transponder codes
- c) D/F procedures
- d) Emergency locator beacons

## D. Airspace

### 1. Classes of Airspace

- a) A, B, C, D, E, and G
- b) Definitions of controlled and non-controlled airspace
- c) RVSM associated with Class A

### 2. Special Use Airspace

- a) Prohibited area
- b) Restricted area
- c) Warning area
- d) Alert area
- e) Military operations area
- f) Controlled firing area

### 3. Other Airspace

- a) ADIZ
- b) FRZ

### **Lesson Completion Requirements**

The student must pass the unit test at the College Testing Center with a minimum grade of 84%.

### **Next Assignment**

Navigation Charts & Flight Computer

## **Unit 6      Navigation Charts & Flight Computer, 150 minutes (SLO 4)**

### **Learning Objectives**

In order for a pilot to be competent in his navigation, he must possess the knowledge of and the ability to use charts and the flight computer. The student must be able to:

1. Distinguish between a WAC and Sectional chart and be familiar with their basic differences.
2. Read and interpret latitude and longitude in order to locate places on the earth's surface.
3. Define True North and Magnetic North and understand their importance with respect to navigation.
4. Measure direction in degrees of the compass.
5. Interpret all aeronautical and topographical information printed on the navigational charts.
6. Interpret airspace utilization and define airspace, including Class A, B, C, D, E, G, federal airways, transitional areas, control zones, and airport advisory areas.
7. Define special use airspace, such as: prohibited areas, restricted areas, warning areas, military operation areas, alert areas, controlled firing areas, military training routes, and national security areas.
8. Utilize the navigation plotter to determine course and distance off a navigational chart.
9. Calculate time, speed and distance problems on the flight computer.
10. Compute fuel consumption, endurance, and fuel remaining.
11. Perform airspeed corrections and compute density altitude by using the flight computer.
12. Compute true headings and ground speeds by using the wind side of the flight computer.

### **Lesson Content**

Navigation Charts & Flight Computer

- A. Sectional and WAC Charts
  1. Projections
    - a) Lambert Conformal Conic Projection
    - b) Mercator
  2. Latitude and Longitude
    - a) Lines of Parallels
    - b) Lines of Meridians
    - c) Prime Meridian
    - d) Degrees and Minutes
    - e) Geographical Coordinates
  3. The Earth's True North Pole and Magnetic North Pole
    - a) Variation
    - b) Measuring Direction in Degrees of the Compass
  4. Charts
    - a) Sectional Charts
    - b) Local Charts
    - c) VFR Terminal Area Charts
    - d) WAC Charts
    - e) Chart Interpretation and Use of Symbols

## B. Airspace Utilization

1. Class "G" Airspace
2. Controlled Airspace
  - a) Class "A" Airspace
  - b) Continental Control Area
  - c) VOR Federal Airways
  - d) Transition Areas
  - e) Control Zones and TRSA's (Terminal Radar Service Areas)
  - f) Class "D" Airspace
  - g) Airport Advisory Areas
  - h) Class "B" Airspace
  - i) Class "C" Airspace
  - j) Military Training Areas
3. Special Use Airspace
  - a) Prohibited Area
  - b) Restricted Area
  - c) Warning Area
  - d) Military Operation Area
  - e) Alert Area
  - f) Controlled Firing Area
  - g) National Security Areas

## C. The Navigation Plotter

1. Conventional Navigation Plotter
  - a) Protractor, Scales, Straightedge
  - b) Using the Plotter
2. Computer Wind Slide/Plotter
3. Rotating Azimuth Plotter

## D. Flight Computer

1. Calculator Side
  - a) The Scales
    - 1) Scales A, B, and C
    - 2) Changing Values
  - b) Time, Speed, and Distance Computations
  - c) Fuel Consumption
    - 1) Finding Endurance
    - 2) Computing Amount of Fuel
    - 3) Finding Fuel Consumption
  - d) Airspeed Corrections
    - 1) True Airspeed
  - e) Density Altitude Computations
  - f) Conversion Indexes
2. Wind Side
  - a) Understanding Wind Effects on:
    - 1) Ground Speed
    - 2) Aircraft Drift
    - 3) True Course vs. True Heading
  - b) Problem Solving
    - 1) Finding True Heading and Ground Speed
  - c) Other Computer Uses

### **Lesson Completion Requirements**

The student must pass the unit test at the College Testing Center with a minimum grade of 84%.

### **Next Assignment**

Cross-Country Flight Planning

## **Unit 7      **Cross-Country Flight Planning, 150 minutes (SLOs 4, 5, 6, 7, and 13)****

### **Learning Objectives**

*The student must be able to:*

1. Select the proper chart for use in navigation.
2. Draw the proper course, pick out prominent checkpoints, measure the true course, determine magnetic variation, and magnetic course.
3. Determine True Airspeeds, find magnetic headings and ground speeds.
4. Determine time and fuel required for the trip.
5. Complete and file an FAA Flight Plan.
6. Locate an ICAO Flight Plan and complete the form.

### **Lesson Content**

Cross-Country Flight Planning

#### A. Flight Planning

1. Selecting the Charts
2. Drawing the Course
3. Checkpoints
4. Measuring the True Course
5. Magnetic Variation
6. Magnetic Course
7. Obtaining Weather Information
  - a) Weather at Destination
  - b) En Route Weather
  - c) Alternate
  - d) Frontal Activity
  - e) Winds Aloft Forecast
  - f) NOTAMS
  - g) Sigmets Airmets
8. Determining True Airspeed
9. Finding Magnetic Heading and Ground Speed
10. Time Required to Fly the Trip / Calculating Fuel Utilization
11. Compass Heading
12. Federal Aviation Administration Flight Plan
13. Fuel Requirements for VFR Flight

#### B. Flying a VFR Trip

1. Pre-Taxi
2. En Route
3. Landing

### **Lesson Completion Requirements**

The student must pass the unit test at the College Testing Center with a minimum grade of 84%.

### **Next Assignment**

Flight Publications

## **Unit 8      Flight Publications, 150 minutes (SLOs 1 and 3)**

### **Learning Objectives**

Pilot procedures and knowledge requirements are constantly changing. New airports are opening, old ones are closing, new regulations replace old ones, some radio facilities are temporarily closed for repair, and others are shut down permanently. New factors affecting safety of flight are uncovered while new flight routes and techniques are established. These are a few important reasons why a pilot must learn to read and understand the Aeronautical Information Manual (AIM) and the Chart Supplements and become familiar with and use Advisory Circulars (AC).

The student must be able to read and interpret the Aeronautical Information Manual and use such deciphered information in determining the safety of his flight.

### **Lesson Content**

Flight Publications

- A. Part 1 of the Aeronautical Information Manual
  - 1. Glossary of Aeronautical Terms
  - 2. Navigation Aids
  - 3. The Airspace
  - 4. Air Traffic Control
  - 5. Safety of Flight
  
- B. Chart Supplements
  - 1. Table of Contents and Information Provided
  - 2. Radio Navigation Facilities – including high and low altitude VOR's & DME's
  - 3. Special Notices
  - 4. Notices to Airmen – NOTAM's
  - 5. VOR Receiver Checks
  
- C. Advisory Circular System and Use

### **Lesson Completion Requirements**

The student must pass the unit test at the College Testing Center with a minimum grade of 84%.

### **Next Assignment**

Radio Navigation

## **Unit 9      Radio Navigation, 150 minutes (SLO 4)**

### **Learning Objectives**

In order for a pilot to be competent in his navigation, he must understand and be able to utilize to its fullest Radio Navigation. The student must be able to:

- 1. Define and put to practical use the basic principles of VOR navigation, DME and Area navigation, GPS and the use of Radar and transponders in practical navigation.
- 2. Develop practical techniques in combining the different methods of radio navigation as described above.

### **Lesson Content**

Radio Navigation



- A. Very High Frequency Omni-directional Range (VOR)
  - 1. VOR Principle
    - a) VOR Radials
    - b) TACAN
    - c) VORTAC
    - d) VOR-DME
  - 2. The VOR Receiver
    - a) Course Deviation Indicator (CDI)
    - b) TO-FROM Indicator
    - c) Course Selector (OBS)
  - 3. VOR Navigation Procedures
    - a) VOR Indications
    - b) VOR Practice Problems
    - c) Reverse Needle Sensing
    - d) Intercepting an Inbound and Outbound Course
    - e) Using the VOR for a Crosscheck
    - f) VOR Orientation and Identification
    - g) VOR Test Signals
    - h) Time to Station and Distance to Station Calculations
  
- B. DME and Area Navigation
  - 1. Distance Measuring Equipment
    - a) Slant Distance
  - 2. Area Navigation
    - a) Doppler Radar System
    - b) Inertial Navigation System
    - c) Course Line Computer
  
- C. Radar and Transponders
  - 1. Radar Principles
    - a) Echo
    - b) Target
  - 2. Radar
    - a) Airport Surveillance Radar (ASR)
    - b) Precision Approach Radar (PAR)
    - c) ARTCC (center)
    - d) VFR Radar Services
  - 3. Transponders
    - a) Air Traffic Control Radar Beacon System (ATCRBS)
    - b) Primary Radar
    - c) Secondary Radar
  - 4. Transponder Phraseology
  - 5. Transponder Codes
  
- D. GPS
  - 1. Principles of Operation
  - 2. Information Provided by GPS
  - 3. Garmin 430 Operation
    - a) Self-Test Page
    - b) Navigation
    - c) Waypoint
    - d) Nearest Facility
    - e) Discuss Above Pages

### **Lesson Completion Requirements**

The student must pass the unit test at the College Testing Center with a minimum grade of 84%.

### **Next Assignment**

Weather Theory and Weather Data

## **Unit 10      Weather Theory & Weather Data, 300 minutes (SLOs 6 and 7)**

### **Learning Objectives**

An understanding of meteorology is one of the most important areas of knowledge for the aviator. Throughout the history of aviation, adverse weather has hampered flight operations, and has been the cause of accidents for “un-weatherconscious” pilots. Today, modern aircraft are capable of flying in most kinds of meteorological conditions and can perform instrument landings in extremely marginal conditions of ceilings and visibility. The student must be able to:

1. Interpret and explain the basic principles of atmospheric circulation.
2. Define air masses and air mass source regions.
3. Recognize and interpret the different cloud formations and types.
4. Interpret elements of weather which included moisture, temperature, and stability.
5. Determine the effects of pressure and wind changes on the weather.
6. Interpret effects of fog, haze, and smoke on visibility conditions.
7. Recognize and define fronts and their characteristics.
8. Recognize the different stages of a thunderstorm, the danger associated with thunderstorms, and how to avoid them.
9. Interpret weather reports and forecasts such as DUAT reports, METAR hourly aviation weather reports, TAF forecasts, area forecasts, winds aloft forecasts, and in-flight advisories.
10. Interpret weather charts that include: surface analysis charts, weather depiction charts, and low-level significant weather prognostic charts.

### **Lesson Content**

Weather Theory & Weather Data

- A. Weather Theory
  1. Basic Atmospheric Circulation
    - a) Heating of the Earth
    - b) Earth Rotation
    - c) Coriolis Effect
  2. Air Masses
    - a) Air Mass Source Regions
    - b) Air Mass Modifications
  3. Cloud Formation and Type
    - a) Classifications of Clouds
    - b) High Clouds
    - c) Middle Clouds
    - d) Low Clouds
    - e) Clouds with Vertical Development
  4. Elements of Weather
    - a) Moisture
    - b) Temperature
    - c) Stability

- d) Temperature Inversions
- 5. Pressures and Winds
  - a) Station Pressure
  - b) Types of Pressure Systems
  - c) Pressure Gradient
  - d) Friction Effect
  - e) Local Wind Systems
- 6. Effects of Elements of Weather
  - a) Fog Formation and Types
  - b) Haze and Smoke
  - c) Visibility Restriction Due to Wind
  - d) Obscured Sky Conditions
- 7. Fronts
  - a) Discontinuities Across Fronts
  - b) Factors Influencing Frontal Weather
  - c) Cold Fronts
  - d) Warm Fronts
  - e) Stationary Fronts
  - f) Occluded Fronts
- 8. Thunderstorms
  - a) Stages of the Thunderstorm
  - b) Micro Bursts
  - c) Clear Air Turbulence
  - d) Wind Shear Definitions
- 9. Weather in Mountainous Areas
  - a) Mountain Wave
- 10. Icing
  - a) Rime Ice
  - b) Clear Ice
  - c) Frost
  - d) Freezing Rain

## B. Weather Reports and Forecasts

- 1. Weather Services
- 2. Hourly Aviation Weather Reports, METAR
  - a) Location
  - b) Time
  - c) Wind
  - d) Visibility
  - e) Runway Visual Range
  - f) Significant Present and Forecast Weather
  - g) Cloud Amount, Height and Type
  - h) Temperature (Celcius), Dewpoint
  - i) Altimeter Setting
- 3. Terminal Forecasts, TAF
- 4. Area Forecasts
- 5. Winds Aloft Forecasts
- 6. In-Flight Advisories
  - a) Sigments
  - b) Airmets
  - c) Pireps

## C. Weather Charts

1. Surface Analysis Chart
  - a) Station Models
  - b) Isobars
  - c) Pressure System Locations
  - d) Front Locations
2. Weather Depiction Chart
  - a) Station Model
  - b) Visibility and Ceiling Boundary Codes
3. Low-Level Significant Weather Prognostic Charts
  - a) Prognosis for 12 Hours
  - b) Prognosis for 24 Hours
  - c) Low-level Prognostic Chart Symbols
4. Radar Summary Chart

**Lesson Completion Requirements**

The student must pass the unit test at the College Testing Center with a minimum grade of 84%.

**Next Assignment**

Federal Aviation Regulations & NTSB

**Unit 11      **Federal Aviation Regulations & NTSB, 300 minutes (SLOs 1 and 2)****

**Learning Objectives**

The student will acquire the knowledge necessary to correctly interpret and adhere to the Federal Aviation Regulations pertaining to the operation and procedures required of a Private Pilot. The student must be able to:

1. State the definitions listed in Part 1 of the FAR's.
2. Define and interpret the regulations listed in Part 43, 61, 67, 71, 73, 141 of the FAR's.
3. Define, interpret, and put to practical use the regulations stipulated in Part 91 of the FARs.
4. Interpret all regulations pertaining to aircraft accidents, incidents, overdue aircraft, and safety investigations which are issued by the Department of Transportation on Part 830.

**Lesson Content**

Federal Aviation Regulations & NTSB

- A. FAR (Federal Aviation Regulation) Part 1
  1. Part 1 of the FARs alphabetically lists the definitions of terms used in the subsequent regulations. In addition, any abbreviations or symbols used in the FARs are defined and explained in Part 1. Only those definitions of significant importance or of general interest to the student and private pilot have been included.
- B. FAR Part 61 (Certification: Pilots and Flight Instructors)
 

Note: This lesson will be broken down into the various sub-parts of FAR Part 61.

  - 61.3 Requirements for Certificates, Ratings, and Authorizations
  - 61.15 Offenses Involving Alcohol or Drugs
  - 61.17 Temporary Certificate
  - 61.19 Duration of Pilot and Instructor Certificates
  - 61.23 Medical Certificates: Requirement and Duration

- 61.31 Type Rating Requirements, Additional Training, and Authorization Requirements
- 61.51 Pilot Logbooks
- 61.56 Flight Review
- 61.57 Recent Flight Experience: Pilot in Command
- 61.60 Change of Address
- 61.69 Glider Towing: Experience and Training Requirements
- 61.113 Private Pilot Privileges and Limitations: Pilot in Command

#### SUBPART B – Aircraft Ratings and Special Certificates

- 61.61 Applicability
- 61.63 Additional Aircraft Rating (other than Airline Transport Pilot)
- 61.69 Glider Towing: Experience and Instruction Requirements
- 61.71 Graduates of Certificated Flying Schools: Special Rules
- 61.73 Military Pilots or Former Military Pilots: Special Rules
- 61.75 Pilot Certificate Issued on Basis of a Foreign Pilot License

#### SUBPART C – Student Pilots

- 61.81 Applicability
- 61.83 Eligibility Requirements: Student Pilots
- 61.85 Applications
- 61.87 Solo Flight: Requirements for Student Pilots
- 61.89 General Limitations
- 61.91 Aircraft Limitations: Pilot in Command
- 61.93 Cross-Country Flight Requirements
  - 61.95 Operations in Class B Airspace and at Airports Located within Class B Airspace

#### SUBPART D – Private Pilots

- 61.102 Applicability
- 61.103 Eligibility Requirements: General
- 61.105 Aeronautical Knowledge
- 61.107 Flight Proficiency
- 61.109 Airplane Rating: Aeronautical Experience
- 61.111 Cross-Country Flights: Pilots Based on Small Islands
- 61.113 Private Pilot Privileges and Limitations: Pilot in Command
  - 61.117 Private Pilot Privileges and Limitations: Second in Command of Aircraft Requiring More than One Pilot

#### C. FAR Part 91 (General Operating and Flight Rules)

Note: This lesson will be broken down into the various sub-parts of FAR Part 91.

- 91.3 Responsibility and Authority of the Pilot in Command
- 91.7 Civil Aircraft Airworthiness
- 91.9 Civil Aircraft Flight Manual, Marking, and Placard Requirements
- 91.13 Careless or Reckless Operation
- 91.15 Dropping Objects
- 91.17 Alcohol or Drugs
- 91.103 Preflight Action
- 91.105 Flight Crewmembers at Stations

91.107 Use of Safety Belts, Shoulder Harnesses, and Child Restraint Systems  
91.111 Operating near Other Aircraft  
91.113 Right-of-Way Rules: Except Water Operations  
91.115 Right-of-Way Rules: Water Operations  
91.117 Aircraft Speed  
91.119 Minimum Safe Altitudes: General  
91.121 Altimeter Settings  
91.123 Compliance with ATC Clearances and Instructions  
91.130 Operations in Class C Airspace  
91.131 Operations in Class B Airspace  
91.133 Restricted and Prohibited Areas  
91.135 Operations in Class A Airspace  
91.137 Temporary Flight Restrictions  
91.151 Fuel Requirements for Flight in VFR Conditions  
91.153 VFR Flight Plan: Information Required  
91.155 Basic VFR Weather Minimums  
91.157 Special VFR Weather Minimums  
91.159 VFR Cruising Altitude or Flight Level  
91.203 Civil Aircraft: Certifications Required  
91.205 Instrument and Equipment Requirements  
91.207 Emergency Locator Transmitters  
91.209 Aircraft Lights  
91.211 Supplemental Oxygen  
91.215 ATC Transponder and Altitude Reporting Equipment and Use  
91.303 Aerobatic Flight  
91.307 Parachutes and Parachuting  
91.313 Restricted Category Civil Aircraft: Operating Limitations  
91.319 Aircraft Having Experimental Certificates: Operating Limitations  
91.403 General  
91.405 Maintenance Required  
91.407 Operation after Maintenance, Preventive Maintenance, Rebuilding, or Alteration  
91.409 Inspections  
91.413 ATC Transponder Tests and Inspections  
91.417 Maintenance Records  
91.519 Passenger Briefings

D. NTSB Part 830 (National Transportation Safety Board – Safety Investigation Regulations)

Note: This lesson will be broken down into the various sub-parts of FAR Part 830.

830.5 Immediate Notification  
830.10 Preservation of Aircraft Wreckage, Mail, Cargo, and Records  
830.15 Reports and Statements to Be Filed

**Lesson Completion Requirements**

The student must pass the unit test at the College Testing Center with a minimum grade of 84%.

**Next Assignment**

Medical Factors of Flight

## **Unit 12      Medical Factors of Flight, 75 minutes (SLO 12)**

### **Learning Objectives**

The student must:

1. Recognize the interrelationship between oxygen, altitude, and the body, the effects of the atmosphere in the body and the respiratory cycle.
2. Be familiar with gas transfer within the body and how it is affected by oxygen and altitude.
3. Recognize the effects of vertigo and vision in all flight parameters.
4. Be totally familiar with the effects of drugs, flight effects, and alcohol on the body in flight.

### **Lesson Content**

Medical Factors of Flight

- A. Oxygen, Altitude and the Body
  1. The Atmosphere
    - a) Gas Composition
    - b) Atmospheric Pressure and Altitude
  2. Respiration
    - a) Oxygen Used in the Body
  3. Gas Transfer
    - a) Oxygen Transfer
  4. Oxygen Needs and Availability
    - a) Hypoxia
    - b) Time of Useful Consciousness
    - c) Recovery from Hypoxia
    - d) Prevention of Hypoxia
    - e) Aircraft Oxygen Systems
  5. Carbon Dioxide
    - a) Hyperventilation
- B. Vertigo and Vision
  1. Vertigo
    - a) Spatial Disorientation
    - b) Instrument Conditions
    - c) Ground Light vs. Stars
    - d) Flicker Vertigo
  2. Vision in Flight
    - a) Night Vision
    - b) Diet and Night Vision
    - c) Carbon Monoxide and Night Vision
    - d) Smoking and the Effects on Night Vision
- C. Flight Effects, Drugs and Alcohol
  1. Airlsickness
    - a) Physical Factors
    - b) Environmental Factors
    - c) Mental Factors
    - d) Preventive Aids
  2. Drugs

- a) Drug Side Effects
  - b) Aspirin
  - c) Nose Drops and Inhalers
  - d) Antihistamines
  - e) Cough Medicines
  - f) Tranquilizers
  - g) Pep Pills
  - h) Motion Sickness Drugs
3. Anesthetics
  4. Blood Donations
  5. Carbon Monoxide
  6. Alcohol
  7. Psychological Considerations
    - a) Anxiety and Stress

D. Aeronautical Decision Making

1. Judgment
2. Resource Management
3. Situational Awareness
4. Hazardous Attitudes and Self-Assessment

**Lesson Completion Requirements**

The student must pass the unit test at the College Testing Center with a minimum grade of 84%.

**College Final**

**Learning Objectives**

The student will have successfully completed all chapter tests with a mastery indication of 84% or better on each test. The college final will be taken after all unit tests are mastered.

Upon completion of the above requirement, and upon an evaluation completed by the instructor on the successful completion of the course by the student, the instructor may give the student authorization to take the FAA Private Pilot Computer Examination.

A failure grade on the FAA Private Pilot Computer Examination will result in a failure grade for the class.

**Evaluation of student learning:**

Grading Criteria:

Unit Tests	30%
In-Class Quizzes	30%
FAA Knowledge Test*	20%
Class Work**	20%
Total	100%

\*A score of less than 70 on the FAA Knowledge Test will result in a failure for AVI 131

\*\*Projects, Homework, Participation