

Instrument Pilot Ground Instruction Lesson Plan

Preflight Preparation – Flight Instruments

Student: _____ Date: _____

Objectives:

Upon completion of this lesson, the student will:

- Be able to describe the flight instrument system(s) and their operating characteristics, including:
 - Pitot-static system
 - Altimeter
 - Airspeed Indicator
 - Vertical Speed Indicator
 - Attitude Indicator
 - Horizontal Situation Indicator
 - Magnetic Compass
 - Turn and slip indicator/Turn Coordinator
 - Heading Indicator
 - Tachometer and Manifold Pressure Gauge

Elements:

- Instrument groupings – Pitch, Bank and Power
- Gyroscopic principles
- Instrument operation and limitations
- Preflight procedures related to flight instruments

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Schedule:

• Pre-lesson briefing	00:05
• Pitot-Static System Overview	00:05
• Pitot-Static Instruments	00:10
– Altimeter	
– Vertical Speed Indicator	
– Airspeed Indicator	
• Vacuum System Overview	00:05
• Vacuum System Instruments	00:10
– Attitude Indicator	
– Heading Indicator	
– Gyroscopic Principles	
• Magnetic Compass	00:10
– Theory of operation	
– Magnetic dip	
– Compass errors	
– Timed compass turns	
• Turn and Slip Indicator/Turn Coordinator	00:05
• Horizontal Situation Indicator	00:05
• Tachometer and Manifold Pressure	00:05
• Instrument Groupings	00:10
– Pitch	
– Bank	
– Power	
• Review of lessons learned/questions and answers	00:10
	Total: 01:20

Equipment:

- Cockpit wall poster showing flight instruments.
- Actual instruments removed from airplane if possible.
- POH and/or Flight Manual for the airplane.
- Toy Gyroscope.

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Instructor Actions:

1. Pre-lesson briefing
 - Present lesson objective and outline of the lesson.
2. Pitot-Static System
 - Provide overview of the Pitot-Static system; use diagrams from the POH for the airplane being used.
 - Describe the operation and limitations of:
 - The altimeter.
 - The Vertical Speed Indicator.
 - The Airspeed Indicator.
 - Discuss failure possibilities due to icing of the pitot tube, static port or both.
 - Discuss instrument errors using backup static source.
 - Discuss pre-flight checks and maintenance requirements (check every 24 months).
3. Vacuum System
 - Provide overview of the vacuum system.
 - Explain gyroscopic principles (use toy gyroscope to demonstrate)
 - Describe the operation and limitations of.
 - The Attitude Indicator
 - The Heading Indicator
 - Discuss failures due to:
 - Vacuum failure
 - Tumbling due to unusual attitudes
 - Discuss standby vacuum system if available.
 - Discuss pre-flight checks
4. Magnetic Compass
 - Discuss theory of operation.
 - Explain Magnetic dip and the errors it causes.
 - Explain timed compass turns.
 - Discuss pre-flight checks.
5. Turn and Slip Indicator/Turn Coordinator.
 - Discuss theory of operation.
 - Horizontal component of lift versus centrifugal force.
 - Explain standard rate turns.
 - Discuss pre-flight checks.
6. Horizontal Situation Indicator
 - Explain that it's a combination of the Heading indicator and OBS.
 - Usually the Heading Indicator is slaved to a remote compass; explain slaved and free mode operation.
 - Explain OBS operation.

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7. Tachometer and Manifold Pressure
 - Explain uses
8. Instrument Groupings
 - Pitch Instruments
 - Altimeter
 - Vertical speed Indicator
 - Attitude Indicator
 - Airspeed Indicator
 - Bank Instruments
 - Heading Indicator (or HSI)
 - Turn Coordinator
 - Attitude Indicator
 - Magnetic Compass
 - Power Instruments
 - Tachometer
 - Manifold Pressure
 - Airspeed Indicator
9. Post Lesson Debriefing
 - Review the material covered in the class
 - Answer student questions.
 - Ask student questions to evaluate what was learned.
 - Explain what will be covered in the next lesson and assign reading material.

Student Actions:

1. Pre-lesson briefing
 - Ask for clarification of the lesson objective and outline if necessary.
2. Instrument explanations
 - Listen attentively.
 - Ask questions.
3. Post Lesson Debriefing
 - Ask for clarification of anything that is not fully understood.
 - Answer instructors questions to evaluate what was learned.
 - Ask any questions pertaining to the next lesson.

Completion Standards:

This lesson will be completed when the student is able to describe the operation, limitations and use of the flight instruments

Common Errors:

- None.

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References:

- Pilot's Handbook of Aeronautical Knowledge (FAA-H-8083-25); Chapter 6
- Instrument Flying Handbook (FAA-H-8083-15); Chapter 3
- Instrument PTS Area of Operation II, Task B.

Possible Review Questions: