

SESSION 22: AIRCRAFT SYSTEMS — PITOT-STATIC SYSTEM OPERATION AND FAILURES

1. Which three instruments are driven by the pitot-static system?

- A. Attitude indicator, heading indicator, turn coordinator
- B. Tachometer, manifold pressure gauge, fuel flow
- C. Magnetic compass, attitude indicator, VSI
- D. Airspeed indicator, altimeter, vertical speed indicator

2. The airspeed indicator measures the difference between:

- A. Static pressure and cabin pressure
- B. Ram air pressure and cabin pressure
- C. Pitot (ram) pressure and static pressure
- D. Total pressure and manifold pressure

3. The altimeter and the VSI both operate using:

- A. Ram air pressure from the pitot tube only
- B. Cabin differential pressure
- C. Static pressure only
- D. Vacuum from the engine-driven pump

4. If the pitot tube ram-air inlet becomes blocked but the drain hole remains open, the airspeed indicator will:

- A. Continue to read normally

- B. Drop toward zero
- C. Read increasingly high in a climb
- D. Freeze at the current indication

5. If the pitot tube becomes blocked at both the ram inlet AND the drain hole (trapped pressure), the airspeed indicator will:

- A. Drop immediately to zero
- B. Read normally throughout the flight
- C. Behave like an altimeter — increasing in a climb, decreasing in a descent
- D. Reverse its indication entirely

6. When the static port becomes blocked, the altimeter will:

- A. Freeze at the altitude where the blockage occurred
- B. Read increasingly high in a climb
- C. Drop immediately to zero
- D. Continue to read accurately

7. With a blocked static port, the vertical speed indicator will:

- A. Read zero (no vertical rate indication)
- B. Read an exaggerated climb rate
- C. Read an exaggerated descent rate
- D. Read accurately throughout

8. With a blocked static port, the airspeed indicator will read erroneously:

- A. High in a climb and low in a descent

- B. Low in a climb and high in a descent
- C. Always zero regardless of phase
- D. Always exactly correct

9. The alternate static source remedies a blocked static port by:

- A. Switching the static instruments to ram air pressure
- B. Connecting the static instruments to cabin air pressure
- C. Disabling the airspeed indicator entirely
- D. Routing pitot pressure to the static side

10. When the alternate static source (cabin air) is selected in an unpressurized aircraft, the altimeter typically reads:

- A. Slightly high, because cabin pressure is slightly lower than outside static
- B. Slightly low, because cabin pressure is higher than outside
- C. Exactly the same as the normal source
- D. Zero until the source is deselected

11. If no alternate static source is installed, an emergency technique to restore static pressure is to:

- A. Open the cabin door slightly in flight
- B. Increase airspeed to force air into the static line
- C. Turn off the pitot heat
- D. Break the glass face of the VSI

12. Breaking the VSI face as an emergency static source works because:

- A. It vents ram air to all three instruments

- B. The VSI is the most important static instrument
- C. It recalibrates the altimeter automatically
- D. It exposes the static line to cabin pressure, the least critical instrument to sacrifice

13. The most insidious aspect of a blocked static port in IMC is that:

- A. The airspeed indicator immediately fails, alerting the pilot
- B. A frozen altimeter gives no indication of an actual descent
- C. The VSI displays a violent climb rate
- D. All three instruments fail simultaneously and obviously

14. A pilot in a climb notices the airspeed indicator increasing at constant power and pitch. The most likely cause is:

- A. A blocked pitot tube (ram inlet and drain) trapping pressure
- B. A blocked static port only
- C. A failed vacuum pump
- D. An over-rich fuel mixture

15. Pitot heat prevents pitot blockage caused by:

- A. Insects accumulating on the ground
- B. Excessive ram air at high speed
- C. Dust in dry climates
- D. Ice forming in the pitot tube in visible moisture near freezing

16. The recognition technique that reveals a pitot-static failure is to:

- A. Rely solely on the suspect instrument

- B. Disregard the pitot-static instruments entirely
- C. Restart the engine to reset the system
- D. Cross-check the suspect instrument against the others and the known aircraft state

17. A pilot suspects a blocked static system because the altimeter is not changing during a known descent. The correct action is to:

- A. Increase the descent rate to force the altimeter to move
- B. Ignore the altimeter and use GPS altitude only
- C. Select the alternate static source
- D. Disconnect the autopilot immediately

18. When using the alternate static source, the pilot must apply correction values because:

- A. Cabin air pressure differs slightly from external static pressure
- B. The pitot tube becomes the primary pressure source
- C. The instruments switch to vacuum power
- D. The magnetic compass becomes unreliable

19. A blocked pitot ram inlet (drain open) on the takeoff roll would be revealed by:

- A. The altimeter reading high
- B. The airspeed indicator failing to come alive or reading near zero
- C. The VSI showing a rapid climb
- D. The attitude indicator tumbling

20. Why is unreliable airspeed manageable by attitude and power?

- A. Airspeed has no relationship to pitch and power

- B. A known pitch attitude and power setting produce a known, safe airspeed for a configuration
- C. The autopilot automatically maintains airspeed without the indicator
- D. The magnetic compass provides backup airspeed data

21. The static port is positioned on the aircraft to sense:

- A. Undisturbed ambient (static) atmospheric pressure
- B. Ram air pressure from forward motion
- C. Engine manifold pressure
- D. Cabin differential pressure

22. A pilot flying with a blocked static port and the alternate static source unavailable, with the VSI face intact, should expect:

- A. Accurate altimeter and airspeed throughout
- B. The airspeed indicator to read correctly
- C. Only the heading indicator to be affected
- D. Frozen altimeter, zero VSI, and erroneous airspeed until a static source is restored

23. The key reference values a pilot should memorize to fly with an unreliable airspeed indicator are:

- A. The pitch attitudes and power settings for level, climb, descent, and approach
- B. The aircraft's empty weight and CG range
- C. The transponder codes for each phase of flight
- D. The frequencies for each ATC sector

24. A blocked static port causing the airspeed to read low in a climb is dangerous because:

- A. It causes the engine to run rough

- B. It triggers an automatic autopilot disconnect
- C. The pilot may pitch down to "regain" airspeed, accelerating into an unsafe descent
- D. It has no effect on aircraft control

25. The fundamental safeguard against an undetected pitot-static failure in IMC is:

- A. Disabling the static instruments before flight
- B. A disciplined instrument cross-check that correlates all instruments against known aircraft state
- C. Reliance on a single primary instrument
- D. Increasing cruise airspeed to maximum

ANSWER KEY & EXPLANATIONS – SESSION 22

1. D. ASI/altimeter/VSI — The airspeed indicator, altimeter, and vertical speed indicator are driven by the pitot-static system.
2. C. Pitot vs. static — The airspeed indicator measures the difference between pitot (ram) pressure and static pressure.
3. C. Static only — The altimeter and VSI both operate using static pressure.
4. B. Drops toward zero — With the ram inlet blocked but drain open, trapped pressure bleeds out and airspeed drops toward zero.
5. C. Acts like altimeter — With both the ram inlet and drain blocked, trapped pressure makes the airspeed behave like an altimeter (increasing in a climb, decreasing in a descent).
6. A. Freezes — A blocked static port freezes the altimeter at the blockage altitude.

7. A. Reads zero — With a blocked static port, the VSI reads zero (no vertical rate indication).
8. B. Low climb/high descent — With a blocked static port, the airspeed reads low in a climb and high in a descent.
9. B. Cabin air — The alternate static source connects the static instruments to cabin air pressure.
10. A. Slightly high — On the alternate (cabin) source in an unpressurized aircraft, the altimeter typically reads slightly high because cabin pressure is slightly lower than outside static.
11. D. Break VSI face — With no alternate static source, breaking the glass face of the VSI restores static pressure.
12. D. Least critical — Breaking the VSI face exposes the static line to cabin pressure and sacrifices the least critical static instrument.
13. B. Frozen altimeter hides descent — The insidious danger is that a frozen altimeter gives no indication of an actual descent in IMC.
14. A. Blocked pitot trapping pressure — Airspeed increasing at constant power and pitch in a climb indicates a blocked pitot (ram inlet and drain) trapping pressure.
15. D. Ice in visible moisture — Pitot heat prevents blockage from ice forming in the pitot tube in visible moisture near freezing.
16. D. Cross-check — A pitot-static failure is revealed by cross-checking the suspect instrument against the others and the known aircraft state.
17. C. Alternate static — If the altimeter is frozen during a known descent, select the alternate static source.

18. A. Cabin differs from static — Correction values are applied because cabin air pressure differs slightly from external static pressure.

19. B. ASI fails to come alive — A blocked pitot ram inlet (drain open) is revealed on the takeoff roll by the airspeed indicator failing to come alive or reading near zero.

20. B. Pitch + power = airspeed — Unreliable airspeed is manageable because a known pitch attitude and power setting produce a known, safe airspeed for a configuration.

21. A. Ambient static — The static port senses undisturbed ambient (static) atmospheric pressure.

22. D. Frozen alt/zero VSI/bad ASI — With a blocked static port and no alternate source (VSI intact), expect a frozen altimeter, zero VSI, and erroneous airspeed until a static source is restored.

23. A. Pitch/power settings — The key memorized references are the pitch attitudes and power settings for level, climb, descent, and approach.

24. C. Pitch-down trap — A low-reading airspeed in a climb is dangerous because the pilot may pitch down to "regain" airspeed, accelerating into an unsafe descent.

25. B. Disciplined cross-check — The fundamental safeguard is a disciplined instrument cross-check correlating all instruments against known aircraft state.