

SESSION 46: INSTRUMENT FLIGHT — MIXED SCENARIO: IMC ENCOUNTER AND SYSTEMS FAILURE

1. In stable cruise, you maintain altitude using the control/performance method. The primary instrument for altitude in level flight is the:

- A. Attitude indicator
- B. Altimeter
- C. Vertical speed indicator
- D. Airspeed indicator

2. Your scan returns frequently to the attitude indicator because, as a control instrument, it:

- A. Directly displays the pitch and bank attitude you are setting
- B. Shows the aircraft's altitude
- C. Indicates the heading
- D. Displays the navigation course

3. You notice the vacuum gauge has dropped below the green range. You should suspect:

- A. An impending vacuum failure affecting the attitude and heading indicators
- B. A pitot blockage
- C. A static blockage
- D. An electrical bus failure

4. Shortly after, the attitude indicator slowly shows a bank, but the turn coordinator, altimeter, and heading all indicate wings-level, constant heading and altitude. You conclude:

- A. The turn coordinator failed
- B. The altimeter failed
- C. The aircraft is actually banking
- D. The attitude indicator has failed due to the vacuum loss

5. Recognizing the vacuum failure, your first priority is to:

- A. Shut off the master switch
- B. Begin a rapid descent
- C. Maintain aircraft control using the remaining reliable instruments
- D. Disregard the turn coordinator

6. On partial panel now, you maintain pitch control primarily using the:

- A. Magnetic compass
- B. Airspeed indicator, altimeter, and VSI
- C. Turn coordinator
- D. Heading indicator

7. You maintain bank/heading control primarily using the:

- A. Failed attitude indicator
- B. Turn coordinator and magnetic compass
- C. Altimeter
- D. Airspeed indicator

8. As you work the problem, you glance down at a chart and immediately feel a strong tumbling sensation. This is the:

- A. Coriolis illusion, triggered by the head movement
- B. Somatogravic illusion
- C. False horizon
- D. Autokinesis

9. The correct response to the disorienting sensation is to:

- A. Re-enter a turn to relieve it
- B. Look outside for a horizon
- C. Trust the bodily feeling
- D. Disregard the sensation and fly the reliable instruments

10. Distracted by the sensation, you let the nose drop. You now see the airspeed increasing, the altimeter unwinding, and the VSI showing a descent. This indicates a:

- A. Nose-low unusual attitude
- B. Nose-high unusual attitude
- C. Coordinated turn
- D. Level flight condition

11. Because your attitude indicator is unreliable (vacuum failed), you recognize the nose-low attitude using the:

- A. Attitude indicator
- B. Magnetic compass
- C. Airspeed, altimeter, and VSI

D. Navigation display

12. The correct recovery from this nose-low unusual attitude is to:

A. Add full power and pull back hard

B. Increase the bank

C. Maintain the dive

D. Reduce power, level the wings, then gently raise the nose to level flight

13. You level the wings BEFORE raising the nose because:

A. The nose cannot be raised in a bank

B. The airspeed must increase first

C. Power must be added first

D. Pulling back while banked tightens the spiral and increases load factor

14. Recovered and stabilized on partial panel, you need to turn to a heading of 270. With no heading indicator, you use:

A. The attitude indicator

B. The VSI

C. A timed standard-rate turn, and the magnetic compass allowing for its errors

D. The altimeter

15. To turn 90 degrees at standard rate, you hold the turn for approximately:

A. 15 seconds

B. 45 seconds

C. 30 seconds

D. 60 seconds

16. Rolling out near a westerly heading using the magnetic compass, you remember the compass reads most accurately when:

A. Straight, level, and unaccelerated

B. In a turn

C. Accelerating

D. Decelerating

17. You declare the situation to ATC and request assistance. A no-gyro approach is helpful because the controller:

A. Restores the vacuum system

B. Provides a backup attitude reference

C. Issues "turn left/right" and "stop turn" commands you fly with the turn coordinator

D. Flies the aircraft remotely

18. During the no-gyro approach, ATC has you make standard-rate turns except:

A. You use the attitude indicator instead

B. On final approach, where half-standard-rate turns are used

C. You ignore the ball

D. You use the heading indicator

19. Throughout the partial-panel approach, you keep your control inputs:

A. Large and abrupt to correct quickly

B. Based on bodily sensations

- C. Small and smooth, with a disciplined cross-check of the remaining instruments
- D. Focused on the failed attitude indicator

20. You also choose, where possible, an approach that:

- A. Has the lowest minimums regardless of type
- B. Requires the most turns
- C. Uses circling in marginal conditions
- D. Provides a course reference (e.g., ILS or GPS) to reduce heading-management workload

21. The reason the vacuum failure was so hazardous early on is that:

- A. It failed all instruments instantly and obviously
- B. The gradual drift of the attitude indicator could have led you to follow a false attitude into loss of control
- C. It affected only the magnetic compass
- D. It caused an engine failure

22. The single most important defense that carried you through the disorientation was:

- A. Relying on the inner ear
- B. Trusting and flying the reliable instruments over conflicting sensations
- C. Looking outside for a horizon
- D. Increasing airspeed

23. The control/performance discipline that anchored the whole sequence was:

- A. Setting a known attitude and power on the reliable instruments and verifying performance, then making small corrections

- B. Fixating on whichever instrument showed the largest deviation
- C. Ignoring power entirely
- D. Relying on a single instrument

24. The DPE asks what tied the entire Area IV sequence together. The best answer:

- A. Maintaining aircraft control by reference to the reliable instruments — through normal flight, failure recognition, disorientation, unusual attitude, and partial panel
- B. Selecting the destination
- C. Computing the fuel reserve
- D. Copying the clearance

25. Summarizing Area IV, the DPE asks the single governing principle of flight by reference to instruments. It is:

- A. The pilot's sensations are the most reliable reference
- B. A single primary instrument is sufficient
- C. Automation removes the need for a cross-check
- D. The pilot must maintain precise control by trusting and interpreting the instruments, even when the body and a failed instrument say otherwise

ANSWER KEY & EXPLANATIONS – SESSION 46

1. B. Altimeter — In level flight, the primary instrument for altitude is the altimeter.

2. A. Displays set attitude — The attitude indicator is a control instrument because it directly displays the pitch and bank attitude you are setting.

3. A. Impending vacuum failure — A vacuum gauge below the green range indicates an impending vacuum failure affecting the attitude and heading indicators.
4. D. Attitude indicator failed — A gradual bank on the attitude indicator contradicted by the TC/altimeter/heading indicates the attitude indicator failed due to the vacuum loss.
5. C. Maintain control — The first priority on recognizing the vacuum failure is to maintain aircraft control using the remaining reliable instruments.
6. B. ASI/altimeter/VSI — On partial panel, pitch control is maintained primarily using the airspeed indicator, altimeter, and VSI.
7. B. TC and compass — Bank/heading control is maintained primarily using the turn coordinator and magnetic compass.
8. A. Coriolis — A strong tumbling sensation triggered by a head movement during the workload is the coriolis illusion.
9. D. Fly the instruments — The correct response to the disorienting sensation is to disregard it and fly the reliable instruments.
10. A. Nose-low — Increasing airspeed, unwinding altimeter, and descending VSI indicate a nose-low unusual attitude.
11. C. ASI/altimeter/VSI — With the attitude indicator unreliable, the nose-low attitude is recognized using the airspeed, altimeter, and VSI.
12. D. Power reduce/level/raise — The nose-low recovery is to reduce power, level the wings, then gently raise the nose to level flight.
13. D. Pulling in bank tightens spiral — Wings are leveled before raising the nose because pulling back while banked tightens the spiral and increases load factor.

14. C. Timed turn + compass — With no heading indicator, the turn to 270 uses a timed standard-rate turn with the magnetic compass allowing for its errors.

15. C. 30 seconds — A 90-degree standard-rate turn ($3^\circ/\text{sec}$) takes about 30 seconds.

16. A. Straight/level/unaccelerated — The magnetic compass reads most accurately when straight, level, and unaccelerated.

17. C. ATC turn commands — A no-gyro approach helps because the controller issues "turn left/right" and "stop turn" commands flown with the turn coordinator.

18. B. Half-standard on final — In a no-gyro approach, turns are standard rate except on final, where half-standard-rate turns are used.

19. C. Small/smooth + cross-check — Partial-panel approach control inputs are kept small and smooth, with a disciplined cross-check of the remaining instruments.

20. D. Course-reference approach — Where possible, choose an approach providing a course reference (ILS or GPS) to reduce heading-management workload.

21. B. Gradual drift hazard — The vacuum failure was hazardous because the gradual drift of the attitude indicator could have led to following a false attitude into loss of control.

22. B. Trust the instruments — The most important defense through the disorientation was trusting and flying the reliable instruments over conflicting sensations.

23. A. Set attitude/power, verify — The anchoring control/performance discipline was setting a known attitude and power on the reliable instruments and verifying performance, then making small corrections.

24. A. Control by reliable instruments — Area IV is tied together by maintaining aircraft control by reference to the reliable instruments through every phase.

25. D. Trust/interpret instruments — The governing principle of flight by reference to instruments is that the pilot must maintain precise control by trusting and interpreting the instruments, even when the body and a failed instrument say otherwise.