SESSION 27: FLIGHT INSTRUMENTS — PFD, MFD, ADS-B, AND EFB OPERATIONS

1. A Primary Flight Display (PFD) integrates which information onto a single screen?

A. Engine instruments and fuel quantity only

B. Attitude, airspeed, altitude, vertical speed, and heading

C. The moving map and traffic only

D. Weather radar and lightning detection exclusively

2. The Multi-Function Display (MFD) typically presents:

A. The primary attitude reference only

B. Only the airspeed tape

C. A moving map, navigation data, weather, traffic, and system information

D. The magnetic compass card exclusively

3. On a glass PFD, airspeed is most commonly displayed as:

A. A round analog dial in the upper left

B. A digital number with no trend information

C. A circular gauge identical to a steam instrument

D. A vertical tape on the left side of the display

4. On a glass PFD, altitude is most commonly displayed as:

A. A vertical tape on the right side of the display

B. A round analog altimeter in the center

C. A digital readout in the lower corner only

D. Part of the moving map

5. The Air Data Computer (ADC) in a glass cockpit provides the PFD with:

A. Attitude and heading information

B. Engine performance data

C. Pitot-static-derived data: airspeed, altitude, and vertical speed

D. GPS position only

6. The Attitude and Heading Reference System (AHRS) provides the PFD with:

A. Attitude and heading information, replacing the spinning-gyro instruments

B. Pitot-static airspeed and altitude

C. Engine and fuel data

D. Weather radar returns

7. A failure of the ADC or AHRS in a glass cockpit:

A. Can remove primary flight data from the PFD, requiring use of standby instruments

B. Has no effect on the displayed flight information

C. Affects only the MFD moving map

D. Disables only the transponder

8. Glass-cockpit aircraft are required to carry standby instruments because:

A. The PFD is more reliable than steam gauges

B. A display, ADC, or AHRS failure could remove primary flight information, requiring an independent backup

C. The MFD cannot display a map

D. The autopilot needs them

9. ADS-B Out broadcasts which information about the aircraft?

A. The pilot's medical certificate status

B. The aircraft's maintenance history

C. GPS-derived position, altitude, velocity, and identification

D. The fuel quantity remaining

10. ADS-B Out is required to operate in which airspace?

A. Generally the same airspace that required a Mode C transponder (Class A, B, C, and specified areas)

B. Only above FL600

C. Only in Class G airspace

D. Only at non-towered airports

11. ADS-B In, distinct from ADS-B Out, allows the aircraft to:

A. Broadcast its position to ATC

B. Replace the transponder entirely

C. Provide vertical guidance for approaches

D. Receive traffic (TIS-B) and weather (FIS-B) information in the cockpit

12. FIS-B, available through ADS-B In, provides:

A. Real-time radar vectors

B. Glideslope guidance

C. Weather products such as METARs, TAFs, NEXRAD, and AIRMETs/SIGMETs

D. Engine monitoring data

13. A limitation of NEXRAD weather displayed via FIS-B is that it:

A. Is delayed and not suitable for tactical thunderstorm penetration decisions

B. Updates continuously in real time with no lag

C. Provides higher resolution than onboard radar

D. Shows only clear-air conditions

14. An Electronic Flight Bag (EFB) is best described as:

A. A required primary navigation source for all IFR flights

B. A portable electronic device displaying charts, documents, and aeronautical information

C. A backup attitude instrument

D. A replacement for the certified GPS navigator

15. A pilot using an EFB for charts in IFR flight should:

A. Rely on it as the sole navigation source for approaches

B. Disable the certified avionics

C. Use it without any backup plan

D. Have a backup (paper or a second device) in case the EFB fails

16. A PFD "red X" through a display field typically indicates:

A. The information is highlighted for emphasis

B. The autopilot is engaged

C. That data source has failed and the information is invalid/unavailable

D. The aircraft is on the glideslope

17. The slip-skid indicator on a glass PFD is usually presented as:

A. A separate round inclinometer below the panel

B. A small trapezoid/bar beneath the bank pointer at the top of the attitude display

C. A digital number near the airspeed tape

D. Part of the moving map

18. A pilot transitioning from steam gauges to a glass PFD must adapt their scan because:

A. The information is in different locations and integrated, changing the scan pattern

B. Glass displays require no scan at all

C. The attitude information is no longer shown

D. The PFD removes the need to monitor airspeed

19. ADS-B position information is derived from:

A. A ground-based radar return

B. The aircraft's pitot-static system

C. A GPS/GNSS position source

D. The magnetic compass

20. TIS-B traffic displayed via ADS-B In should be understood as:

A. An aid to situational awareness, not a substitute for see-and-avoid or ATC separation

B. A guarantee that all traffic is displayed

C. A replacement for ATC separation services

D. A primary collision-avoidance authority overriding ATC

21. A glass-cockpit failure mode that removes the PFD entirely requires the pilot to:

A. Land immediately at the nearest airport in all cases

B. Continue using the PFD by cycling power repeatedly

C. Disregard the standby instruments

D. Transition to the standby attitude indicator, altimeter, and airspeed indicator

22. The EFB's "own-ship" position display on a moving map georeferenced chart:

A. Replaces the certified navigator for approach guidance

B. Eliminates the need to monitor the certified avionics

C. Aids situational awareness but is not approved as a primary means of navigation for IFR approaches

D. Is prohibited in all IFR operations

23. An advantage of the integrated glass cockpit for IFR is:

A. It eliminates the need for any backup instruments

B. Consolidated information can reduce scan workload and improve situational awareness when properly managed

C. It removes the need for a current database

D. It guarantees the autopilot will fly the approach

24. A pilot should treat datalink weather (FIS-B) as:

A. Real-time, suitable for close-in storm avoidance

B. Strategic planning information with inherent latency, not for tactical storm penetration

C. A replacement for preflight weather briefings

D. Identical in timeliness to onboard radar

25. The fundamental principle for using advanced displays (PFD/MFD/ADS-B/EFB) in IFR is that they:

A. Eliminate the need for pilot proficiency

B. Replace all conventional instruments and procedures

C. Guarantee safety regardless of pilot input

D. Are tools that enhance awareness but require understanding their sources, modes, and failure indications

ANSWER KEY & EXPLANATIONS – SESSION 27

1. B. Integrated flight data — The PFD integrates attitude, airspeed, altitude, vertical speed, and heading onto a single screen.

2. C. Map/nav/weather/traffic — The MFD presents a moving map, navigation data, weather, traffic, and system information.

3. D. Vertical tape left — Airspeed on a glass PFD is commonly a vertical tape on the left side.

4. A. Vertical tape right — Altitude on a glass PFD is commonly a vertical tape on the right side.

5. C. Pitot-static data — The Air Data Computer provides pitot-static-derived airspeed, altitude, and vertical speed.

6. A. Attitude/heading — The AHRS provides attitude and heading information, replacing the spinning-gyro instruments.

7. A. Removes primary data — An ADC or AHRS failure can remove primary flight data from the PFD, requiring standby instruments.

8. B. Backup for failure — Standby instruments are required because a display, ADC, or AHRS failure could remove primary flight information.

9. C. Position/alt/velocity/ID — ADS-B Out broadcasts GPS-derived position, altitude, velocity, and identification.

10. A. Mode C airspace — ADS-B Out is generally required in the same airspace that required a Mode C transponder (Class A, B, C, and specified areas).

11. D. Receive traffic/weather — ADS-B In allows receiving traffic (TIS-B) and weather (FIS-B) in the cockpit.

12. C. Weather products — FIS-B provides weather products such as METARs, TAFs, NEXRAD, and AIRMETs/SIGMETs.

13. A. Delayed/not tactical — FIS-B NEXRAD is delayed and not suitable for tactical thunderstorm penetration decisions.

14. B. Portable chart/document device — An EFB is a portable electronic device displaying charts, documents, and aeronautical information.

15. D. Have a backup — A pilot using an EFB for charts in IFR should have a backup (paper or a second device) in case it fails.

16. C. Source failed/invalid — A red X through a PFD field indicates that data source has failed and the information is invalid/unavailable.

17. B. Trapezoid under bank pointer — The glass-PFD slip-skid indicator is a small trapezoid/bar beneath the bank pointer at the top of the attitude display.

18. A. Different locations/scan — Transitioning to a glass PFD changes the scan because information is in different, integrated locations.

19. C. GPS/GNSS — ADS-B position information is derived from a GPS/GNSS source.

20. A. Awareness aid — TIS-B traffic is an aid to situational awareness, not a substitute for see-and-avoid or ATC separation.

21. D. Standby instruments — A total PFD failure requires transitioning to the standby attitude indicator, altimeter, and airspeed indicator.

22. C. Awareness, not primary nav — The EFB own-ship display aids awareness but is not approved as a primary means of navigation for IFR approaches.

23. B. Reduced workload — A glass cockpit can reduce scan workload and improve situational awareness when properly managed.

24. B. Strategic with latency — Datalink weather is strategic planning information with inherent latency, not for tactical storm penetration.

25. D. Tools requiring understanding — Advanced displays are tools that enhance awareness but require understanding their sources, modes, and failure indications.