

# SESSION 25: FLIGHT INSTRUMENTS — VOR, ILS, DME, AND MARKER BEACON SYSTEMS

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1. A VOR operates by allowing the receiver to determine the aircraft's:
  - A. Distance from the station in nautical miles
  - B. Groundspeed relative to the station
  - C. Altitude above the station
  - D. Magnetic bearing (radial) to or from the station
  
2. VOR signals are line-of-sight, which means reception is limited by:
  - A. Terrain, obstructions, and the curvature of the earth at low altitude
  - B. The aircraft's airspeed
  - C. The time of day only
  - D. The pilot's medical certificate class
  
3. Full-scale deflection of a VOR CDI represents approximately how many degrees of course deviation?
  - A. 2 degrees
  - B. 5 degrees
  - C. 10 degrees
  - D. 20 degrees
  
4. Because VOR CDI sensitivity is angular, the same number of degrees of deviation represents:
  - A. A smaller lateral distance close to the station and a larger distance far from it

- B. A constant lateral distance regardless of range
- C. A larger lateral distance close to the station
- D. No lateral displacement at any range

5. The localizer component of an ILS provides:

- A. Vertical guidance along the glidepath
- B. Lateral guidance aligned with the runway centerline
- C. Distance information to the threshold
- D. The missed approach altitude

6. The glideslope component of an ILS provides:

- A. Lateral course guidance to the runway
- B. Vertical guidance, typically along a 3-degree descent path
- C. The runway visual range
- D. The minimum descent altitude

7. The localizer CDI is more sensitive than a VOR CDI, with full-scale deflection representing approximately:

- A. 10 degrees, the same as a VOR
- B. 5 degrees
- C. 2.5 degrees (about four times more sensitive than a VOR)
- D. 20 degrees

8. The standard ILS glideslope angle is approximately:

- A. 1.5 degrees

- B. 3 degrees
- C. 6 degrees
- D. 9 degrees

9. DME (Distance Measuring Equipment) provides the pilot with:

- A. The aircraft's magnetic heading
- B. The lateral course deviation
- C. The glideslope angle
- D. Slant-range distance to the DME station

10. "Slant range" error in DME is greatest when the aircraft is:

- A. Close to the station and at high altitude (nearly overhead)
- B. Far from the station at low altitude
- C. Exactly on the published radial
- D. Tuned to the wrong frequency

11. Marker beacons on an ILS provide:

- A. Lateral course corrections
- B. Glidepath angle adjustments
- C. Distance in nautical miles continuously
- D. Aural and visual indications at specific points along the approach

12. The outer marker on an ILS is typically located at:

- A. The runway threshold

- B. The middle of the final approach
- C. The decision height point
- D. The glideslope intercept point / final approach fix area

13. The outer marker is identified by which indication?

- A. A white light and a high-pitched tone
- B. A green light and a steady tone
- C. A blue light and a series of low-pitched dashes
- D. A red light and continuous dots

14. A localizer back course, when published, provides:

- A. Lateral guidance to a runway using the localizer signal from the opposite direction (without glideslope)
- B. A second glideslope for the reciprocal runway
- C. DME-based vertical guidance
- D. A precision approach with standard ILS minimums

15. When flying a localizer back course, CDI indications may be "reverse sensing" unless:

- A. The DME is tuned correctly
- B. The pilot uses an HSI set to the front-course inbound heading, or applies reverse-sensing technique
- C. The glideslope is captured first
- D. The marker beacons are disabled

16. A VOR receiver check is required for IFR operations to ensure the equipment is:

- A. Accurate within published tolerances

- B. Tuned to the correct frequency only
- C. Receiving GPS augmentation
- D. Connected to the autopilot

17. Identifying a VOR or localizer by its Morse code identifier confirms:

- A. The pilot is receiving the correct, operational station
- B. The aircraft's distance from the station
- C. The glideslope is operational
- D. The transponder is functioning

18. A "to/from" indicator on a VOR display tells the pilot:

- A. The aircraft's groundspeed
- B. Whether the selected course would take the aircraft to or from the station
- C. The distance to the station
- D. The glideslope deviation

19. As an aircraft passes directly over a VOR station, the pilot observes:

- A. A momentary CDI fluctuation and a to/from flag flip in the "cone of confusion"
- B. A steady, accurate CDI throughout
- C. An immediate glideslope capture
- D. A loss of all electrical power

20. The middle marker on an ILS is associated with the aircraft being near:

- A. The glideslope intercept point

- B. The initial approach fix
- C. The decision height on a Category I ILS
- D. The missed approach holding fix

21. A pilot tuning an ILS frequency should expect to receive:

- A. Only the DME signal
- B. Both the localizer and the glideslope on the paired frequency
- C. Only the localizer
- D. Marker beacons exclusively

22. DME is paired with the ILS or VOR frequency, meaning the pilot:

- A. Must tune a separate DME frequency manually
- B. Cannot use DME with an ILS
- C. Tunes the VOR/ILS frequency and the DME automatically pairs to the associated channel
- D. Receives DME only above 18,000 feet

23. When the glideslope is unavailable or the aircraft is not glideslope-equipped, the ILS may be flown as a:

- A. Precision approach with the same minimums
- B. Visual approach only
- C. Localizer (LOC) non-precision approach to a higher MDA
- D. Circling approach exclusively

24. VOR navigation accuracy degrades with distance from the station primarily due to:

- A. The aircraft's increasing airspeed

- B. Magnetic variation changes
- C. DME interference
- D. The angular nature of the signal, where the same angle spans more distance farther out

25. The fundamental reason a pilot must identify and verify ground-based nav aids before use is to:

- A. Calculate the required fuel
- B. Ensure the navigation guidance is from the intended, operational station and is reliable
- C. Establish the weight and balance
- D. Determine the alternate minimums

## **ANSWER KEY & EXPLANATIONS – SESSION 25**

1. D. Magnetic bearing — A VOR lets the receiver determine the aircraft's magnetic bearing (radial) to or from the station.
2. A. Line-of-sight limits — VOR reception is line-of-sight, limited by terrain, obstructions, and earth curvature at low altitude.
3. C. ~10 degrees — Full-scale VOR CDI deflection represents approximately 10 degrees of course deviation.
4. A. Smaller close, larger far — Because deviation is angular, the same degrees represent a smaller lateral distance close to the station and a larger distance far away.
5. B. Lateral/centerline — The localizer provides lateral guidance aligned with the runway centerline.
6. B. Vertical/3° path — The glideslope provides vertical guidance, typically along a 3-degree descent path.

7. C.  $\sim 2.5^\circ$ ,  $4\times$  sensitive — The localizer is about four times more sensitive than a VOR, with full-scale deflection near 2.5 degrees.
8. B. 3 degrees — The standard ILS glideslope angle is approximately 3 degrees.
9. D. Slant range — DME provides slant-range distance to the DME station.
10. A. Overhead/high — Slant-range error is greatest when the aircraft is close to the station and at high altitude (nearly overhead).
11. D. Aural/visual at points — Marker beacons provide aural and visual indications at specific points along the approach.
12. D. GS intercept/FAF area — The outer marker is typically at the glideslope intercept point / final approach fix area.
13. C. Blue light/low dashes — The outer marker is identified by a blue light and a series of low-pitched dashes.
14. A. LOC opposite direction — A localizer back course provides lateral guidance using the localizer signal from the opposite direction, without glideslope.
15. B. HSI front-course/technique — Back course CDI may reverse-sense unless the pilot uses an HSI set to the front-course inbound heading or applies reverse-sensing technique.
16. A. Within tolerances — The VOR receiver check ensures the equipment is accurate within published tolerances for IFR.
17. A. Correct operational station — Identifying the Morse code identifier confirms the pilot is receiving the correct, operational station.

18. B. To/from course — The to/from indicator tells whether the selected course would take the aircraft to or from the station.

19. A. Cone of confusion — Passing over a VOR produces a momentary CDI fluctuation and to/from flag flip in the cone of confusion.

20. C. Cat I DH — The middle marker is associated with the aircraft being near the decision height on a Category I ILS.

21. B. LOC + GS paired — Tuning an ILS frequency provides both the localizer and the glideslope on the paired frequency.

22. C. Auto-pairs — DME is paired with the VOR/ILS frequency, so tuning that frequency automatically pairs the DME channel.

23. C. LOC non-precision — Without glideslope, the ILS may be flown as a localizer non-precision approach to a higher MDA.

24. D. Angular signal — VOR accuracy degrades with distance due to the angular nature of the signal, where the same angle spans more distance farther out.

25. B. Reliable intended guidance — Identifying and verifying nav aids ensures the guidance is from the intended, operational station and is reliable.