SESSION 54: NAVIGATION — FLY-BY VS. FLY-OVER WAYPOINTS AND TURN ANTICIPATION

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1. A "fly-by" waypoint is one at which the RNAV system:

A. Overflies the waypoint before turning

B. Begins the turn before the waypoint to smoothly join the next leg (turn anticipation)

C. Enters a hold

D. Reverses course

2. A "fly-over" waypoint is one at which the aircraft must:

A. Turn before the waypoint

B. Cross/overfly the waypoint before commencing the turn to the next leg

C. Begin a descent

D. Hold

3. On a chart, a fly-over waypoint is depicted by a:

A. Circle drawn around the waypoint star/symbol

B. Square box

C. Triangle

D. Diamond

4. A fly-by waypoint is depicted by:

A. A circled symbol

B. A four-pointed star symbol without a surrounding circle

C. A solid triangle

D. A diamond

5. "Turn anticipation" at a fly-by waypoint means the navigator commands the turn:

A. After passing the waypoint

B. Exactly over the waypoint

C. Before reaching the waypoint, based on groundspeed and the turn angle, to roll out on the next course

D. Only in a hold

6. A fly-over waypoint is used where the procedure design requires the aircraft to:

A. Turn early to save time

B. Pass over a specific point (e.g., for obstacle or procedure-design reasons) before turning

C. Reverse course only

D. Maintain a constant DME

7. The amount of turn anticipation (lead distance) at a fly-by waypoint increases with:

A. Lower altitude

B. A smaller turn angle

C. A current database

D. Higher groundspeed and a larger turn angle

8. An "RF leg" (radius-to-fix leg) is a constant-radius curved path that:

A. Is flown by timing only

B. Requires the pilot to manually estimate the arc

C. Is a straight segment

D. The navigator flies precisely between two fixes, like a curved track of defined radius

9. RF legs require the aircraft and navigator to be:

A. Equipped with DME

B. Above FL180

C. Authorized/capable of flying RF legs (a specific RNP capability)

D. In VMC

10. A "path terminator" (e.g., TF, CF, DF) in the coded procedure defines:

A. The transponder code

B. The type of path to fly and how the leg terminates, which the navigator uses to construct the route

C. The fuel reserve

D. The alternate airport

11. A "TF" (Track to Fix) leg is:

A. A holding pattern

B. A constant-radius arc

C. A heading to an altitude

D. A straight track between two defined fixes

12. A "DF" (Direct to Fix) leg is:

A. A constant-radius arc

B. A holding pattern

C. A direct path from the present position to a fix

D. A heading to a radial

13. The pilot should anticipate a fly-over waypoint's behavior because the aircraft will:

A. Turn early, potentially cutting a corner

B. Enter a hold automatically

C. Overshoot beyond the waypoint before turning, requiring awareness of the wider path

D. Maintain the same track

14. A missed-approach holding waypoint at the end of an approach is often a:

A. Fly-over waypoint, so the aircraft crosses it before turning

B. Fly-by waypoint

C. RF leg

D. DME arc

15. The navigator constructs the lateral path of a procedure from the database's:

A. Coded sequence of waypoints, leg types (path terminators), and altitude/speed constraints

B. Magnetic compass

C. Transponder code

D. ATIS broadcast

16. A pilot monitoring the moving map should verify that the navigator's constructed path:

A. Matches the airspeed

B. Matches the charted procedure (correct waypoints, sequence, and turns)

C. Matches the altimeter setting

D. Matches the transponder code

17. A fly-by waypoint with a large course change (sharp turn) will have:

A. No turn anticipation

B. A fly-over behavior

C. The aircraft stop at the waypoint

D. A greater lead distance for the turn anticipation

18. When an RNAV procedure includes an RF leg, the pilot must:

A. Time the leg manually

B. Use a DME arc instead

C. Allow the navigator to fly the defined curved path while monitoring it, as manual tracking is not practical

D. Fly a straight line

19. The difference between a fly-by and a fly-over waypoint matters most for:

A. Obstacle clearance and the actual ground track flown through the turn

B. The fuel reserve

C. The transponder code

D. The alternate minimums

20. A pilot should brief the waypoint types on a procedure so as to:

A. Eliminate the need for a current database

B. Avoid using the autopilot

C. Replace the chart

D. Anticipate where the aircraft will turn early (fly-by) versus overfly (fly-over)

21. A fly-over waypoint followed by a large turn may result in the aircraft:

A. Briefly flying beyond the waypoint and then maneuvering back to intercept the next leg

B. Turning before the waypoint

C. Holding at the waypoint

D. Maintaining a constant DME

22. The accuracy of the constructed RNAV path depends on:

A. The transponder

B. A current, valid navigation database and a properly functioning RNAV system

C. The magnetic compass

D. The DME pairing

23. "CF" (Course to Fix) leg defines a path that:

A. Follows a specified course to terminate at a fix

B. Is a constant-radius arc

C. Is a holding pattern

D. Is a heading to an altitude

24. A pilot encountering an unexpected turn behavior at a waypoint should:

A. Disregard it

B. Continue regardless

C. Recognize whether the waypoint is fly-by or fly-over and confirm the navigator is constructing the correct path

D. Squawk 7600

25. The fundamental purpose of distinguishing fly-by and fly-over waypoints in RNAV path construction is to:

A. Eliminate the need for waypoints

B. Replace ground-based navaids

C. Ensure the aircraft flies the precise intended ground track for obstacle clearance and procedure integrity

D. Set the cruising altitude

ANSWER KEY & EXPLANATIONS – SESSION 54

1. B. Turn before — A fly-by waypoint is one where the system begins the turn before the waypoint to smoothly join the next leg (turn anticipation).

2. B. Overfly then turn — A fly-over waypoint requires crossing/overflying the waypoint before commencing the turn to the next leg.

3. A. Circled symbol — A fly-over waypoint is depicted by a circle drawn around the waypoint symbol.

4. B. Star, no circle — A fly-by waypoint is depicted by a four-pointed star symbol without a surrounding circle.

5. C. Turn before to roll out — Turn anticipation commands the turn before the waypoint, based on groundspeed and turn angle, to roll out on the next course.

6. B. Cross specific point — A fly-over waypoint is used where the design requires passing over a specific point before turning.

7. D. Higher GS/larger angle — Turn-anticipation lead distance increases with higher groundspeed and a larger turn angle.

8. D. Curved defined-radius track — An RF leg is a constant-radius curved path the navigator flies precisely between two fixes.

9. C. RF-capable/authorized — RF legs require the aircraft and navigator to be authorized/capable of flying RF legs (a specific RNP capability).

10. B. Path type/termination — A path terminator defines the type of path to fly and how the leg terminates, which the navigator uses to construct the route.

11. D. Straight track — A TF (Track to Fix) leg is a straight track between two defined fixes.

12. C. Direct to fix — A DF (Direct to Fix) leg is a direct path from the present position to a fix.

13. C. Overshoot then turn — A fly-over waypoint means the aircraft overshoots beyond the waypoint before turning, requiring awareness of the wider path.

14. A. Fly-over — A missed-approach holding waypoint is often a fly-over waypoint, so the aircraft crosses it before turning.

15. A. Coded sequence — The navigator constructs the lateral path from the database's coded sequence of waypoints, leg types, and constraints.

16. B. Matches the procedure — The pilot verifies the constructed path matches the charted procedure (correct waypoints, sequence, and turns).

17. D. Greater lead distance — A fly-by waypoint with a sharp turn has a greater lead distance for the turn anticipation.

18. C. Let navigator fly/monitor — On an RF leg, the pilot allows the navigator to fly the defined curved path while monitoring it, as manual tracking is not practical.

19. A. Ground track/obstacles — The fly-by vs. fly-over distinction matters most for obstacle clearance and the actual ground track flown through the turn.

20. D. Anticipate turns — Briefing waypoint types lets the pilot anticipate where the aircraft will turn early (fly-by) versus overfly (fly-over).

21. A. Beyond then back — A fly-over waypoint followed by a large turn may have the aircraft briefly fly beyond the waypoint and then maneuver back to intercept the next leg.

22. B. Current database/system — The constructed path's accuracy depends on a current, valid navigation database and a properly functioning RNAV system.

23. A. Course to a fix — A CF (Course to Fix) leg follows a specified course to terminate at a fix.

24. C. Confirm correct path — Unexpected turn behavior should prompt recognizing whether the waypoint is fly-by or fly-over and confirming the navigator is constructing the correct path.

25. C. Precise ground track — Distinguishing fly-by and fly-over waypoints ensures the aircraft flies the precise intended ground track for obstacle clearance and procedure integrity.