

Unit 10 Navigation Systems

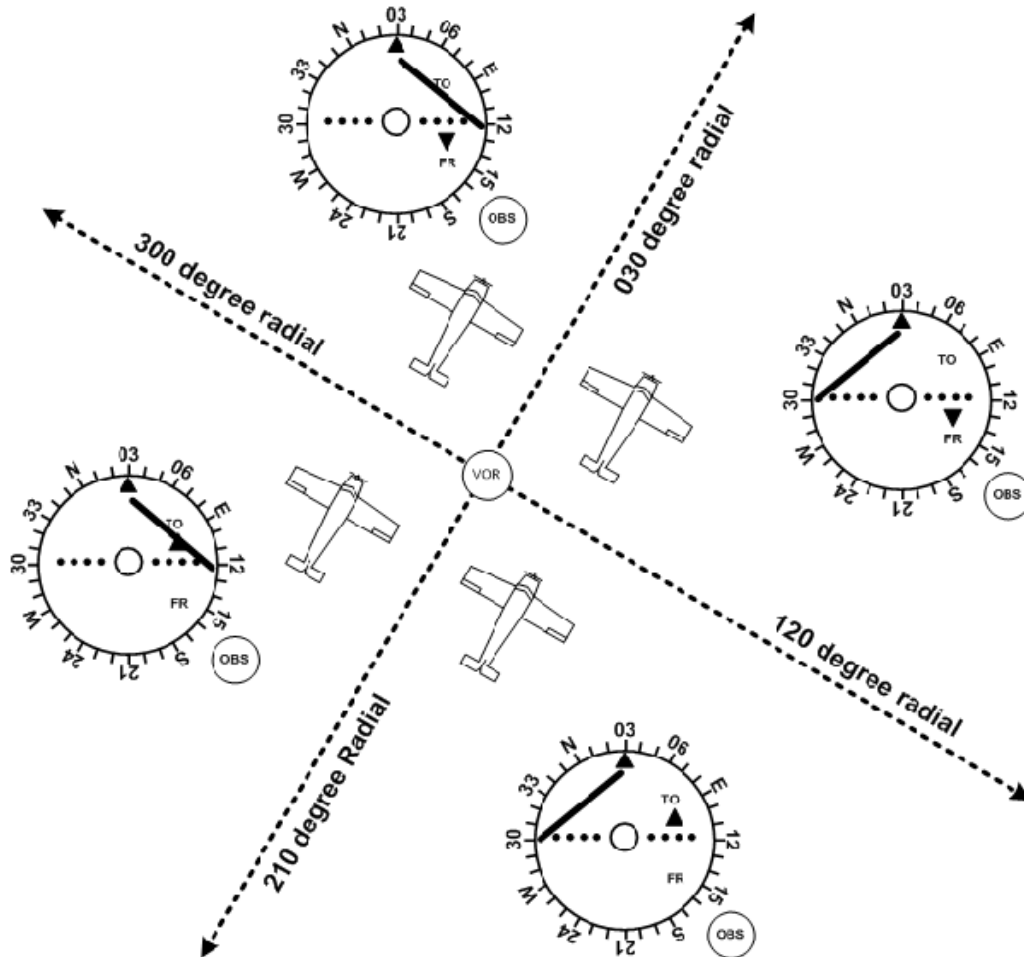
10.1 VOR Test Facility (VOT)

- VOR Test facilities (VOT) - available on a specific frequency at certain airports. You can check the accuracy of your VOR receiver on the ground.
 - Airborne VOT use - ok, but restricted altitudes and areas in chart supp.
 - In each CS, there is a section, listed by state, of VOT ground locations and airborne checkpoints.
- Turn nav radio to the specified VOT freq; center the course deviation indicator.
 - The OBS should read either 0 or 180 regardless of your position at the airport.
 - If 0, the TO/FROM indicator should indicate FROM.
 - If 180, the TO/FROM indicator should indicate TO.
 - Accuracy should be pm 4 deg on the ground and pm 6 deg in the air.

10.2 Determining Position Using VORs

- Identify position based on intersection of radials of two VORs
 - Draw the radials on the chart or using the plastic overlay.
 - Radials are from the VOR
 - Make sure you've located the correct radial on the compass before drawing the line.
 - Recheck by counting in 5s or 10s from each of the closest 30 deg numbered intervals
- Identify position based on a single VOR
 - Compare OBS setting and the TO/FROM indicator with the a/c heading. The OBS (top) setting must be roughly the same as the a/c heading.
 - TO/FROM indicator must correspond to the a/c's flight path in relation to the VOR. Flying to a VOR with a FROM indication or vice versa results in reverse sensing.
 - When flying directly from a station, the heading and radial being flown will be the same. When flying directly to, the heading and radial will be opposite.
 - CDI deflection - pretend your a/p has the same heading as the OBS setting. Left deflection means you are right of course; a correction to the left is necessary. Right deflection = left of course; correct to the right. The CDI needle points to the station. CDI doesn't work if the heading is not roughly equal to the OBS.
 - No TO/FROM indication -> directly 90 degrees from the radial dialed on the OBS. Deviate towards the direction the CDI needle points (toward the station)
- VOR indications - when selecting a course on the OBS, imagine that you have drawn a line through the VOR in the direction of the course. The line should extend outward from the VOR in both the direction of the selected course and its reciprocal. Imagine an

arrowhead at the end of the line in the direction of the desired course.



- The VOR is in the center of the diagram. Rotate it until the arrowhead points in the direction of the OBS setting. When facing in the direction of the OBS setting, the CDI needle points in the direction you should correct in.
- TO/FROM indicator indicates TO when you are "below" the horizontal radial and moving towards the VOR and FROM when you are "above" the horizontal radial and moving away from the VOR, given that the OBS setting is the same as the a/c's direction of ground travel.
- The a/c heading does not affect the VOR signal; only the geolocation and direction of movement
- VOR/DME-based RNAV units need both VOR and DME signals to operate. If the navaid selected is a VOR without DME, RNAV mode will not function.

10.3 Global Positioning System (GPS)

- Satellite based radio nav system
- GPS receiver needs at least four satellites to yield a 3D position and time solution. Computes navigational data such as distance and bearing to a waypoint, groundspeed, etc. by using the known position and referencing a database in the receiver

- GPS receivers contain chart databases, moving maps, traffic, weather; VOR/DME/loc/glideslope receivers; can compute groundspeed, time, and fuel burn.
- To effectively navigate with GPS, pilots should determine the GPS unit is approved for their planned flight
 - Understand how to make and cancel all appropriate entries,
 - Determine the status of the databases
 - Program and review the programmed route; ensure the track is ATC approved
- Navigating by GPS must be used with other forms of electronic navigation, as well as pilotage and dead reckoning.
 - Never rely on one sole system of navigation
 - When using a handheld GPS, consider that accuracy may degrade without notification.
- Always check to see if the unit has receiver autonomous integrity monitoring (RAIM)
 - If it doesn't, be wary when a disagreement exists b/w other forms of navigation
 - If RAIM is lost during flight, the GPS accuracy is not guaranteed.
 - 3 satellites - narrow the possible location down to one of two possible points. 4 is req'd for navigation. At least one satellite must be in view for the receiver to perform the RAIM function. Thus, it needs at least 5 satellites in view, or four satellites and a barometric altimeter to detect integrity anomalies.

10.4 Pilotage and Dead Reckoning

- Pilotage - referencing landmarks or checkpoints.
- Dead reckoning - using time, airspeed, distance, and direction calculations.

Unit 10 Quiz 16/21

Missed questions 5

2. VOT testing: when the CDI is centered, it should read 0 FROM or 180 TO (opposite what you might expect)
7. If the current radial is known, compare the OBS setting with the radial. If the difference is 90 degrees, the correct choice is the one with no to/from indication.
8. Radials and OBS settings are with magnetic north - keep in mind when drawing out
10. Draw out each VOR situation.
14. Draw out each VOR situation (and know tertiary compass rose directions)