

Lesson 609

Intercepting & Tracking NAV Systems

Overview

This lesson will cover the use the NAV radios and HSI to intercept and track using the VOR and GPS navigation systems.

Briefing

Using navigational aids such as VOR's or GPS is common for both visual and instrument flight. In this lesson, you will practice using both sources of navigation during a flight. Refer to Lesson 607 for review on the fundamentals of aircraft control in instrument flight.

VOR Navigation

Very High Frequency Omni-Directional Range (VOR) stations are ground based navigational aids that emit radio waves 360° around and outward from the station.

Using the NAV radios on the aircraft, you can tune VOR frequencies (108.0 to 117.95 MHz) and navigate towards or away from the station on a specific course. These courses are called radials. There are 360 radials, one for each degree, extending outward from the station similar to spokes on a bicycle tire.

Each radial is identified by its relation to magnetic north. For example, the radial extending directly north from the station is the 360 radial, the radial extending east is the 090 radial, etc.

NAV Radios

The NAV radios (Figure 609-1) are located on the upper left side of the PFD. When either NAV radio has a VOR tuned and identified, the three-letter identifier of the VOR will appear next to the frequency.



Figure 609-1: NAV Radios

Horizontal Situational Indicator (HSI)

The Horizontal Situational Indicator (HSI) is the principal flight instrument to intercept and track both VOR and GPS course guidance.

In the upper right of Figure 609-2, the selected course TO or radial FROM the VOR is displayed (green box).

The CDI push button (yellow box) below the HSI will toggle the active navigation source between NAV 1, NAV 2, and GPS with the active NAV frequency colored green.

The long, hollow green arrow through the center of the HSI is aligned with the selected course. The small, solid green triangle towards the center of the HSI points towards the station and indicates if the aircraft is flying towards or away from the station. The bottom left and bottom right of Figure 609-2 (red boxes) display the distance information to the stations tuned into NAV 1 (left side) and NAV 2 (right side).



Figure 609-2: Horizontal Situation Indicator

Specific courses are set with the course selector knob located between the PFD and MFD (Figure 609-3).



Figure 609-3: Course Selector Knob

The Turn Rate Indicator is an arcing magenta arrow that appears along the top of the HSI (Figure 609-4). During instrument flight, you will be using standard-rate turns (3° per second) which are obtained when the magenta arc is aligned with the outside, longer white line.



Figure 609-4: Turn Rate Indicator

The Course Deviation Indicator (CDI) is the sliding bar in the center of the instrument that will align with the long, hollow arrow when the aircraft is on the desired course or radial.

Figure 609-5 depicts how the CDI will appear when aligned and indicating the aircraft is on the selected course. If the aircraft deviates off-course, the bar will slide in the direction of the selected course. For example, if the aircraft deviates right of course, the bar will slide left indicating the aircraft must turn left to re-intercept the course. Each white, hollow circle to the side of the CDI represents 5° off-course.



Figure 609-5: Course Deviation Indicator (VOR and GPS)

To recapture the desired course or radial, turn towards the bar until it re-aligns with the long, hollow arrow.

When close to the ground station, the CDI will be significantly more sensitive due to the radials being close together near the station. As the aircraft moves farther from the station, the CDI will become less sensitive as the radials spread apart.

GPS Navigation

If GPS is selected as the source of navigation on the HSI, the large arrow will become magenta in color. Course deviation will no longer be measured in degrees but by nautical miles off-course. When the HSI displays "ENR" on the right side, full CDI deflection is equal to 2 nautical miles off-course. If the HSI displays "TERM", full CDI deflection is equal to 1 nautical mile off-course.

You will not use the GPS to its full navigational capabilities on this flight, as you will only use its basic functions to navigate to the airport. To select a destination to fly direct to, press the DIRECT soft key (outlined in red in Figure 609-6) and type the airport identifier in the pop-up box (Figure 609-7). After typing the airport identifier, hit the "enter" key (ENT) twice to load the direct route into the GPS.



Figure 609-6: Direct and Enter Keys

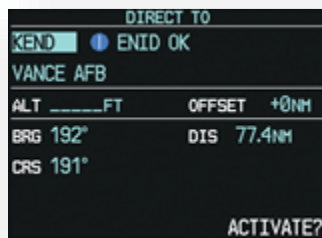


Figure 609-7: Airport Identifier

After the airport has been activated by the GPS, information on distance and heading to the airport will be displayed in magenta along the top of the PFD. Press the CDI soft key, if necessary, to cycle the HSI to display GPS course guidance to the selected airport.

Wind Effects

If intercepting and tracking in strong winds, a wind correction may be necessary to keep the aircraft flying on a direct track towards the destination. As with visual flight, the wind correction must be applied towards the direction the wind is coming from and will increase as the crosswind component increases.

To help with tracking a course, a magenta diamond will appear on the top of the HSI (Figure 609-8). This diamond depicts the ground track of the aircraft.

When the diamond is kept aligned with the tip of the CDI arrow, the aircraft will track a straight line towards the destination. If the magenta diamond is on either side of the CDI arrow tip, the aircraft's flight course will deviate towards that side. When flying in strong winds, reference the magenta diamond to keep the aircraft on a straight ground track to the destination and use it to correct for deviations.



Figure 609-8: Diamond

On this flight, you will practice intercepting and tracking VOR's before using GPS to navigate back to the airport. Incorporate the HSI into the instrument scan to navigate on-course while maintaining altitude and airspeed.

End of Briefing
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