GARMIN®

G900X® Integrated Flight Deck Pilot's Guide



SYSTEM OVERVIEW

FLIGHT INSTRUMENTS

ENGINE INDICATION SYSTEM

AUDIO PANEL & CNS

FLIGHT MANAGEMENT

HAZARD AVOIDANCE

AUTOMATIC FLIGHT CONTROL SYSTEM

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This manual reflects the operation of System Software version 0718.16 or later. Some differences in operation may be observed when comparing the information in this manual to earlier or later software versions.

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Product	Serial Number

WARNING: *Navigation and terrain separation must NOT be predicated upon the use of the terrain avoidance feature. The terrain avoidance feature is NOT intended to be used as a primary reference for terrain avoidance and does not relieve the pilot from the responsibility of being aware of surroundings during flight. The terrain avoidance feature is only to be used as an aid for terrain avoidance. Terrain data is obtained from third party sources. Garmin is not able to independently verify the accuracy of the terrain data.*

WARNING: *The displayed minimum safe altitudes (MSAs) are only advisory in nature and should not be relied upon as the sole source of obstacle and terrain avoidance information. Always refer to current aeronautical charts for appropriate minimum clearance altitudes.*

WARNING: *The altitude calculated by G900X GPS receivers is geometric height above Mean Sea Level and could vary significantly from the altitude displayed by pressure altimeters, such as the GDC 74A Air Data Computer, or other altimeters in aircraft. GPS altitude should never be used for vertical navigation. Always use pressure altitude displayed by the G900X PFD or other pressure altimeters in aircraft.*

WARNING: *Do not use outdated database information. Databases used in the G900X system must be updated regularly in order to ensure that the information remains current. Pilots using any outdated database do so entirely at their own risk.*

WARNING: *Do not use basemap (land and water data) information for primary navigation. Basemap data is intended only to supplement other approved navigation data sources and should be considered as an aid to enhance situational awareness.*

WARNING: *Do not rely solely upon the display of traffic information for collision avoidance maneuvering. The traffic display does not provide collision avoidance resolution advisories and does not under any circumstances or conditions relieve the pilot's responsibility to see and avoid other aircraft.*

WARNING: *Do not rely solely upon the display of traffic information to accurately depict all of the traffic within range of the aircraft. Due to lack of equipment, poor signal reception, and/or inaccurate information from aircraft or ground stations, traffic may be present that is not represented on the display.*

WARNING: *Do not use data link weather information for maneuvering in, near, or around areas of hazardous weather. Information contained within data link weather products may not accurately depict current weather conditions.*

WARNING: *For safety reasons, G900X operational procedures must be learned on the ground.*

WARNING: *Do not use the indicated data link weather product age to determine the age of the weather information shown by the data link weather product. Due to time delays inherent in gathering and processing weather data for data link transmission, the weather information shown by the data link weather product may be significantly older than the indicated weather product age.*

WARNING: *The Garmin G900X, as installed in this aircraft, has a very high degree of functional integrity. However, the pilot must recognize that providing monitoring and/or self-test capability for all conceivable system failures is not practical. Although unlikely, it may be possible for erroneous operation to occur without a fault indication shown by the G900X. It is thus the responsibility of the pilot to detect such an occurrence by means of cross-checking with all redundant or correlated information available in the cockpit.*

WARNING: *The United States government operates the Global Positioning System and is solely responsible for its accuracy and maintenance. The GPS system is subject to changes which could affect the accuracy and performance of all GPS equipment. Portions of the Garmin G900X utilize GPS as a precision electronic NAVigation AID (NAVAID). Therefore, as with all NAVAIDs, information presented by the G900X can be misused or misinterpreted and, therefore, become unsafe.*

WARNING: *To reduce the risk of unsafe operation, carefully review and understand all aspects of the G900X Pilot's Guide documentation and the G900X Integrated Avionics System in the Airplane Flight Manual. Thoroughly practice basic operation prior to actual use. During flight operations, carefully compare indications from the G900X to all available navigation sources, including the information from other NAVAIDs, visual sightings, charts, etc. For safety purposes, always resolve any discrepancies before continuing navigation.*

WARNING: *The illustrations in this guide are only examples. Never use the G900X to attempt to penetrate a thunderstorm. Both the FAA Advisory Circular, Subject: Thunderstorms, and the Aeronautical Information Manual (AIM) recommend avoiding "by at least 20 miles any thunderstorm identified as severe or giving an intense radar echo."*

WARNING: *Lamp(s) inside this product may contain mercury (HG) and must be recycled or disposed of according to local, state, or federal laws. For more information, refer to our website at www.garmin.com/aboutGarmin/environment/disposal.jsp.*

WARNING: *Because of variation in the earth's magnetic field, operating the G900X within the following areas could result in loss of reliable attitude and heading indications. North of 72° North latitude at all longitudes; South of 70° South latitude at all longitudes; North of 65° North latitude between longitude 75° W and 120° W. (Northern Canada); North of 70° North latitude between longitude 70° W and 128° W. (Northern Canada); North of 70° North latitude between longitude 85° E and 114° E. (Northern Russia); South of 55° South latitude between longitude 120° E and 165° E. (Region south of Australia and New Zealand)*

WARNING: *Do not use GPS to navigate to any active waypoint identified as a 'NON WGS84 WPT' by a system message. 'NON WGS84 WPT' waypoints are derived from an unknown map reference datum that may be incompatible with the map reference datum used by GPS (known as WGS84) and may be positioned in error as displayed.*

WARNING: *Do not use a QFE altimeter setting with this system. System functions will not operate properly with a QFE altimeter setting. Use only a QNH altimeter setting for height above mean sea level, or the standard pressure setting, as applicable.*

CAUTION: *The PFD and MFD displays use a lens coated with a special anti-reflective coating that is very sensitive to skin oils, waxes, and abrasive cleaners. CLEANERS CONTAINING AMMONIA WILL HARM THE ANTI-REFLECTIVE COATING. It is very important to clean the lens using a clean, lint-free cloth and an eyeglass lens cleaner that is specified as safe for anti-reflective coatings.*

CAUTION: *The Garmin G900X does not contain any user-serviceable parts. Repairs should only be made by an authorized Garmin service center. Unauthorized repairs or modifications could void both the warranty and the pilot's authority to operate this device under FAA/FCC regulations.*

NOTE: *Do not rely solely upon data link services to provide Temporary Flight Restriction (TFR) information. Always confirm TFR information through official sources such as Flight Service Stations or Air Traffic Control.*

NOTE: *All visual depictions contained within this document, including screen images of the G900X panel and displays, are subject to change and may not reflect the most current G900X system and aviation databases. Depictions of equipment may differ slightly from the actual equipment.*

NOTE: *This device complies with part 15 of the FCC Rules. Operation is subject to the following two conditions: (1) this device may not cause harmful interference, and (2) this device must accept any interference received, including interference that may cause undesired operation.*

NOTE: *Interference from GPS repeaters operating inside nearby hangars can cause an intermittent loss of attitude and heading displays while the aircraft is on the ground. Moving the aircraft more than 100 yards away from the source of the interference should alleviate the condition.*

NOTE: *Use of polarized eyewear may cause the flight displays to appear dim or blank.*

NOTE: *This product, its packaging, and its components contain chemicals known to the State of California to cause cancer, birth defects, or reproductive harm. This notice is being provided in accordance with California's Proposition 65. If you have any questions or would like additional information, please refer to our web site at www.garmin.com/prop65.*

NOTE: *The FAA has asked Garmin to remind pilots who fly with Garmin database-dependent avionics of the following:*

- *It is the pilot's responsibility to remain familiar with all FAA regulatory and advisory guidance and information related to the use of databases in the National Airspace System.*
- *Garmin equipment will only recognize and use databases that are obtained from Garmin or Jeppesen. Databases obtained from Garmin or Jeppesen are assured compliance with all data quality requirements (DQRs) by virtue of a Type 2 Letter of Authorization (LOA) from the FAA. A copy of the Type 2 LOA is available for each database and can be viewed at http://fly.garmin.com by selecting 'Type 2 LOA Status.'*
- *Use of a current Garmin or Jeppesen database in your Garmin equipment is required for compliance with established FAA regulatory guidance, but does not constitute authorization to fly any and all terminal procedures that may be presented by the system. It is the pilot's responsibility to operate in accordance with established AFM(S) and regulatory guidance or limitations as applicable to the pilot, the aircraft, and installed equipment.*

NOTE: *The pilot/operator must review and be familiar with Garmin's database exclusion list as discussed in SAIB CE-14-04 to determine what data may be incomplete. The database exclusion list can be viewed at www.flygarmin.com by selecting 'Database Exclusions List.'*

NOTE: *The pilot/operator must have access to Garmin and Jeppesen database alerts and consider their impact on the intended aircraft operation. The database alerts can be viewed at www.flygarmin.com by selecting 'Aviation Database Alerts.'*

NOTE: *If the pilot/operator wants or needs to adjust the database, contact Garmin Product Support to coordinate the revised DQRs.*

NOTE: *Garmin requests the flight crew report any observed discrepancies related to database information. These discrepancies could come in the form of an incorrect procedure; incorrectly identified terrain, obstacles and fixes; or any other displayed item used for navigation or communication in the air or on the ground. Go to FlyGarmin.com and select 'Report An Aviation Data Error Report.'*

Record of Revisions				
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SECTION 1 SYSTEM OVERVIEW

The G900X Integrated Flight Deck System presents flight instrumentation, position, navigation, communication, and identification information to the pilot using flat-panel color displays. The system is distributed across the following Line Replaceable Units (LRUs):

- **GDU 1040/1045** Primary Flight Display(s) (PFD)
- **GDU 1040/1045** Multi Function Display (MFD)
- **GMA 1347** Audio Panel with Integrated Marker Beacon Receiver
- **GIA 63W** Integrated Avionics Units (IAU)
- **GDC 74A** Air Data Computer (ADC)
- **GEA 71** Engine/Airframe Unit
- **GTX 33** Mode S Transponder
- **GRS 77** Attitude and Heading Reference System (AHRS)
- **GMU 44** Magnetometer

Figure 1-1 shows interactions between the LRUs. Additional/optional equipment are shown in Figure 1-2. The G900X is capable of interfacing with the following optional equipment:

- **GCU 476** MFD/PFD Control Unit
- **GCU 477** MFD Control Unit
- **GDL 69A/69A SXM** Data Link Receiver
- **GWX 68** Weather Radar
- **GTS 800/820** Traffic Advisory System
- **GSR 56** Iridium Transceiver
- **Flight Stream 210** Wireless Bluetooth® Gateway
- **GDL 88** ADS-B Transceiver
- KN 63 DME
- KR 87 ADF
- CO Guardian Aero 353R/452R Remote Carbon Monoxide Detector
- Avidyne TAS600-series Traffic Advisory System
- Artex ELT 406-N Emergency Locator Transmitter
- S-TEC 55X Autopilot
- TruTrak Sorcerer/DFC Series autopilots
- TruTrak Digiflight II-Series autopilots
- TruTrak Digitrak/Pictorial Pilot autopilots
- TruTrak ADI
- Trio Avionics EZ Pilot Autopilot

NOTE: *Refer to the AFCS section for details on the (optional, Lancair Evolution only) GFC 7X AFCS.*

The GFC 7X Automated Flight Control System (AFCS) provides the flight director (FD), autopilot (AP), and yaw damper (YD) functions of the G900X system.

1.1 LINE REPLACEABLE UNITS

- **GDU 1040/1045** (2 or 3) – In a two display configuration, the left-hand GDU is configured as a Primary Flight Display (PFD) and the right-hand GDU as a Multi Function Display (MFD). In a three display configuration, the left and right GDUs are configured as Primary Flight Displays (PFDs) and the middle GDU as a Multi Function Display (MFD).All feature 10.4-inch LCD screens with 1024 x 768 resolution. The displays communicate with each other through a High-Speed Data Bus (HSDB) Ethernet connection. Each display is also paired with an Ethernet connection to an IAU.



or

- **GMA 1347** – The Audio Panel integrates navigation/communication radio (NAV/COM) digital audio, intercom, and marker beacon controls, and is installed between the displays. This unit also provides manual control of display reversionary mode (red **DISPLAY BACKUP** Button; see Section 1.5, System Operation) and communicates with both IAUs using an RS-232 digital interface.



- **GIA 63W** (2) – The Integrated Avionics Units (IAU) function as the main communication hubs, linking all LRUs with the on-side display. Each IAU contains a GPS SBAS receiver, VHF COM/NAV/GS receivers, and system integration microprocessors, and is paired with the on-side display via HSDB connection. The IAUs are not paired together and do not communicate with each other directly.



- **GDC 74A** (1 or 2) – The Air Data Computer (ADC) processes data from the pitot/static system and outside air temperature (OAT) sensor. The ADC provides pressure altitude, airspeed, vertical speed, and OAT information to the system. It communicates with the primary IAU, displays, and AHRS using an ARINC 429 digital interface.



- **GEA 71** – The Engine Airframe Unit receives and processes signals from the engine and airframe sensors. This unit communicates with both IAUs using an RS-485 digital interface.



- **GTX 33** (1 or 2) – The solid-state Transponder provides Modes A, C, and S capability and communicates with both IAUs through an RS-232 digital interface.



- **GRS 77** (1 or 2) – The Attitude and Heading Reference System (AHRS) provides aircraft attitude and heading information via ARINC 429 to both PFDs and the primary IAU. The AHRS contains advanced sensors (including accelerometers and rate sensors) and interfaces with the Magnetometer to obtain magnetic field information, with the ADC to obtain air data, and with both IAUs to obtain GPS information. AHRS operation is discussed in Section 1.4, System Operation.



- **GMU 44** (1 or 2) – The Magnetometer measures local magnetic field and sends data to the AHRS for processing to determine aircraft magnetic heading. This unit receives power directly from the AHRS and communicates with it via an RS-485 digital interface.



- **GCU 476** or **GCU 477** – (optional) The GCU 476 provides MFD/PFD and radio tuning control through an RS-232 digital interface. The GCU 477 provides MFD and radio tuning control through an RS-232 digital interface



- **GDL 69A/69A SXM –** (optional) The Data Link Satellite Radio Receiver provides real-time weather information to the G900X MFD and PFD Inset Map, as well as digital audio entertainment. The Data Link Receiver communicates with the MFD via a HSDB connection. A subscription to XM Satellite Radio Service is required to enable the GDL 69A capability.



- **GWX 68** (1) – (optional) Provides airborne weather and ground mapped radar data to the MFD, through the GDL 69A, via HSDB connection.



- **GTS 800/820** (1) – The optional GTS 800/820 provides real-time traffic information to the MFD (and, indirectly, to the inset map of the PFD). The GTS 800/820 communicates with the MFD with an HSDB connection.



- **GSR 56** (1 optional) The Iridium Transceiver provides voice communication by means of pilot and copilot headsets. The unit can also send and receive data over the Iridium satellite network. The GSR 56 is connected to the #1 GIA 63W with an RS-232 digital interface.



- **GDL 88/88D** (1 optional) – Provides ADS-B Traffic in and FIS-B Weather.



- **Flight Stream 210** (1 optional) – Provides wireless Bluetooth connectivity between a compatible tablet/mobile device and the avionics system.



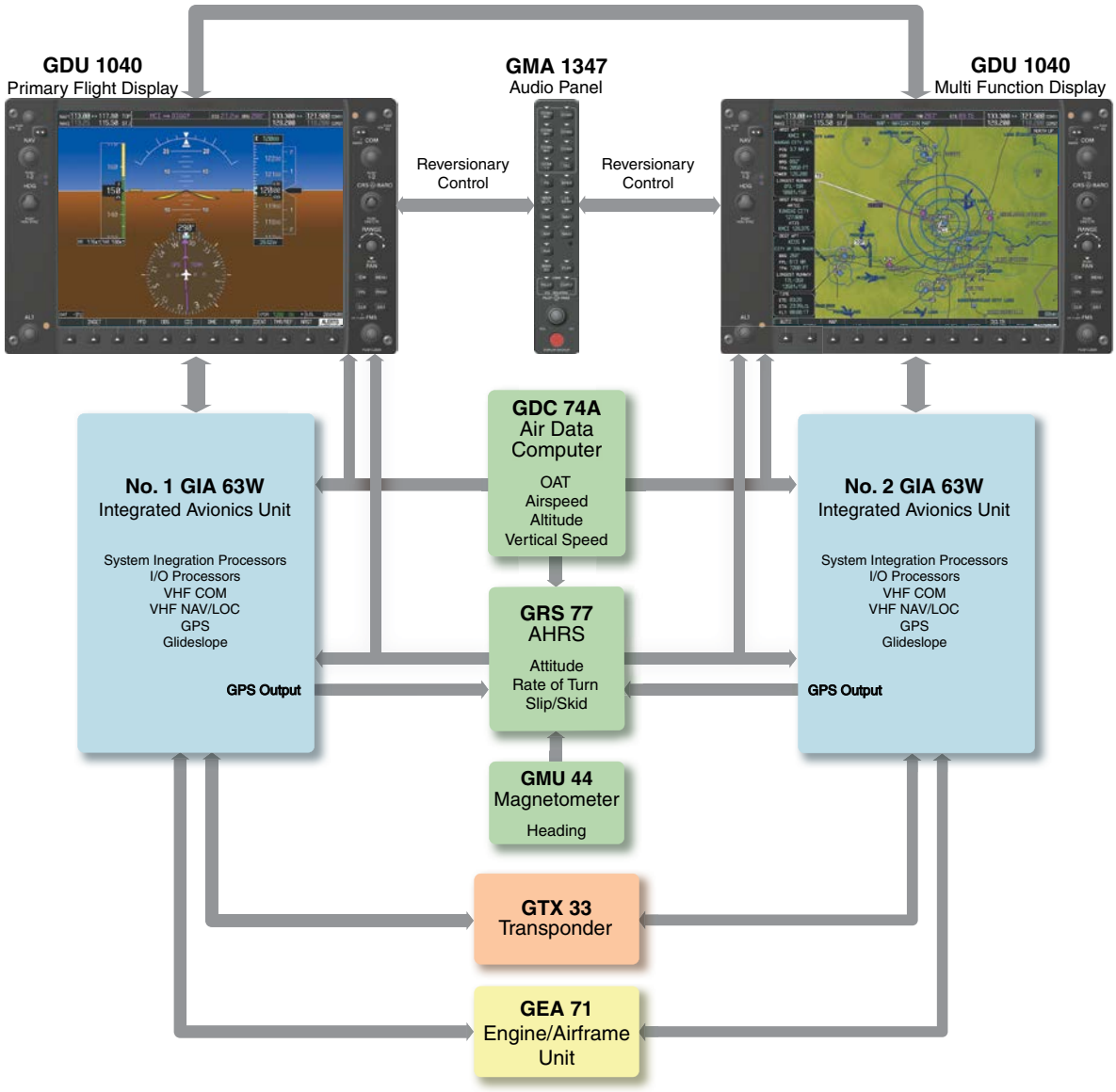


Figure 1-1 Basic G900X Two Display System Block Diagram

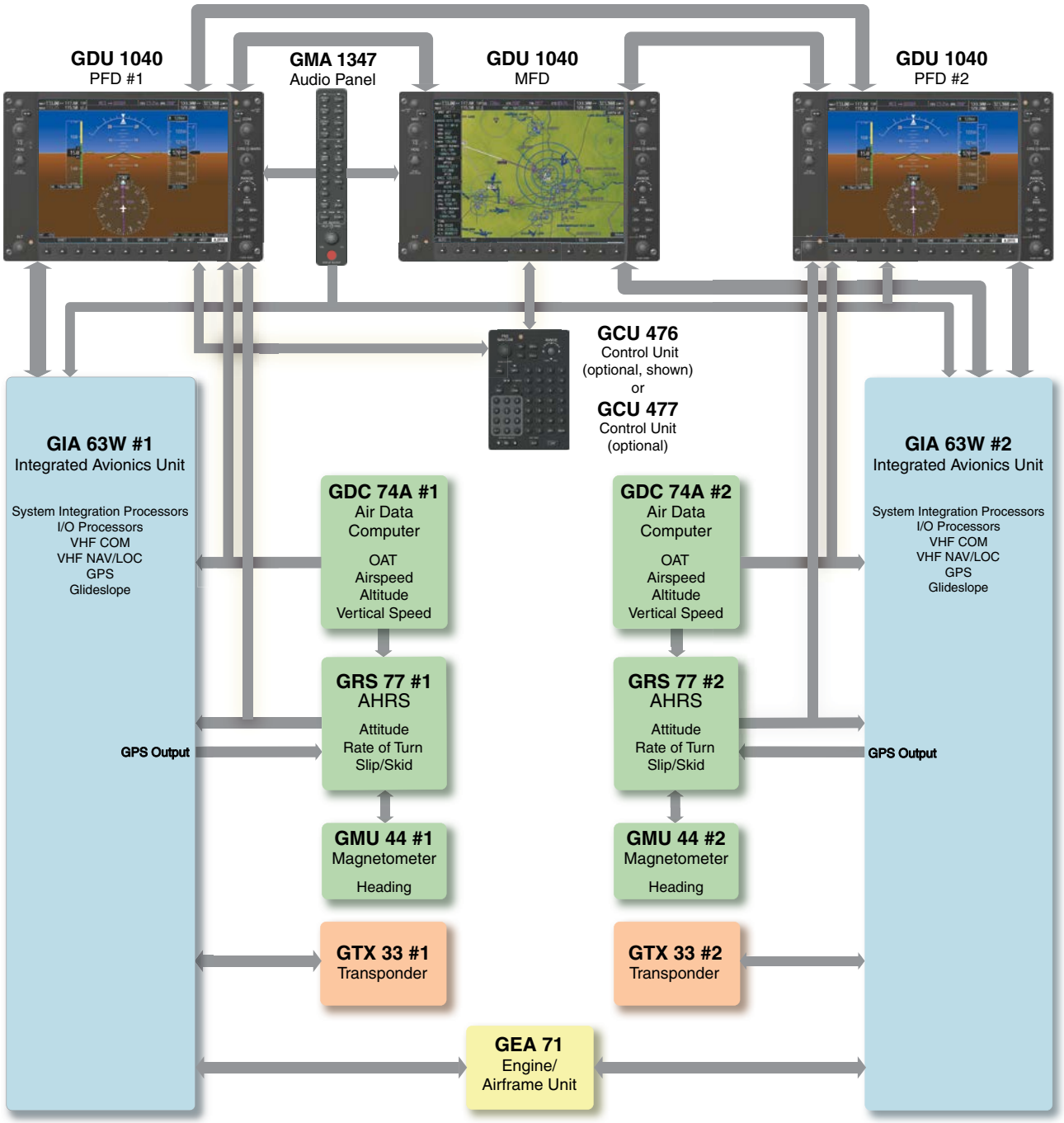


Figure 1-2 Basic G900X Three Display System Block Diagram

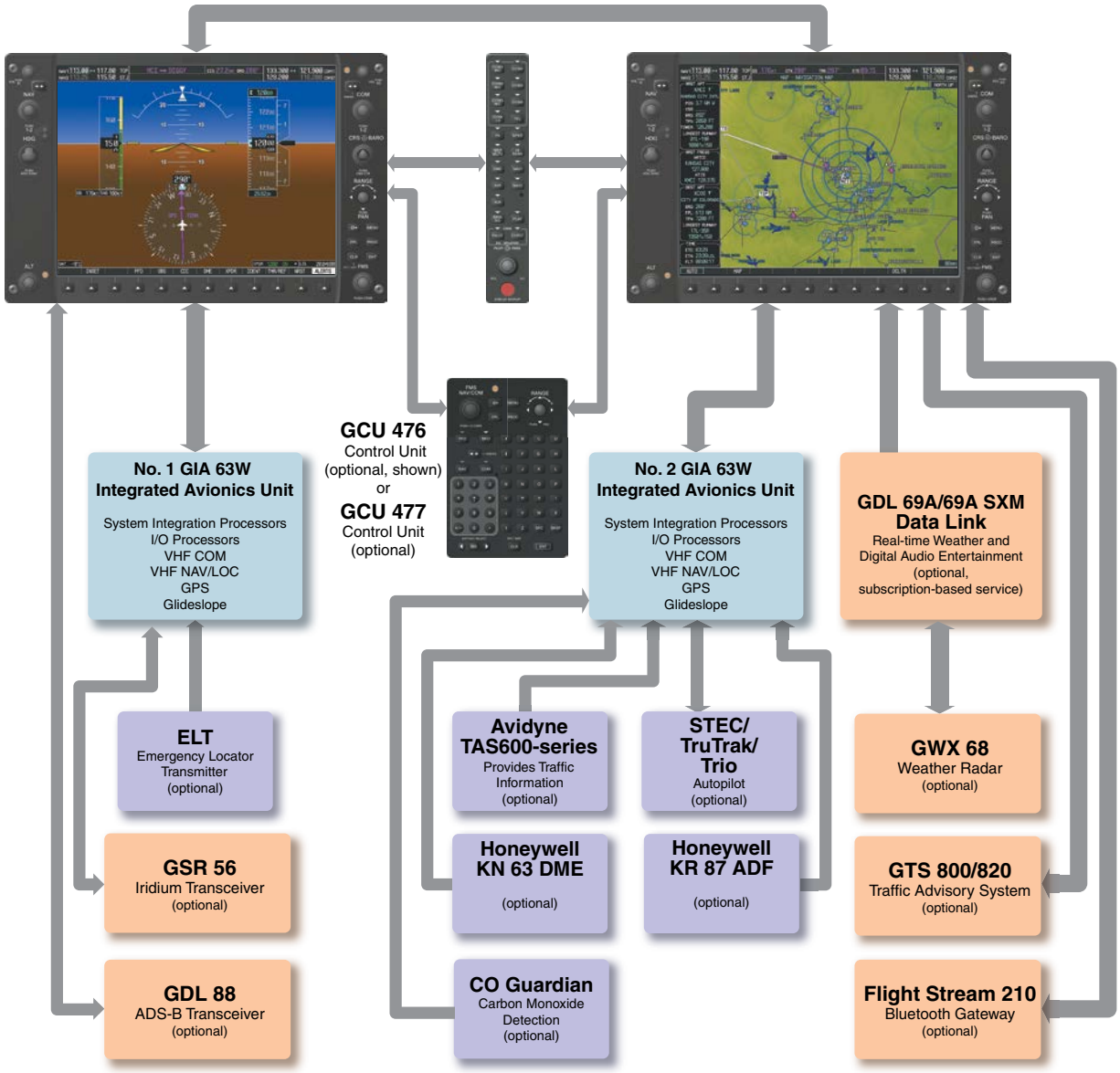


Figure 1-3 G900X Two Display With Optional/Additional Equipment

NOTE: *For information on non-Garmin optional/additional equipment shown in Figure 1-3 and Figure 1-4, consult the applicable optional interface user's guide. This document assumes that the reader is already familiar with the operation of this additional equipment.*

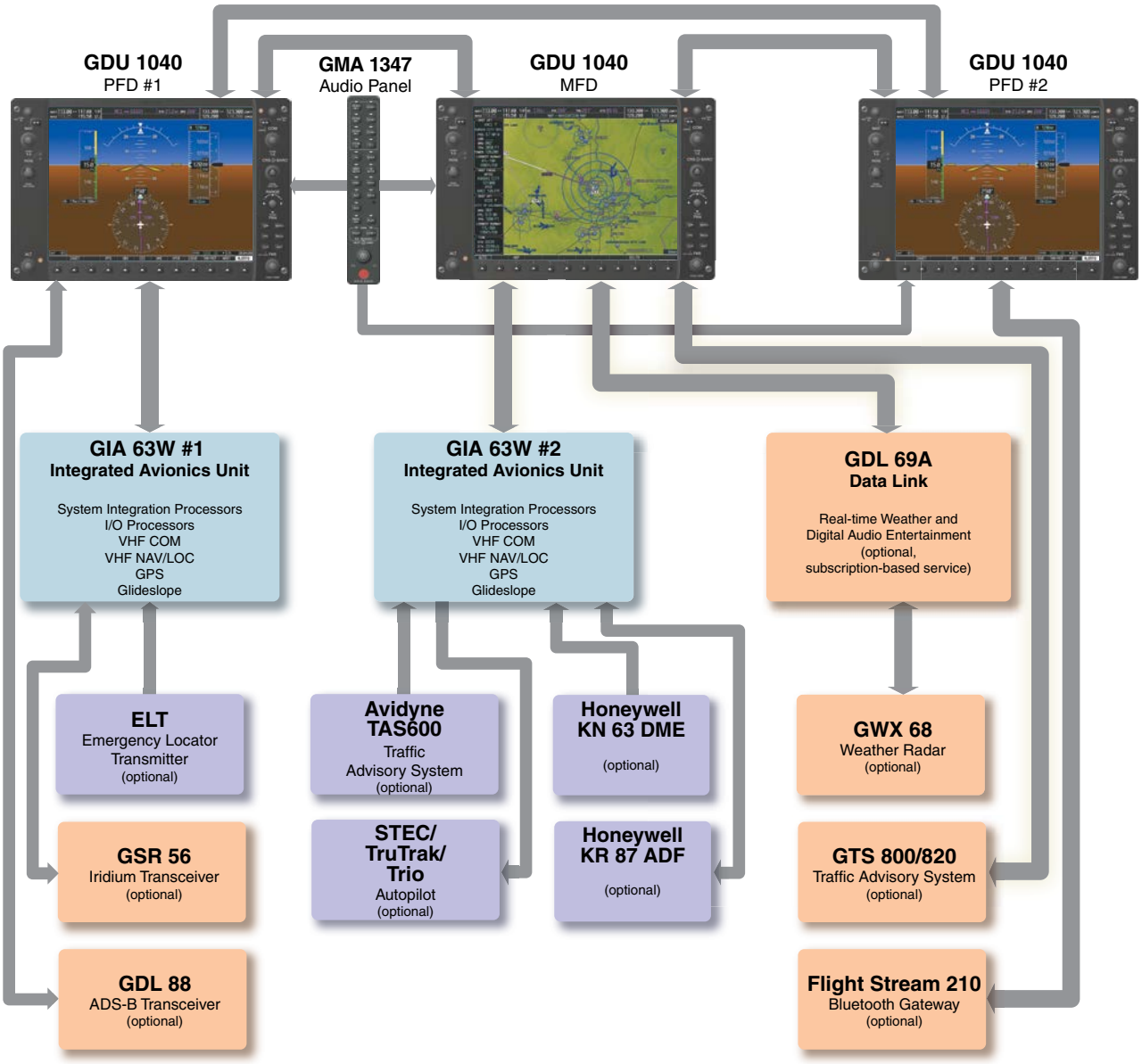


Figure 1-4 G900X Three Display With Optional/Additional Equipment

1.2 SECURE DIGITAL (SD) CARDS

NOTE: *Ensure the G900X System is powered off before inserting an SD card.*

NOTE: *Refer to Appendix B for instructions on updating the aviation database.*

The PFD and MFD data card slots use Secure Digital (SD) cards and are located on the upper right side of the display bezels. Each display bezel is equipped with two SD card slots. SD cards are used for aviation database and system software updates as well as terrain database storage.

Installing an SD card:

1) Insert the SD card in the SD card slot (the front of the card should be flush with the face of the display bezel).

2) To eject the card, gently press on the SD card to release the spring latch.



Figure 1-3 Display Bezel SD Card Slots

1.3 SYSTEM POWER-UP

NOTE: *Refer to Appendix A for system-specific annunciations and alerts.*

The G900X System is integrated with the aircraft electrical system and receives power directly from electrical busses. The PFD(s), MFD, and supporting sub-systems include both power-on and continuous built-in test features that exercise the processor, RAM, ROM, external inputs, and outputs to provide safe operation.

During system initialization, test annunciations are displayed, as shown in Figure 1-4. All system annunciations should disappear typically within the first minute of power-up. Upon power-up, key annunciator lights also become momentarily illuminated on the Audio Panel, the Control Unit, and the display bezels.

On the PFD(s), the AHRS begins to initialize and displays "AHRS ALIGN: Keep Wings Level". The AHRS should display valid attitude and heading fields typically within the first minute of power-up. The AHRS can align itself both while taxiing in a straight line and during level flight.

When the MFD powers up (Figure 1-5), the MFD Power-up Page displays the following information:

- System version
- Copyright
- Land database name and version
- Safe Taxi database name and effective dates
- Terrain database name and version
- Airport Terrain database name and version
- Obstacle database name and effective dates
- Navigation database name and effective dates
- Airport Directory name and effective dates
- FliteCharts/ChartView database information

Current database information includes valid operating dates, cycle number, and database type. When this information has been reviewed for currency (to ensure that no databases have expired), the pilot is prompted to continue.

Pressing the **ENT** Key (or right-most softkey) acknowledges this information, and the Navigation Map Page is displayed upon pressing the key a second time. When the system has acquired a sufficient number of satellites to determine a position, the aircraft's current position is shown on the Navigation Map Page.

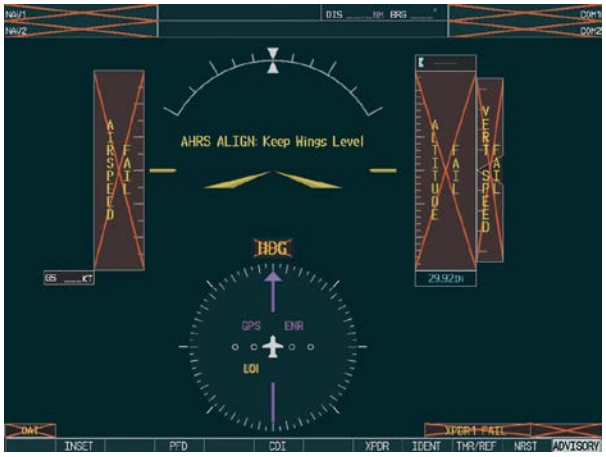


Figure 1-4 PFD Initialization



Figure 1-5 Example MFD Power-up Screen

1.4 SYSTEM OPERATION

NOTE: *Refer to Appendix A for detailed descriptions of all annunciations and alerts. The G900X System alerts the pilot when backup paths are utilized by the LRUs. The kitplane builder should establish appropriate pilot actions in response to all G900X annunciations in the aircraft-specific Pilot's Operating Handbook (POH).*

The displays are connected together via a single Ethernet bus for high-speed communication. As shown in Figure 1-1, each IAU is connected to the on-side display. This section discusses normal and reversionary G900X display operation, AHRS modes, GPS receiver operation, and G900X System Annunciations.

DISPLAY OPERATION

NOTE: *In normal operating mode, backlighting can only be adjusted from the PFD(s) (see Section 1.7). In reversionary mode, it can be adjusted from the remaining display(s).*

In normal operating mode, the PFD(s) presents graphical flight instrumentation (attitude, heading, airspeed, altitude, vertical speed), replacing the traditional flight instrument cluster (see the Flight Instruments Section for more information). The MFD normally displays a full-color moving map with navigation information (see the Flight Management Section), while the left portion of the MFD is dedicated to the Engine Indication System or to Navigation Information (EIS, see the EIS Section; Navigation Information, see the Flight Management Section). Both displays offer control for COM and NAV frequency selection.



Figure 1-6 G900X Two Display System Normal Operation



Figure 1-7 G900X Three Display System Normal Operation

In the event of a display failure, the G900X System automatically switches to reversionary (backup) mode. In reversionary mode, all important flight information is presented on the remaining display(s) in the same format as in normal operating mode.

- **PFD1 failure –** MFD enters reversionary mode; PFD2 remains in normal mode.
- **MFD failure –** PFD1 and PFD2 enter reversionary mode.
- **PFD2 failure –** PFD1 and the MFD remain in normal mode.

If a display fails, the appropriate IAU-display Ethernet interface is cut off. Thus, the IAU can no longer communicate with the remaining display (refer to Figure 1-1), and the NAV and COM functions provided to the failed display by the IAU are flagged as invalid on the remaining display. The system reverts to backup paths for the AHRS, ADC, Engine/Airframe Unit, and Transponder, as required. The change to backup paths is completely automated for all LRUs and no pilot action is required.

If the system fails to detect a display problem, reversionary mode may be manually activated by pressing the Audio Panel's red **DISPLAY BACKUP** Button. Pressing this button again deactivates reversionary mode.

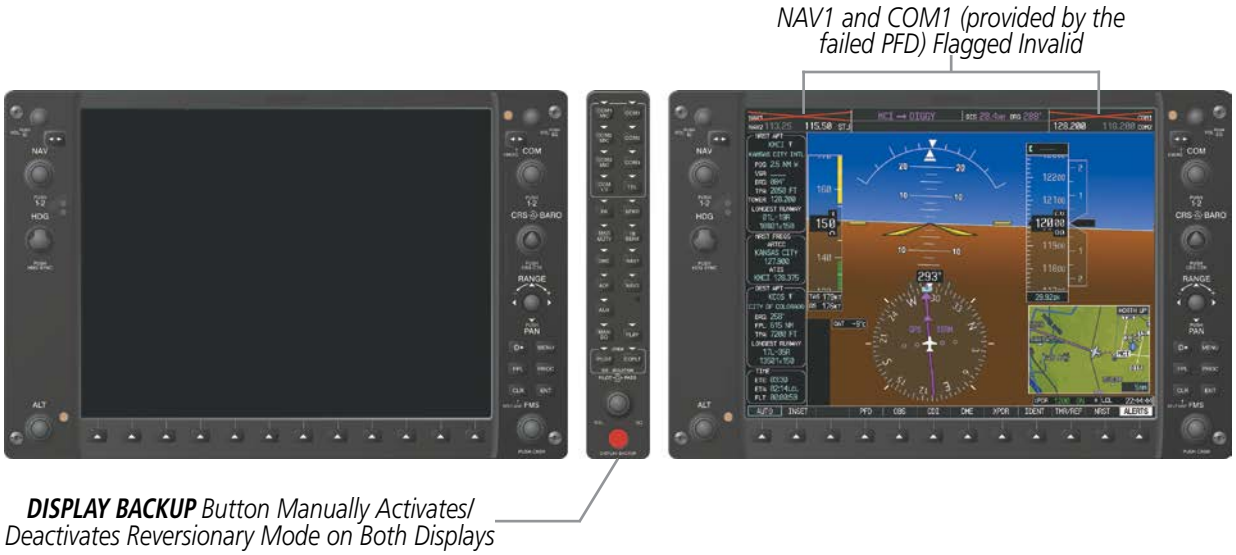


Figure 1-8 G900X Two Display Reversionary Mode (Failed PFD)

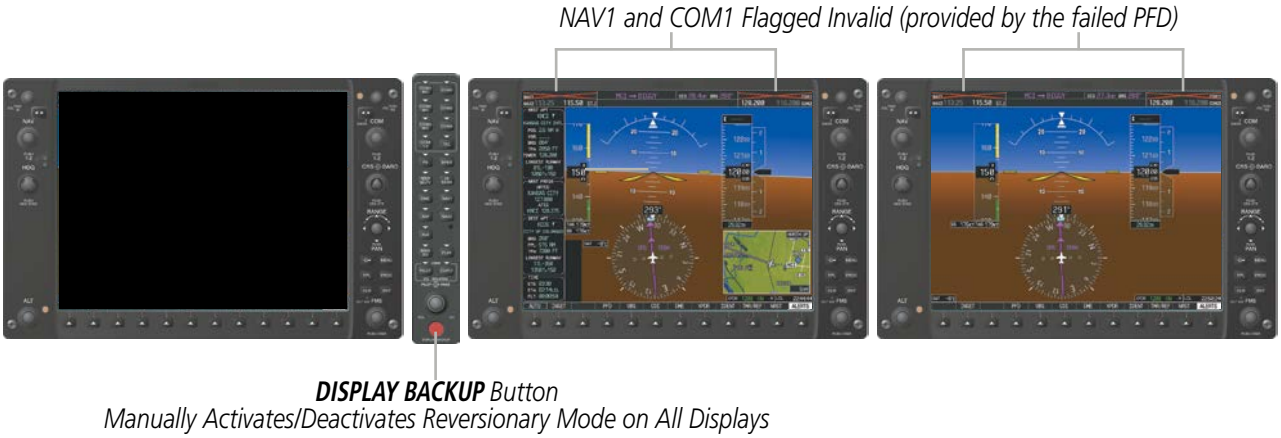


Figure 1-9 G900X Three Display Reversionary Mode (Failed PFD1)

G900X SYSTEM ANNUNCIATIONS

When an LRU or an LRU function fails, a large red 'X' is typically displayed over the instrument experiencing failed data (Figure 1-10 displays all possible flags and responsible LRUs). Upon G900X power-up, certain instruments remain invalid as equipment begins to initialize. All instruments should be operational within one minute of power-up. If any instrument remains flagged, the G900X should be serviced by a Garmin-authorized repair facility.

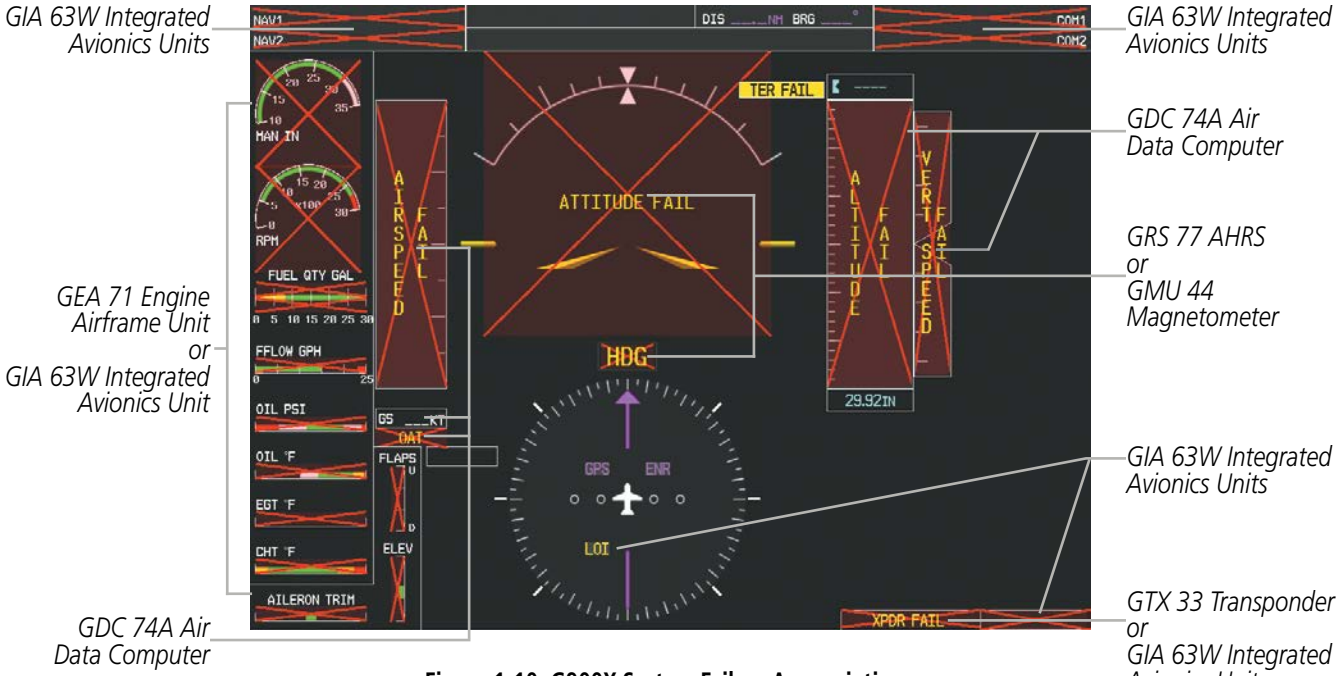


Figure 1-10 G900X System Failure Annunciations

SYSTEM STATUS

The System Status Page displays the statuses, serial numbers, and software version numbers for all detected system LRUs. Active LRUs are indicated by green check marks; failed, by red 'X's. Failed LRUs should be noted and a service center or Garmin-authorized dealer informed.

The **LRU** and **ARFRM** Softkeys on the System Status Page select the applicable list (LRU INFO or AIRFRAME window) through which the **FMS** Knob can be used to scroll information within the selected window.

Pressing the **MFD1 DB** Softkey (label background changes to grey indicting the softkey is selected) places the cursor in the DATABASE window. Use the **FMS** Knob to scroll through database information for the MFD. Pressing the softkey again will change the softkey label to **PFD1 DB**. PFD 1 database information is now displayed in the DATABASE window. Pressing the softkey a third time will change the softkey label to **PFD2 DB** (only if three tube system, otherwise will go to **MFD1 DB** again). PFD 2 database information is now displayed in the DATABASE window.

The **ANN TEST** Softkey, when pressed, causes an annunciation test tone to be played.



Figure 1-11 Example System Status Page

Pertinent information on all system databases is also displayed on this page. Refer to the Appendices and Additional Features sections for more information about databases.

Viewing database information:

1) Use the **FMS** Knob to select the AUX - System Status Page.
2) To place the cursor in the 'Database' Box,
   a) Press the **DB** Softkey (repeat until desired database is shown; MFD1, PFD1, or PFD2).

   Or:

   a) Press the **MENU** Key.
   b) Highlight 'Select Dbase Window' and press the **ENT** Key.
3) Use the **FMS** Knob to scroll through the box to view database status information.

The G900X uses aural tones to convey the priority of airframe-specific alerts. The alerting system's annunciation tone may be tested from the System Status Page. Refer to the Appendices for airframe-specific alerts.

Testing the system annunciation tone:

1) Use the **FMS** Knob to select the AUX - System Status Page.
2) Press the **ANN TEST** Softkey.

   Or:

   a) Press the **MENU** Key.
   b) Highlight 'Enable Annunciator Test Mode' and press the **ENT** Key.

AHRS OPERATION

NOTE: *Refer to the Appendices for specific AHRS alert information.*

NOTE: *Aggressive maneuvering while AHRS is not operating normally may degrade AHRS accuracy.*

In addition to using internal sensors, the GRS 77 AHRS uses GPS information, magnetic field data and air data to assist in attitude/heading calculations. In normal mode, the GRS 77 AHRS relies upon GPS and magnetic field measurements (air data is not used). If one or more of these three external inputs is unavailable or unreliable, the AHRS uses the remaining inputs for attitude/heading determination. Four AHRS modes of operation are available (Figure 1-13) and depend upon the combination of available sensor inputs. Loss of air data, GPS, or magnetometer sensor inputs is communicated to the pilot by message advisory alerts.

The AHRS (GRS 77) corrects for shifts and variations in the Earth's magnetic field by applying the Magnetic Field Variation Database. The Magnetic Field Variation Database is derived from the International Geomagnetic Reference Field (IGRF). The IGRF is a mathematical model that describes the Earth's main magnetic field and its annual rate of change. The database is updated approximately every 5 years. See the Appendices for information on updating the Magnetic Field Variation Database. The system will prompt you on startup when an update is available. Failure to update this database could lead to erroneous heading information being displayed to the pilot.

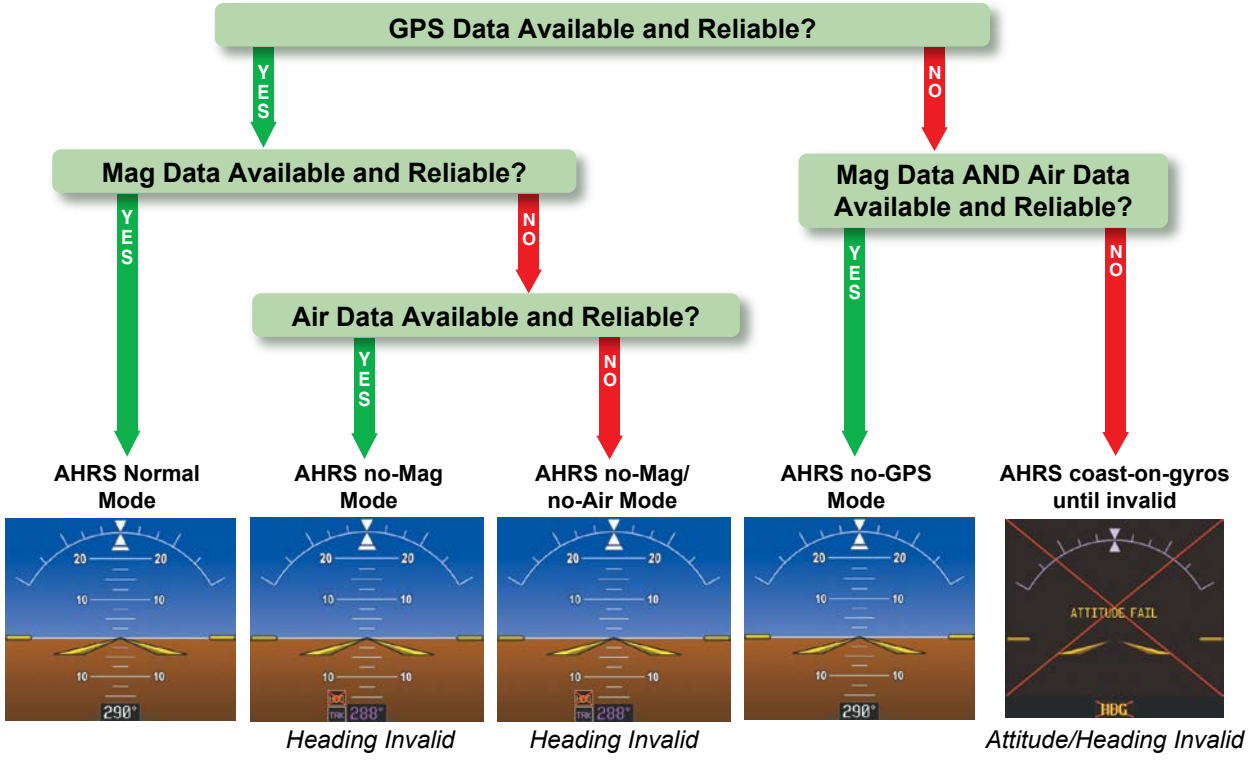


Figure 1-12 AHRS Operation

AHRS FAILURE

Failure of the internal AHRS inertial sensors may result in loss of attitude and heading information (indicated by red 'X' flags over the corresponding flight instruments).

GPS INPUT FAILURE

The system provides two sources of GPS information. If a single GPS receiver fails, or if the information provided from one of the GPS receivers is unreliable, the AHRS seamlessly transitions to using the other GPS receiver. An alert message informs the pilot of the use of the backup GPS path. If both GPS inputs fail, the AHRS continues to operate in reversionary No-GPS mode so long as the air data and magnetometer inputs are available and reliable. Unavailable or unreliable air data or magnetometer data in addition to GPS failure results in loss of all attitude and heading information.

NOTE: *In-flight initialization of AHRS, when operating without any valid source of GPS data and at true air speed values greater than approximately 200 knots, is not guaranteed. Under these rare conditions, it is possible for in-flight AHRS initialization to take an indefinite amount of time which would result in an extended period of time where valid AHRS outputs are unavailable.*

MAGNETOMETER FAILURE

If the magnetometer input fails, the AHRS transitions to one of the reversionary No-Magnetometer modes and continues to output valid attitude information. However, if the aircraft is airborne, the heading output on the PFD does become invalid (as indicated by a red "X").

AIR DATA INPUT FAILURE

Failure of the air data input has no effect on the AHRS output while AHRS is receiving valid GPS information. A failure of the air data input while the AHRS is operating in reversionary No-GPS mode results in invalid attitude and heading information on the PFD (as indicated by red "X" flags).

GPS RECEIVER OPERATION

Each GIA 63W Integrated Avionics Unit (IAU) contains a GPS receiver. Information collected by the specified receiver (GPS1 for the #1 IAU or GPS2 for the #2 IAU) may be viewed on the AUX - GPS Status Page.

GPS1 provides information to the pilot-side PFD and GPS2 provides data to the copilot-side PFD. Internal system checking is performed to ensure both GPS receivers are providing accurate data to the PFDs. In some circumstances, both GPS receivers may be providing accurate data, but one receiver may be providing a better GPS solution than the other receiver. In this case the GPS receiver producing the better solution is automatically coupled to both PFDs. "BOTH ON GPS 1" or "BOTH ON GPS 2" is displayed in the Reversionary Sensor Window (see Appendix A) indicating which GPS receiver is being used. Both GPS receivers are still functioning properly, but one receiver is performing better than the other at that particular time.

These GPS sensor annunciations are most often seen after system power-up when one GPS receiver has acquired satellites before the other, or one of the GPS receivers has not yet acquired an SBAS signal. While the aircraft is on the ground, the SBAS signal may be blocked by obstructions causing one GPS receiver to have difficulty acquiring a good signal. Also, while airborne, turning the aircraft may result in one of the GPS receivers temporarily losing the SBAS signal.

If the sensor annunciation persists, check for a system failure message in the Messages Window on the PFD. If no failure message exists, check the GPS Status Page and compare the information for GPS1 and GPS2. Discrepancies may indicate a problem.

Viewing GPS receiver status information:

1) Use the large **FMS** Knob on the MFD to select the Auxiliary Page Group (see Section 1.6 for information on navigating MFD page groups).
2) Use the small **FMS** Knob to select GPS Status Page (third page in the AUX Page Group).

Selecting the GPS receiver for which data may be reviewed

1) Use the **FMS** Knob to select the AUX - GPS Status Page.
2) To change the selected GPS receiver:

   Press the desired **GPS** Softkey.

   Or:

   a) Press the **MENU** Key.

   b) Use the **FMS** Knob to highlight the receiver which is not selected and press the **ENT** Key.

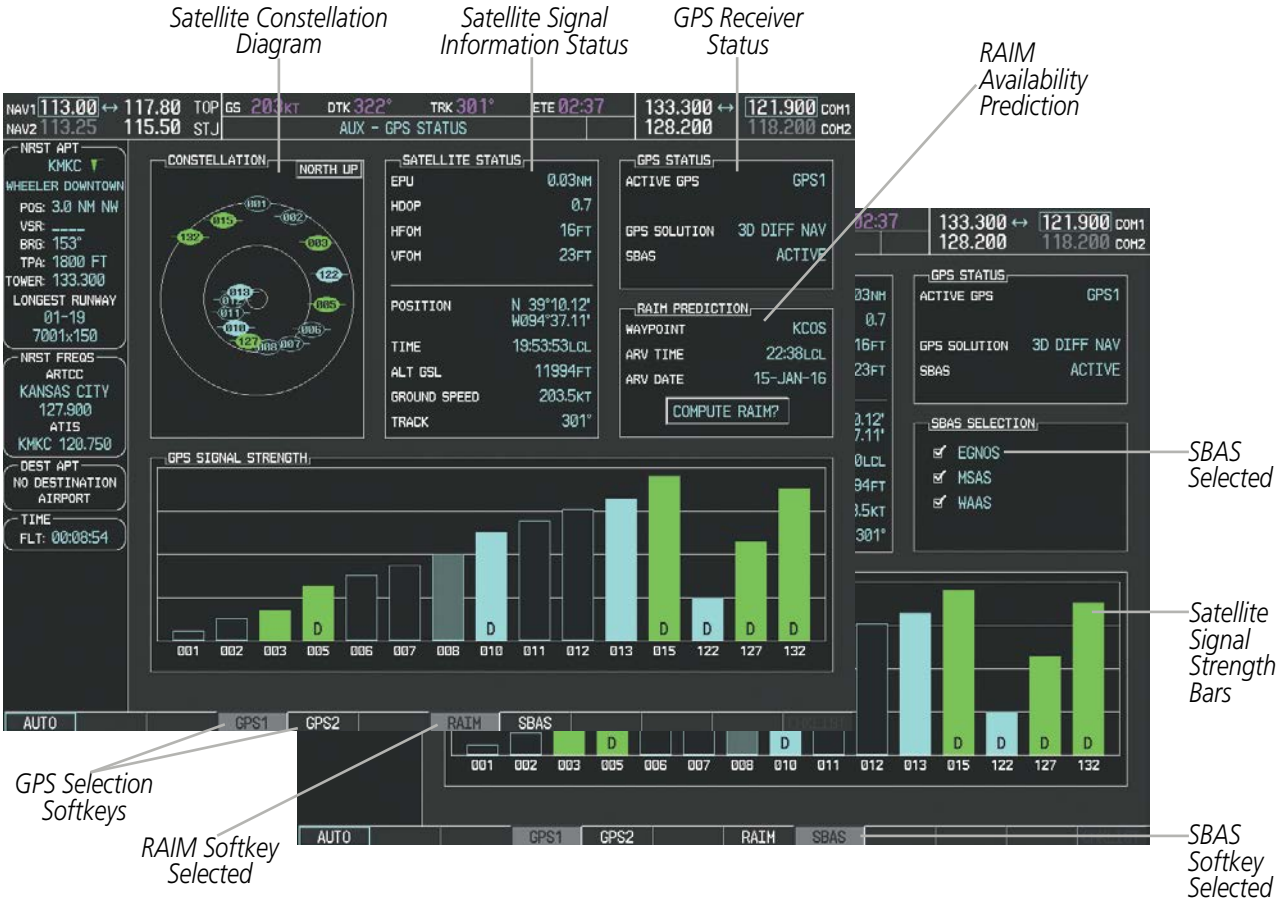


Figure 1-22 GPS Status Page (RAIM or SBAS Selected)

The GPS Status Page provides the following information:

- Satellite constellation diagram

  Satellites currently in view are shown at their respective positions on a sky view diagram. The sky view is always in a north-up orientation, with the outer circle representing the horizon, the inner circle representing 45° above the horizon, and the center point showing the position directly overhead.

  Each satellite is represented by an oval containing the Pseudo-random noise (PRN) number (i.e., satellite identification number). Satellites whose signals are currently being used are represented by solid ovals.

- Satellite signal information status

  The accuracy of the aircraft's GPS fix is calculated using Estimated Position Uncertainty (EPU), Dilution of Precision (DOP), and horizontal and vertical figures of merit (HFOM and VFOM). EPU is the radius of a circle centered on an estimated horizontal position in which actual position has 95% probability of laying. EPU is a statistical error indication and not an actual error measurement.

  DOP measures satellite geometry quality (i.e., number of satellites received and where they are relative to each other) on a range from 0.0 to 9.9, with lower numbers denoting better accuracy. HFOM and VFOM, measures of horizontal and vertical position uncertainty, are the current 95% confidence horizontal and vertical accuracy values reported by the GPS receiver.

  The current calculated GPS position, time, altitude, ground speed, and track for the aircraft are displayed below the satellite signal accuracy measurements.

- GPS receiver status

  The GPS solution type (ACQUIRING, 2D NAV, 2D DIFF NAV, 3D NAV, 3D DIFF NAV) for the active GPS receiver (GPS1 or GPS2) is shown in the upper right of the GPS Status Page. When the receiver is in the process of acquiring enough satellite signals for navigation, the receiver uses satellite orbital data (collected continuously from the satellites) and last known position to determine the satellites that should be in view. ACQUIRING is indicated as the solution until a sufficient number of satellites have been acquired for computing a solution.

  When the receiver is in the process of acquiring a 3D differential GPS solution, 3D NAV is indicated as the solution until the 3D differential fix has finished acquisition. SBAS (Satellite-Based Augmentation System) indicates INACTIVE. When acquisition is complete, the solution status indicates 3D DIFF NAV and SBAS indicates ACTIVE.

- RAIM (Receiver Autonomous Integrity Monitoring) Prediction (**RAIM** Softkey is selected)

  In most cases performing a RAIM prediction is not necessary. However, in some cases, the selected approach may be outside the SBAS coverage area and it may be necessary to perform a RAIM prediction for the intended approach.

  Receiver Autonomous Integrity Monitoring (RAIM) is a GPS receiver function that performs a consistency check on all tracked satellites. RAIM ensures that the available satellite geometry allows the receiver to calculate a position within a specified RAIM protection limit (2.0 nautical miles for oceanic and enroute, 1.0 nm for terminal, and 0.3 nm for non-precision approaches). During oceanic, enroute, and terminal phases of flight, RAIM is available nearly 100% of the time.

The RAIM prediction function also indicates whether RAIM is available at a specified date and time. RAIM computations predict satellite coverage within ±15 min of the specified arrival date and time.

Because of the tighter protection limit on approaches, there may be times when RAIM is not available. The G1000 automatically monitors RAIM and warns with an alert message when it is not available. If RAIM is not predicted to be available for the final approach course, the approach does not become active, as indicated by the messages "Approach is not active" and "RAIM not available from FAF to MAP". If RAIM is not available when crossing the FAF, the missed approach procedure must be flown.

Predicting RAIM availability at a selected waypoint

1) Select the GPS Status Page.
2) If necessary, select the **RAIM** Softkey.
3) Press the **FMS** Knob. The 'WAYPOINT' field is highlighted.
4) Turn the small **FMS** Knob to display the Waypoint Information Window.
5) Enter the desired waypoint:
   a) Use the **FMS** Knob to enter the desired waypoint by identifier, facility, or city name and press the **ENT** Key. Refer to Section 1.7 for instructions on entering alphanumeric data into the G1000.

   Or:

   a) Turn the small **FMS** Knob counter-clockwise to display a list of flight plan waypoints (the FPL list is populated only when navigating a flight plan).
   b) Turn the small **FMS** Knob clockwise to display the NRST, RECENT, or AIRWAY waypoints, if required.
   c) Turn the large **FMS** Knob clockwise to select the desired waypoint. The G1000 automatically fills in the identifier, facility, and city fields with the information for the selected waypoint.
   d) Press the **ENT** Key to accept the waypoint entry.
6) Use the **FMS** Knob to enter an arrival time and press the **ENT** Key.
7) Use the **FMS** Knob to enter an arrival date and press the **ENT** Key.
8) With the cursor highlighting 'COMPUTE RAIM?', press the **ENT** Key. Once RAIM availability is computed, one of the following is displayed:
   - 'COMPUTE RAIM?'—RAIM has not been computed for the current waypoint, time, and date combination
   - 'COMPUTING AVAILABILITY'—RAIM calculation in progress
   - 'RAIM AVAILABLE'—RAIM is predicted to be available for the specified waypoint, time, and date
   - 'RAIM NOT AVAILABLE'—RAIM is predicted to be unavailable for the specified waypoint, time, and date

Predicting RAIM availability at present position

1) Select the GPS Status Page.
2) If necessary, select the **RAIM** Softkey.
3) Press the **FMS** Knob. The 'WAYPOINT' field is highlighted.

4) Press the **MENU** Key.
5) With 'Set WPT to Present Position' highlighted, press the **ENT** Key.
6) Press the **ENT** Key to accept the waypoint entry.
7) Use the **FMS** Knob to enter an arrival time and press the **ENT** Key.
8) Use the **FMS** Knob to enter an arrival date and press the **ENT** Key.
9) With the cursor highlighting 'COMPUTE RAIM?', press the **ENT** Key. Once RAIM availability is computed, one of the following is displayed:
   - 'COMPUTE RAIM?'—RAIM has not been computed for the current waypoint, time, and date combination
   - 'COMPUTING AVAILABILITY'—RAIM calculation in progress
   - 'RAIM AVAILABLE'—RAIM is predicted to be available for the specified waypoint, time, and date
   - 'RAIM NOT AVAILABLE'—RAIM is predicted to be unavailable for the specified waypoint, time, and date

- SBAS Selection (**SBAS** Softkey is selected)

In certain situations, such as when the aircraft is outside or on the fringe of the SBAS coverage area, it may be desireable to disable SBAS (although it is not recommended). When disabled, the SBAS field in the GPS Status box indicates DISABLED.

Disabling SBAS

1) Select the GPS Status Page.
2) If necessary, press the **SBAS** Softkey.
3) Press the **FMS** Knob to activate the cursor.
4) Turn either FMS Knob to select 'EGNOS' or 'MSAS' or 'WAAS', as necessary.
5) Press the **ENT** Key to uncheck the box.
6) Repeat steps 4 & 5 as necessary, then press the **FMS** Knob to remove the cursor.

- GPS Satellite Signal Strengths

The GPS Status Page can be helpful in troubleshooting weak (or missing) signal levels due to poor satellite coverage or installation problems. As the GPS receiver locks onto satellites, a signal strength bar is displayed for each satellite in view, with the appropriate satellite PRN number (01-32 or 120-138 for SBAS) below each bar. The progress of satellite acquisition is shown in three stages, as indicated by signal bar appearance:

- No bar—Receiver is looking for the indicated satellite
- Hollow bar—Receiver has found the satellite and is collecting data
- Cyan bar—Receiver has collected the necessary data and the satellite signal can be used
- Green bar—Satellite is being used for the GPS solution
- Checkered bar—Receiver has excluded the satellite (Fault Detection and Exclusion)
- "D" indication—Denotes the satellite can be used as part of the differential computations

Each satellite has a 30-second data transmission that must be collected (signal strength bar is hollow) before the satellite may be used for navigation (signal strength bar becomes solid).

1.5 G900X CONTROLS

The G900X controls have been designed to simplify operation of the system and minimize workload and the time required to access sophisticated functionality. Controls are located on the PFD and MFD bezels, Control Unit, and Audio Panel. PFD and MFD controls and softkeys are discussed in this section. Audio Panel controls are described in the Audio Panel and CNS section; see the Audio Panel and CNS Section for more information about NAV/COM controls.

PFD/MFD CONTROLS

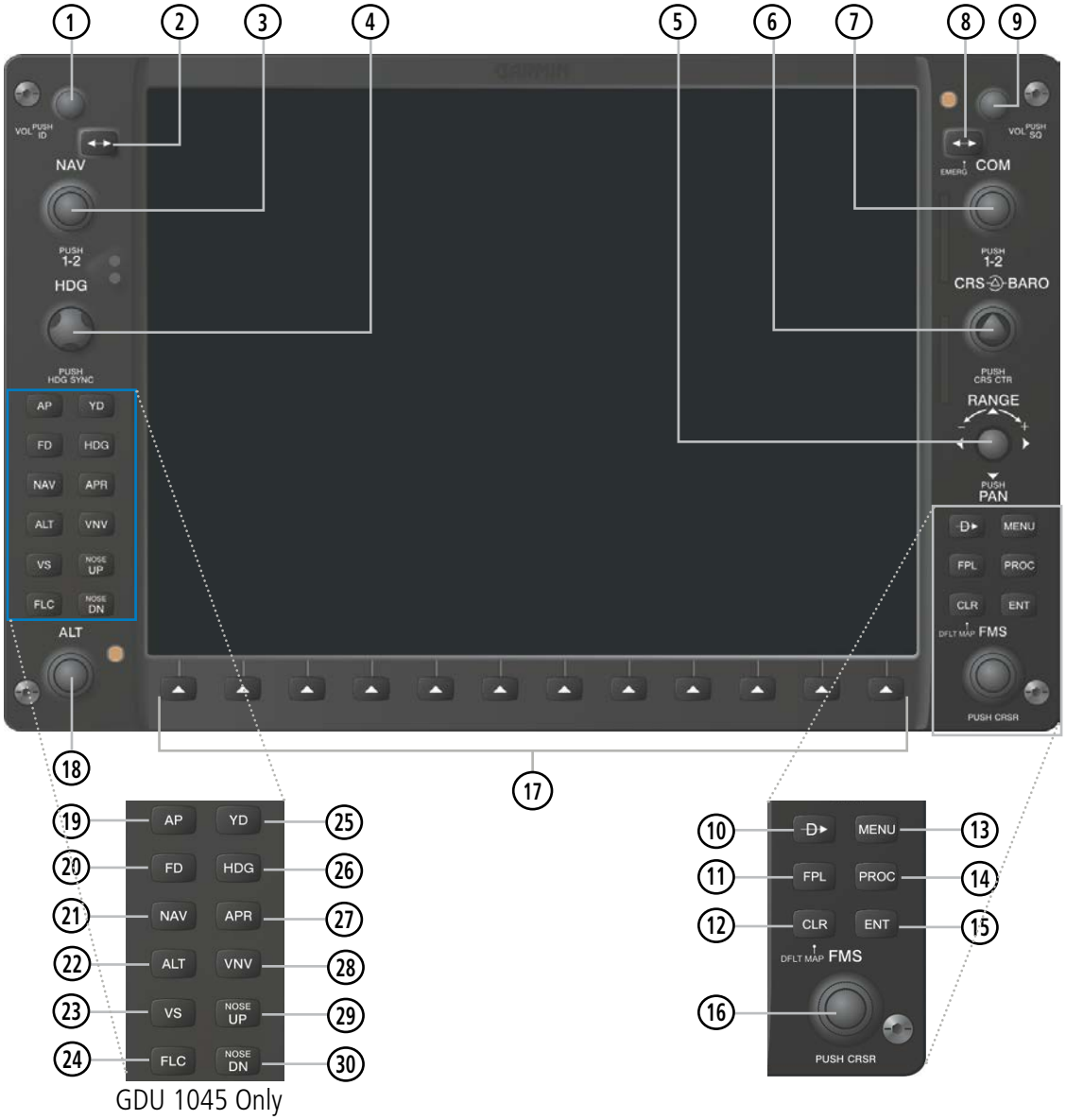


Figure 1-15 PFD/MFD Controls

(1) **NAV VOL/ID Knob**	Turn to control NAV audio volume (shown in the NAV Frequency Box as a percentage) Press to toggle Morse code identifier audio ON/OFF
(2) **NAV Frequency Transfer Key**	Transfers the standby and active NAV frequencies
(3) **NAV Knob**	Turn to tune NAV receiver standby frequencies (large knob for MHz; small for kHz) Press to toggle cyan tuning box between NAV1 and NAV2
(4) **Heading Knob**	Turn to manually select a heading Press to display a digital heading momentarily to the left of the HSI and synchronize the Selected Heading to the and current heading
(5) **Joystick**	Turn to change map range Press to activate Map Pointer for map panning
(6) **CRS/BARO Knob**	Turn large knob for altimeter barometric pressure setting Turn small knob to adjust course (only when HSI is in VOR or OBS Mode) Press to re-center the CDI and return course pointer directly TO bearing of active waypoint/ station
(7) **COM Knob**	Turn to tune COM transceiver standby frequencies (large knob for MHz; small for kHz) Press to toggle cyan tuning box between COM1 and COM2 The selected COM (green) is controlled with the **COM MIC** Key (Audio Panel).
(8) **COM Frequency Transfer Key (EMERG)**	Transfers the standby and active COM frequencies Press and hold 2 seconds to tune the emergency frequency (121.5 MHz) automatically into the active frequency field
(9) **COM VOL/SQ Knob**	Turn to control COM audio volume level (shown as a percentage in the COM Frequency Box) Press to turn the COM automatic squelch ON/OFF
(10) **Direct-to Key (D▸)**	Activates the direct-to function and allows the user to enter a destination waypoint and establish a direct course to the selected destination (specified by identifier, chosen from the active route)
(11) **FPL Key**	Displays flight plan information
(12) **CLR Key (DFLT MAP)**	Erases information, cancels entries, or removes menus Press and hold to display the MFD Navigation Map Page (MFD only).
(13) **MENU Key**	Displays a context-sensitive list of options for accessing additional features or making setting changes
(14) **PROC Key**	Gives access to IFR departure procedures (DPs), arrival procedures (STARs), and approach procedures (IAPs) for a flight plan or selected airport
(15) **ENT Key**	Validates/confirms menu selection or data entry
(16) **FMS Knob (Flight Management System Knob)**	Press to turn the selection cursor ON/OFF. ***Data Entry:*** With cursor ON, turn to enter data in the highlighted field (large knob moves cursor location; small knob selects character for highlighted cursor location) ***Scrolling:*** When a list of information is too long for the window/box, a scroll bar appears, indicating more items to view. With cursor ON, turn large knob to scroll through the list. ***Page Selection:*** Turn knob on MFD to select the page to view (large knob selects a page group; small knob selects a specific page from the group)

(17) **Softkey Selection Keys**	Press to select softkey shown above the bezel key on the PFD/MFD display
(18) **ALT Knob**	Sets the Selected Altitude, shown above the Altimeter (the large knob selects the thousands, the small knob selects the hundreds)
(19) **AP Key**	Engages/disengages the Autopilot and Flight Director in the default vertical and lateral modes.
(20) **FD Key**	Activates/deactivates the Flight Director only. Pressing the **FD** key turns on the Flight Director in the default vertical and lateral modes. Pressing the **FD** key again deactivates the Flight Director and removes the command bars, unless the Autopilot is engaged. If the Autopilot is engaged, the **FD** key is disabled.
(21) **NAV Key**	Selects/deselects the Navigation mode.
(22) **ALT Key**	Selects/deselects the Altitude Hold mode.
(23) **VS Key**	Selects/deselects the Vertical Speed mode.
(24) **FLC Key**	Selects/deselects the Flight Level Change mode.
(25) **YD Key**	Engages/disengages the Yaw Damper.
(26) **HDG Key**	Selects/deselects the Heading Select mode.
(27) **APR Key**	Selects/deselects the Approach mode.
(28) **VNV Key (if equipped)**	Selects/deselects Vertical Navigation mode
(29) **NOSE UP Key**	Controls the active pitch reference for the Pitch Hold, Vertical Speed, and Flight Level Change modes.
(30) **NOSE DN Key**	Controls the active pitch reference for the Pitch Hold, Vertical Speed, and Flight Level Change modes.

The **NAV**, **CRS/BARO**, **COM**, **FMS**, and **ALT** knobs are concentric dual knobs, each having small (inner) and large (outer) control portion. When a portion of the knob is not specified in the text, either may be used.

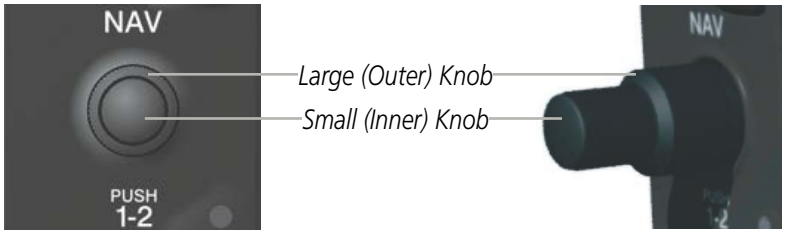


Figure 1-16 Dual Concentric Knob

MFD/PFD CONTROL UNIT (OPTIONAL)

The optional MFD/PFD Control Unit is a pedestal-mounted user interface allowing for ease of data entry, MFD/PFD operation, and NAV/COM tuning. Many procedures in this Pilot's Guide can be performed using the MFD/PFD Control Unit rather than the display bezel controls. Indicators above the **PFD**, **MFD**, **NAV**, and **COM** keys are illuminated when their respective control mode(s) are selected. The unit is in MFD control mode by default on system power-up.

NAV/COM radio tuning can be accomplished in either PFD or MFD control mode. The appropriate frequency box on the selected display is outlined by a cyan selection box, which flashes for a few seconds to indicate Control Unit activity (refer to the Audio Panel and CNS Section for more information about NAV/COM tuning). Selection of a different display control or radio tuning mode results in cancelation of the previous radio tuning mode.



Figure 1-17 GCU 476 MFD/PFD Control Unit (Optional)

(1) **FPL Key**	Displays flight plan information
(2) **Direct-to Key (D▸)**	Activates the direct-to function and allows the user to enter a destination waypoint and establish a direct course to the selected destination (specified by identifier, chosen from the active route)

(3) **MENU Key**	Displays a context-sensitive list of options for accessing additional features or making setting changes
(4) **PROC Key**	Gives access to IFR departure procedures (DPs), arrival procedures (STARs), and approach procedures (IAPs) for a flight plan or selected airport
(5) **Joystick**	Turn to change map range Press to activate Map Pointer for map panning
(6) **Alphanumeric Keys**	Allow data entry (rather than using the **FMS** Knob to select characters/numbers)
(7) **BKSP Key**	Moves cursor back one character space and removes last character entered
(8) **SPC Key**	Adds a space character
(9) **ENT Key**	Validates or confirms a menu selection or data entry
(10) **CLR Key**	Erases information, cancels entries, or removes menus Press and hold to display the MFD Navigation Map Page (MFD only).
(11) **SEL Key**	Arrows move cyan Softkey Selection Box (Figure 1-14) on selected display Press the center to activate the selected softkey
(12) **Decimal Key**	Enters a decimal point character
(13) **Plus-Minus (±) Key**	Toggles entry between the + and - characters
(14) **NAV Key**	Selects/deselects NAV radio tuning mode on the MFD/PFD Control Unit
(15) **COM Key**	Selects/deselects COM radio tuning mode on the MFD/PFD Control Unit
(16) **Frequency Transfer Key (EMERG)**	Transfers between active and standby selected COM or NAV tuning frequencies Press and hold 2 seconds to tune the emergency frequency (121.5 MHz) automatically into the active frequency field
(17) **PFD Key**	When selected, the MFD/PFD Control Unit can be used to access PFD functions
(18) **MFD Key**	When selected, the MFD/PFD Control Unit can be used to access MFD functions (default display control mode)
(19) **FMS/NAV-COM Knob**	***NAV/COM Tuning Modes:*** Acts as the **NAV** or **COM** Knob ***PFD/MFD Control Modes:*** Acts as the **FMS** Knob

MFD CONTROL UNIT (OPTIONAL

Many of the controls on the Control Unit (GCU 477) have the same function as those located on the MFD.

The following list provides an overview of the controls located on the Control Unit (see Figure 1-18):

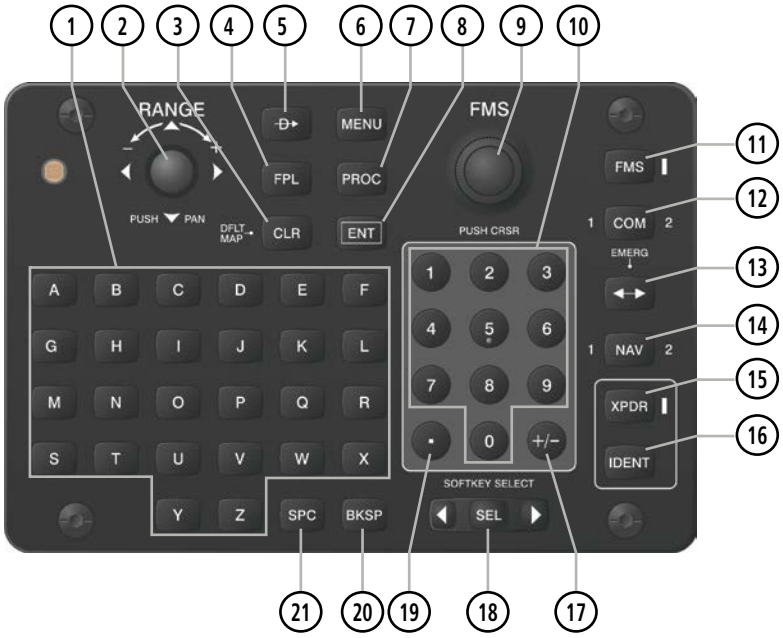


Figure 1-18 Control Unit (GCU 477)

1. **Alphabetic Keys** – Allow the user to enter letters quickly, without having to select individual characters with the **FMS** Knob.
2. **Joystick** – Changes the map range when rotated. Activates the map pointer when pressed.
3. **CLR Key** – Erases information, cancels entries, or removes page menus. Pressing and holding this key displays the Navigation Map Page automatically.
4. **FPL Key** – Displays the active Flight Plan Page for creating and editing the active flight plan, or for accessing stored flight plans.
5. **Direct-to Key (D▸)** – Allows the user to enter a destination waypoint and establish a direct course to the selected destination (the destination is either specified by the identifier, chosen from the active route, or taken from the map pointer position).
6. **MENU Key** – Displays a context-sensitive list of options. This list allows the user to access additional features or make setting changes that relate to particular pages.
7. **PROC Key** – Gives access to IFR departure procedures (DPs), arrival procedures (STARs) and approach procedures (IAPs) for a flight plan. If a flight plan is used, available procedures for the departure and/or arrival airport are automatically suggested. Theses procedures can then be loaded into the active flight plan. If a flight plan is not used, both the desired airport and the desired procedure may be selected.

(8) **ENT Key** – Validates or confirms a menu selection or data entry.

(9) **Dual FMS Knob** – Flight Management System Knob. When the **FMS** Key is pressed, this knob selects the MFD page to be viewed. The large knob selects a page group (MAP, WPT, AUX, NRST), while the small knob selects a specific page within the page group. Pressing the **FMS** Knob turns the selection cursor ON and OFF. When the cursor is ON, data may be entered in the applicable window by turning the small and large knobs. In this case, the large knob moves the cursor on the page, while the small knob selects individual characters for the highlighted cursor location. This knob also tuning capability for the COM and NAV radios when the appropriate COM or NAV key is presssed. When the **XPDR** Key is pressed, the transponder code may be entered using the **FMS** Knob.

(10) **FMS Key** – Sets the **FMS** Knob to control FMS functions on the MFD. When pressed, an annunciator next to the key illuminates indicating adjustment of the **FMS** Knob will now affect FMS functions.

(11) **Numeric Keys** – Allow the user to enter numbers quickly, without having to select individual characters with the **FMS** Knob.

(12) **COM Key** – Sets the **FMS** Knob to control tuning of the COM radios. The first press will select COM1, as indicated by an illuminated "1" to the left of the key. Press again to select COM2. This is annunciated with a "2" to the right of the key. Each subsequent press of the **COM** Key will switch between COM1 and COM2. Use the **FMS** Knob to tune the selected COM.

(13) **Frequency Transfer Key (EMERG)** – Switches the standby and active COM or NAV frequencies. Press and hold this key for two seconds to tune the emergency frequency (121.5 MHz) automatically into the active frequency field.

(14) **NAV Key** – Sets the **FMS** Knob to control tuning of the NAV radios. The first press will select NAV1, as indicated by an illuminated "1" to the left of the key. Press again to select NAV2. This is annunciated with a "2" to the right of the key. Each subsequent press of the **NAV** Key will switch between NAV1 and NAV2. Use the **FMS** Knob to tune the selected NAV.

(15) **XPDR Key** – Sets the **FMS** Knob to enter transponders codes. When pressed, an annunciator next to the key illuminates indicating the **FMS** Knob can now be used for transponder code entry.

(16) **IDENT Key** – Activates transponder IDENT function.

(17) **Plus (+) Minus (-) Key** – Toggles a (+) or (-) character.

(18) **SEL Key** – The center of this key activates the selected MFD softkey, while the right and left arrows move the softkey selection box to the right and left, respectively.

(19) **Decimal Key** – Enters a decimal point.

(20) **BKSP Key** – Moves the cursor back one character space.

(21) **SPC Key** – Adds a space character.

SOFTKEY FUNCTION

The softkeys are located along the bottoms of the displays. The softkeys shown depend on the softkey level or page being displayed. The bezel keys below the softkeys can be used to select the appropriate softkey. When a softkey is pressed, its color changes to black text on gray background and remains this way until it is turned off, at which time it reverts to white text on black background. When a softkey function is disabled, the softkey label is subdued (dimmed).

Softkeys revert to the previous level after 45 seconds of inactivity.

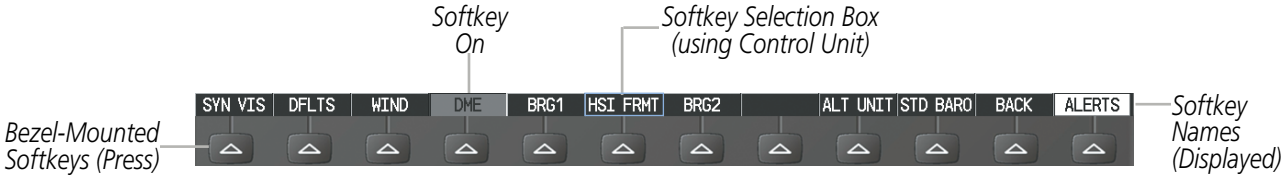


Figure 1-19 Softkeys (Second-Level PFD Configuration)

The Control Unit can also be used to select softkeys.

Selecting a softkey using the Control Unit:

1) Choose the desired display control mode by pressing the **PFD** or **MFD** Key on the Control Unit (GCU 476 only).
2) Move the Softkey Selection Box (the cyan outline around the softkey label) to the desired softkey using the arrows of the **SEL** Key.
3) Press the center of the **SEL** Key to select the desired softkey.

PFD SOFTKEYS

The **CDI**, **IDENT**, **TMR/REF**, **NRST**, and **ALERTS** softkeys undergo a momentary change to black text on gray background and automatically switch back to white text on black background when selected.

The PFD softkeys provide control over flight management functions, including GPS, NAV, terrain, traffic, and lightning (optional). Each softkey sublevel has a **BACK** Softkey which can be pressed to return to the previous level. The **ALERTS** Softkey is visible at all softkey levels (label changes if messages are issued).

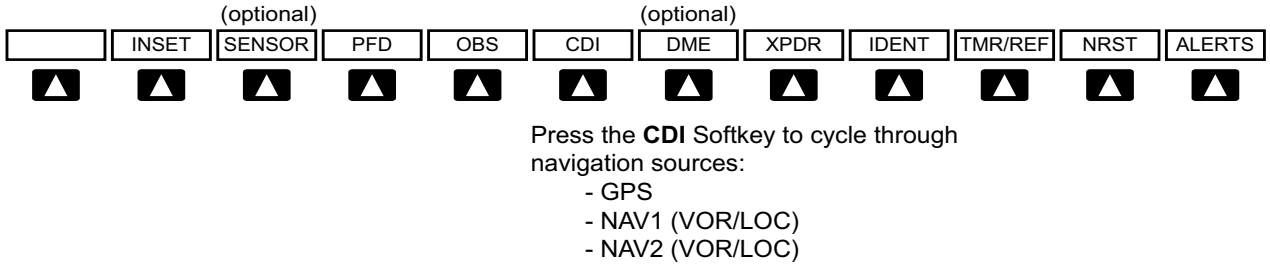


Figure 1-20 Top Level PFD Softkeys

INSET		Displays Inset Map in PFD lower left corner
	OFF	Removes Inset Map
	DCLTR (3)	Selects desired amount of map detail; cycles through declutter levels: DCLTR (No Declutter): All map features visible DCLTR-1: Declutters land data DCLTR-2: Declutters land and SUA data DCLTR-3: Removes everything except for the active flight plan
	WX LGND	Displays icon and age on the Inset Map for the selected weather products
	TRAFFIC	Displays traffic information on Inset Map TRAFFIC: No Traffic displayed on Inset Map TRFC-1: Traffic displayed on Inset Map TRFC-2: Traffic Only display shown
	TOPO	Displays topographical data (e.g., coastlines, terrain, rivers, lakes) and elevation scale on Inset Map
	TERRAIN	Displays terrain information on Inset Map
	STRMSCP	Displays Stormscope information on Inset Map (optional)
	NEXRAD or **NEXRAD** or	Displays SiriusXM NEXRAD weather and coverage on Inset Map (optional) When the GDL 88 is installed and FIS-B is the selected weather source, softkey cycles through NEXRAD weather and additional coverage options on Inset Map (optional): US: Continental US NEXRAD weather displayed on Inset Map RGNL: Regional NEXRAD weather displayed on Inset Map
	PRECIP	Displays/removes Garmin Connext radar precipitation and radar coverage information on Inset Map (optional)
	XM LTNG or **DL LTNG**	Displays SiriusXM lightning on Navigation Map (optional GDL 69/69A/69 SXM/69A SXM only) Displays Connext Weather lightning on Navigation Map (optional GSR 56 only)
	METAR	Displays METAR information on Inset Map (optional)

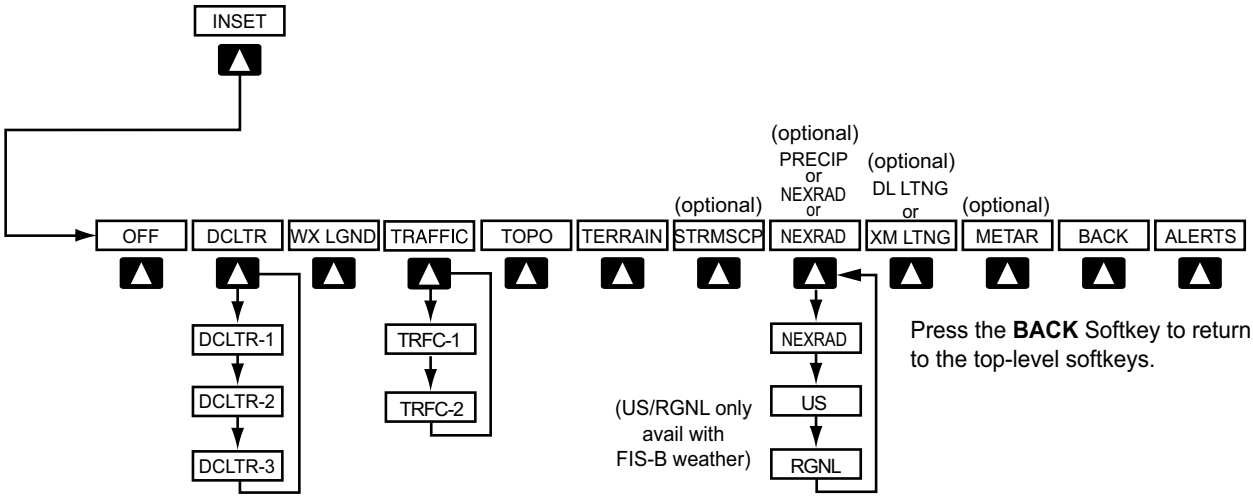


Figure 1-21 INSET Softkeys

SENSOR — Displays softkeys for selecting the #1 and #2 AHRS and Air Data Computers (optional)

- **ADC1** — Selects the #1 Air Data Computer
- **ADC2** — Selects the #2 Air Data Computer
- **AHRS1** — Selects the #1 AHRS
- **AHRS2** — Selects the #2 AHRS

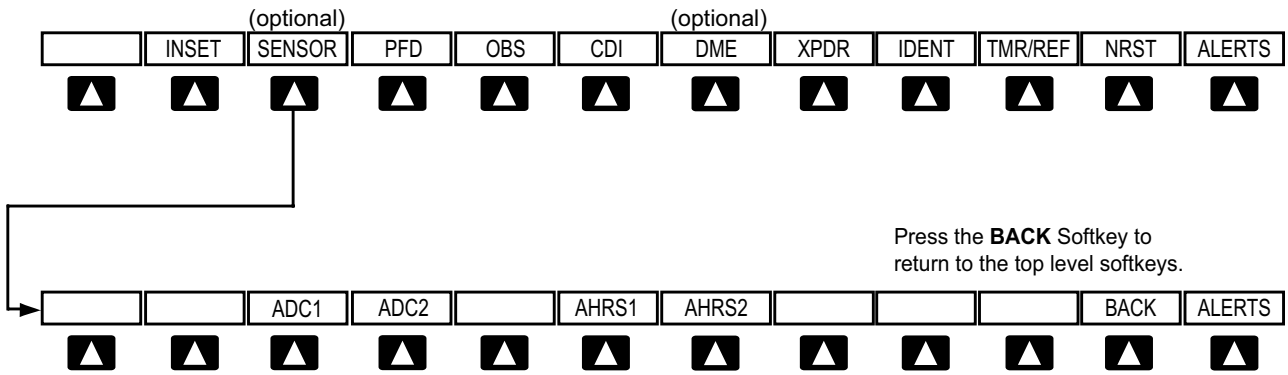


Figure 1-22 SENSOR Softkeys

PFD — Displays second-level softkeys for additional PFD configuration

- **SYN VIS** — Displays the softkeys for enabling or disabling Synthetic Vision features
  - **PATHWAY** — Displays rectangular boxes representing the horizontal and vertical flight path of the active flight plan
  - **SYN TERR** — Enables synthetic terrain depiction
  - **HRZN HDG** — Displays compass heading along the Zero-Pitch line
  - **APTSIGNS** — Displays position markers for airports within approximately 15 nm of the current aircraft position. Airport identifiers are displayed when the airport is within approximately 9 nm.
- **DFLTS** — Resets PFD to default settings, including changing units to standard
- **WIND** — Displays softkeys to select and configure wind data
  - **OPTN1** — Headwind/tailwind and crosswind arrows with numeric speed components
  - **OPTN2** — Wind direction arrow with numeric speed
  - **OPTN3** — Wind direction arrow with numeric headwind/tailwind and crosswind speed
  - **OFF** — Removes wind information from display
- **DME** — Displays/removes the DME Information Window (optional)
- **BRG1** — Cycles the Bearing 1 Information Window through:
  NAV1: Waypoint frequency/identifier and distance information
  GPS: Waypoint identifier and GPS distance information
  OFF: Removes window
- **HSI FRMT** — Displays softkeys to select the HSI format
  - **360 HSI** — Displays HSI as a 360° compass rose
  - **ARC HSI** — Displays HSI as a 140° viewable arc (Bearing Information windows unavailable)

BRG2	Cycles the Bearing 2 Information Window through: NAV2: Waypoint frequency/identifier and distance information GPS: Waypoint identifier and GPS distance information OFF: Removes window
ALT UNIT	Displays softkeys for changing the Altimeter barometric setting and altitude displays to metric units
METERS	Displays the current and Selected altitudes in meters in addition to feet, when selected
IN	Displays the Altimeter barometric setting in inches of mercury (in Hg)
HPA	Displays the Altimeter barometric setting in hectopascals (hPa)
STD BARO	Sets barometric pressure to 29.92 in Hg (1013 hPa if metric display is selected)

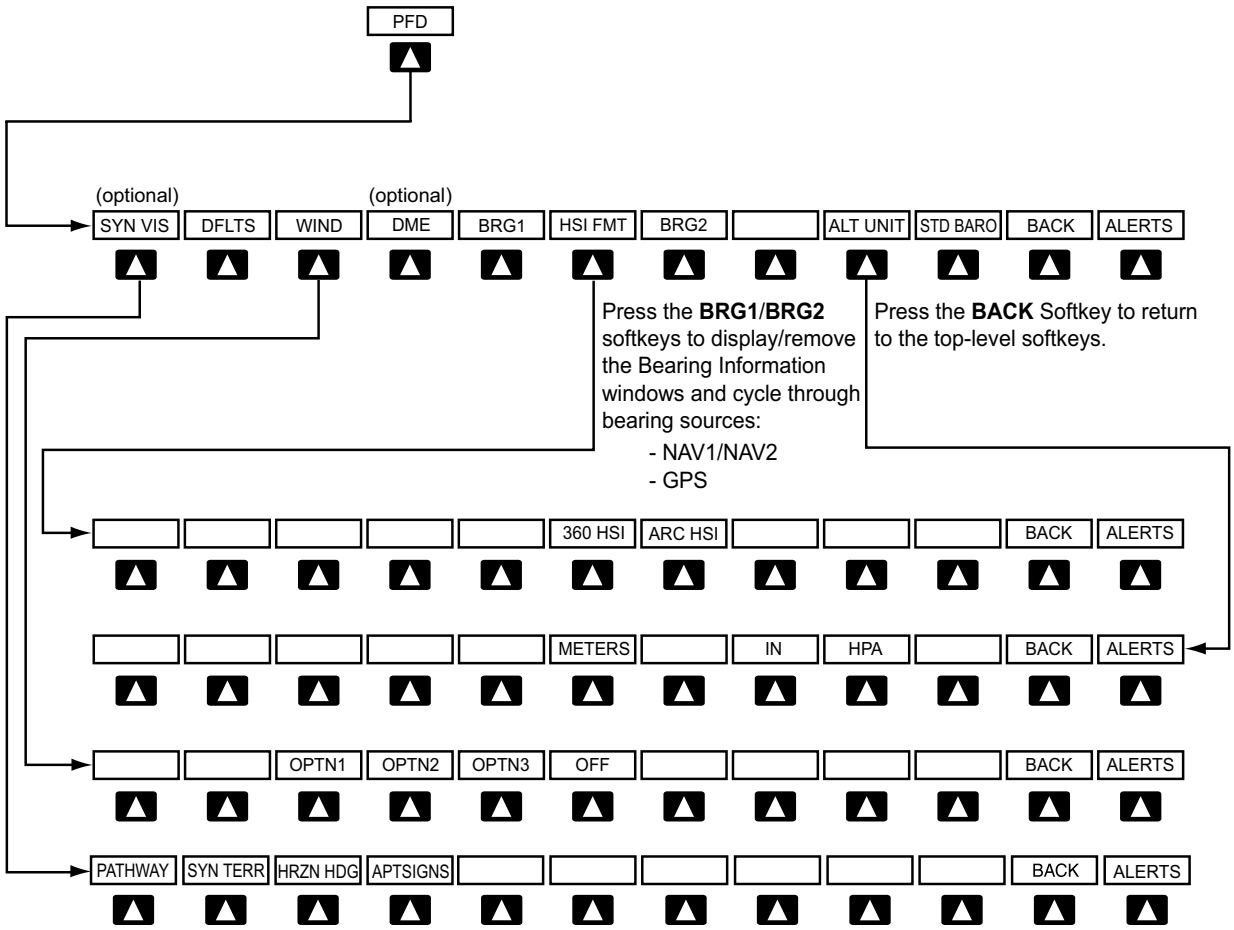


Figure 1-23 PFD Configuration Softkeys

OBS		Selects OBS Mode on the CDI when navigating by GPS (only available with active leg)
CDI		Cycles through GPS, VOR1, and VOR2 navigation sources on the HSI
DME		Displays the DME Tuning Window, allowing tuning and selection of the DME (optional)
XPDR		Displays transponder mode selection softkeys:
	STBY	Selects standby mode (Transponder does not reply to any interrogations)
	ON	Selects Mode A (Transponder replies to interrogations)
	ALT	Selects Mode C – altitude reporting mode (Transponder replies to identification and altitude interrogations)
	VFR	Automatically enters the VFR code (1200 in U.S.A. only)
	CODE	Displays transponder code selection softkeys 0-7
	0 — 7	Use numbers to enter code
	BKSP	Removes numbers entered, one at a time
IDENT		Activates the Special Position Identification (SPI) pulse for 18 seconds, identifying the transponder return on the ATC screen
TMR/REF		Displays/removes Timer/References Window
NRST		Displays/removes Nearest Airports Window
ALERTS		Displays/removes Alerts Window

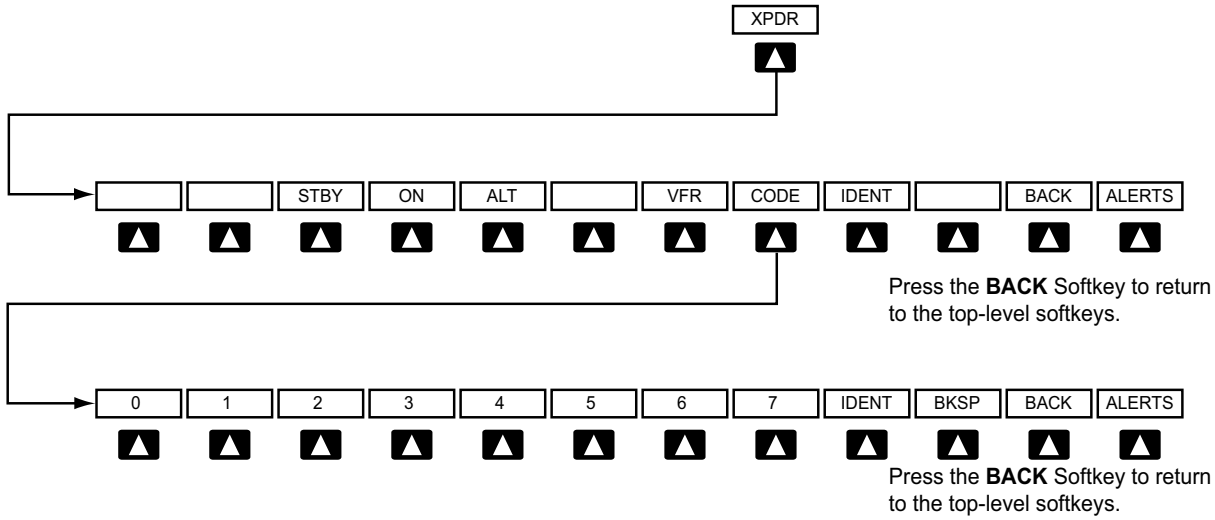


Figure 1-24 XPDR Softkeys

MFD SOFTKEYS

MFD softkeys vary depending on the page selected. EIS, Navigation Map Page (default MFD page), and Checklist Page softkeys are described here.

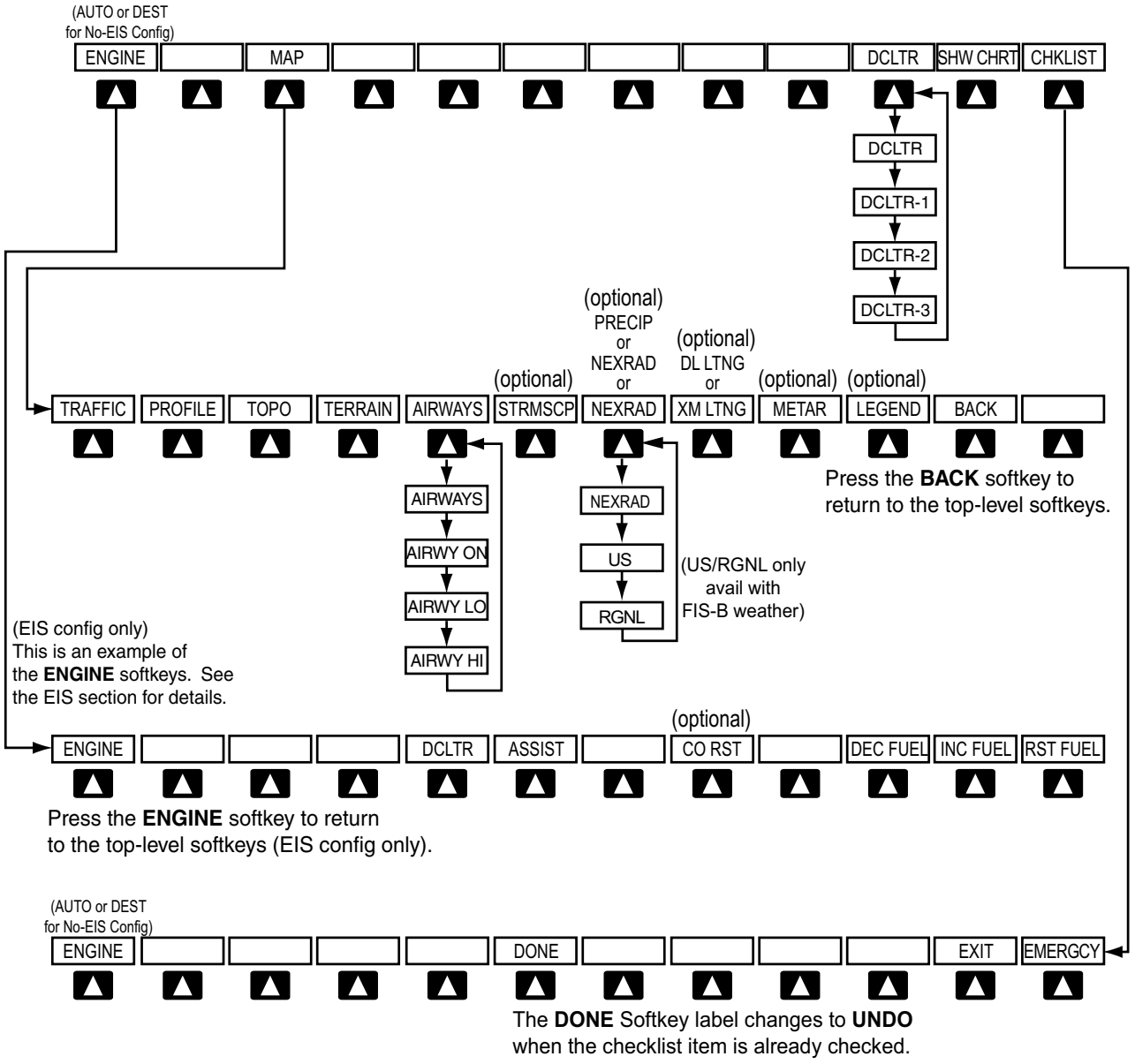


Figure 1-25 MFD Softkeys (EIS, Navigation Map Page, and Checklist)

ENGINE (EIS config only)	Displays EIS - Engine Page and second-level engine softkeys; select again to exit page (see the EIS Section for more information)
DCLTR	Turns off CHT and EGT cylinder readouts
ASSIST	Accesses engine leaning assist mode
CO RST	Resets CO Guardian; softkey enabled when carbon monoxide alert generated (optional)
DEC FUEL	Decreases displayed fuel remaining in 1-gal increments

INC FUEL	Increases displayed fuel remaining in 1-gal increments
RST FUEL	Resets displayed fuel remaining to maximum fuel capacity for aircraft and fuel used to zero
AUTO or **DEST** (No-EIS config only)	Switches between AUTO and DEST mode for the Navigation Information display (see the Flight Management section for more information)
MAP	Enables second-level Navigation Map Page softkeys
TRAFFIC	Displays/removes traffic information on Navigation Map Page
PROFILE	Displays/removes profile view on Navigation Map Page
TOPO	Displays/removes topographical data (e.g., coastlines, terrain, rivers, lakes) on Navigation Map Page
TERRAIN	Displays/removes terrain information on Navigation Map Page
AIRWAYS	Selects the desired display of Airways; cycles through: AIRWY ON: All Airways displayed AIRWY LO: Low Altitude (Victor) Airways displayed AIRWY HI: High Altitude Airways (Jetways) displayed AIRWAYS: Airways are not displayed
STRMSCP	Displays/removes Stormscope information on Navigation Map Page (optional)
NEXRAD	Displays SiriusXM NEXRAD weather and coverage on Inset Map (optional)
or **NEXRAD** or	When the GDL 88 is installed and FIS-B is the selected weather source, softkey cycles through NEXRAD weather and additional coverage options on Inset Map (optional): US: Continental US NEXRAD weather displayed on Inset Map RGNL: Regional NEXRAD weather displayed on Inset Map
PRECIP	Displays/removes Garmin Connext radar precipitation and radar coverage information on Inset Map (optional)
XM LTNG	Displays SiriusXM lightning on Navigation Map (optional GDL 69/69A/69 SXM/69A SXM only)
or **DL LTNG**	Displays Connext Weather lightning on Navigation Map (optional GSR 56 only)
METAR	Displays/removes Graphical METARs on Navigation Map Page (optional)
LEGEND	Displays/removes METAR legend on Navigation Map Page (optional)
BACK	Returns to top-level softkeys
DCLTR (3)	Selects desired amount of map detail; cycles through declutter levels: DCLTR (No Declutter): All map features visible DCLTR-1: Removes land data DCLTR-2: Removes land and SUA data DCLTR-3: Removes everything except the active flight plan
SHW CHRT	When available, displays optional airport and terminal procedure charts
CHKLIST	Displays the Checklist Page
DONE	Selects the highlighted checklist item
EXIT	Returns to the top-level softkeys
EMERGCY	Immediately accesses the emergency procedures

1.6 ACCESSING G900X FUNCTIONALITY

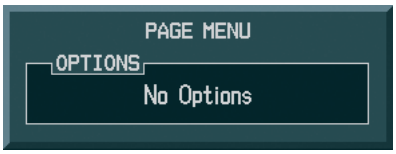
MENUS

The G900X has a dedicated **MENU** Key that when pressed displays a context-sensitive list of options. This options list allows the user to access additional features or make settings changes which specifically relate to the currently displayed window/page. There is no all-encompassing menu. Some menus provide access to additional submenus that are used to view, edit, select, and review options. Menus display 'NO OPTIONS' when there are no options for the window/page selected. The main controls used in association with all window/page group operations are described in Section 1.5, G900X Controls.

Navigating a menu:

1) Press the **MENU** Key to display the menu.
2) Turn the **FMS** Knob to scroll through a list of available options (a scroll bar always appears to the right of the window/box when the option list is longer than the window/box).
3) Press the **ENT** Key to select the desired option.
4) Press the **CLR** Key or **FMS** Knob to remove the menu and cancel the operation.

No Options for NRST Window



Options for FPL Window

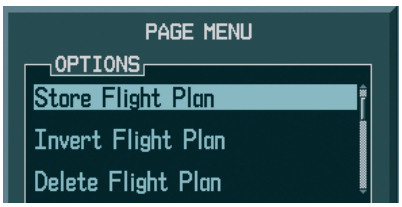


Figure 1-26 Page Menu Examples

DATA ENTRY

Two methods exist for directly entering alphanumeric data (e.g., Flight ID, waypoint identifiers, barometric minimum descent altitude) into the G900X: using the using the alphanumeric keypad (on the Control Unit) or the **FMS** Knob corresponding to the display (PFD, MFD, or Control Unit).

In some instances, such as when entering an identifier, the G900X tries to predict the desired identifier based on the characters being entered. In this case, if the desired identifier appears, use the **ENT** Key to confirm the entry without entering the rest of the identifier manually. This can save the pilot from entering all the characters of the identifier.

Besides character-by-character data entry, the system also provides a shortcut for entering waypoint identifiers. When the cursor is on a field awaiting entry of a waypoint identifier, turning the small **FMS** Knob counter-clockwise accesses five different lists of waypoint identifiers for quick selection: flight plan (FPL), nearest (NRST), recently-entered (RECENT), user (USER), and airway (AIRWAY)(AIRWAY available when active leg is part of an airway). The G900X automatically fills in the identifier, facility, and city fields with the information for the selected waypoint.

Using the Control Unit keypad to enter data:

1) Choose the desired display control mode by pressing the **PFD** or **MFD** Key on the Control Unit (GCU 476 only).

2) If needed, press the **FMS** Knob to activate the cursor.

3) Use the large **FMS** Knob to highlight the desired field.

4) Use the alphanumeric keys to enter the desired information.

5) Press the **ENT** Key to confirm the entry

6) Press the **CLR** Key to cancel data entry (the field revers back to its previous information).

Using the FMS Knob to enter data:

1) If needed, press the **FMS** Knob to activate the cursor.

2) Use the large **FMS** Knob to highlight the desired field.

3) Begin entering data.

a) To quickly enter a waypoint identifier, turn the small **FMS** Knob counter-clockwise to display a list of waypoints in the active flight plan (list is titled FPL). If desired, turn the small **FMS** Knob clockwise to scroll through lists of nearest waypoints (NRST) and recently-entered waypoints (RECENT).

b) Turn the large **FMS** Knob to highlight the desired waypoint from the list and press the **ENT** Key.

Or:

a) Turn the small **FMS** Knob to select a character for the first placeholder.

Turning the knob clockwise scrolls through the alphabet (where appropriate) toward the letter Z, starting at K, and the digits zero through nine. Afterwards, turning the knob counter-clockwise scrolls in the opposite direction.

b) Use the large **FMS** Knob to move the cursor to the next placeholder in the field.

c) Repeat, using the small **FMS** Knob to select a character and the large **FMS** Knob to move the cursor, until the field is complete.

d) Press the **ENT** Key to confirm entry.

7) Press the **FMS** Knob or **CLR** Key to cancel data entry (the field reverts back to its previous information).

PAGE GROUPS

NOTE: *Refer to other supporting sections in this Pilot's Guide for details on specific pages.*

Information on the MFD is presented on pages which are grouped according to function. In the bottom right corner of the screen, a page group window is displayed by turning either **FMS** Knob. The page group tabs are displayed along the bottom of the window. The page titles are displayed in a list above the page group tabs. The current page group and current page within the group are shown in cyan. For some of these pages (Airport/ Procedures/Weather Information, XM, Procedure Loading), the active title of the page changes while the page name in the list remains the same.

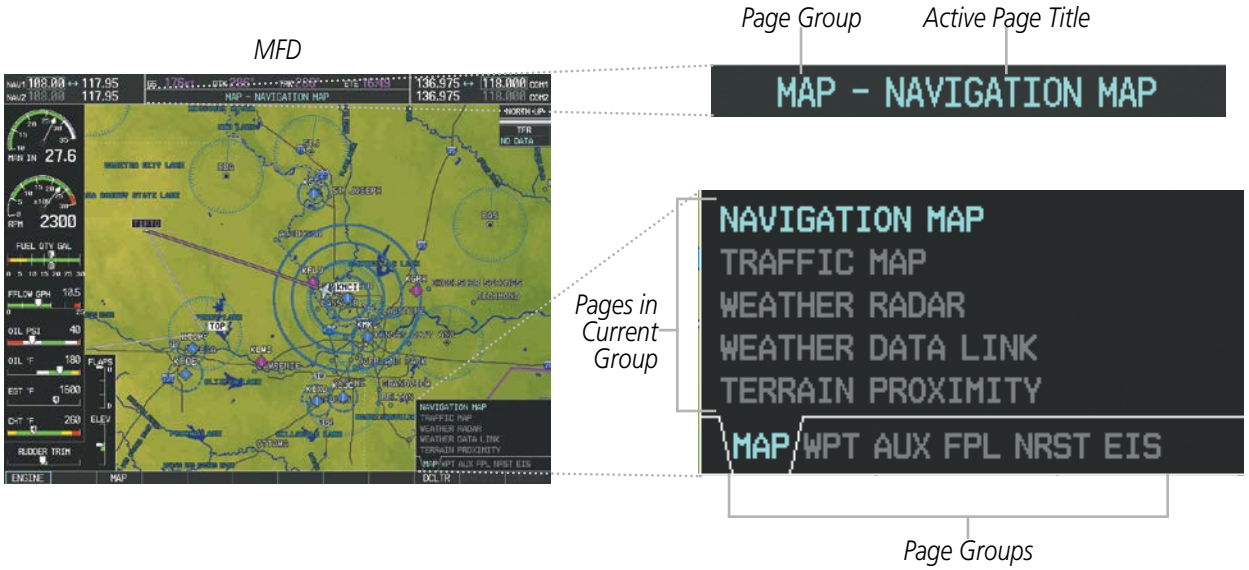


Figure 1-27 Page Title and Page Groups

The main page groups are navigated using the **FMS** Knob; specific pages within each group can vary depending on the configuration of optional equipment.

Selecting a page using the FMS Knob:

1) Turn the large **FMS** Knob to display the list of page groups; continue turning the large **FMS** Knob until the desired page group is selected

2) Turn the small **FMS** Knob to display the desired page within a specific page group.There are also several pages (Airport Information and XM Information pages) which are selected first from within a main page group with the **FMS** Knobs, then with the appropriate softkey at the bottom of the page. In this case, the page remains set to the selected screen until a different screen softkey is pressed.

- **Map Page Group (MAP)**

  Navigation Map

  Traffic Map (TAS *optional*)

  Weather Radar (*optional*)

  Lightning (XM Lightning (*optional*)/ DL Lightning (*optional*))

  Weather Data Link (*optional*)

  Terrain (Terrain SVT (*optional*)/ TAWS (*optional*))

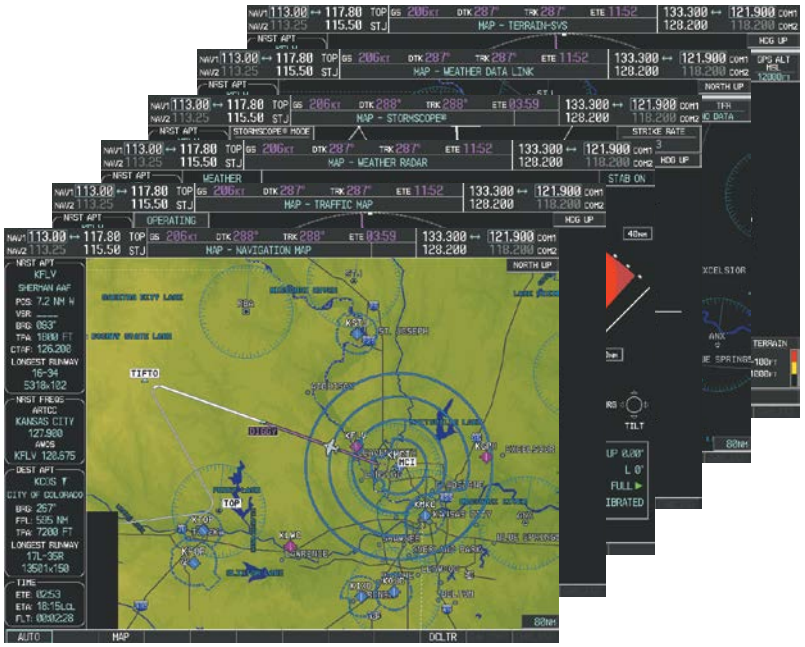


Figure 1-28 Map Pages

- **Waypoint Page Group (WPT)**

  Airport/Procedures/Weather Information Pages

  - Airport Information (**INFO-1** Softkey)
  - Airport Directory Information (**INFO-2** Softkey)
  - Departure Information (**DP** Softkey)
  - Arrival Information (**STAR** Softkey)
  - Approach Information (**APR** Softkey)
  - Weather Information (*optional*) (**WX** Softkey)

  Intersection Information

  NDB Information

  VOR Information

  VRP Information

  User Waypoint Information

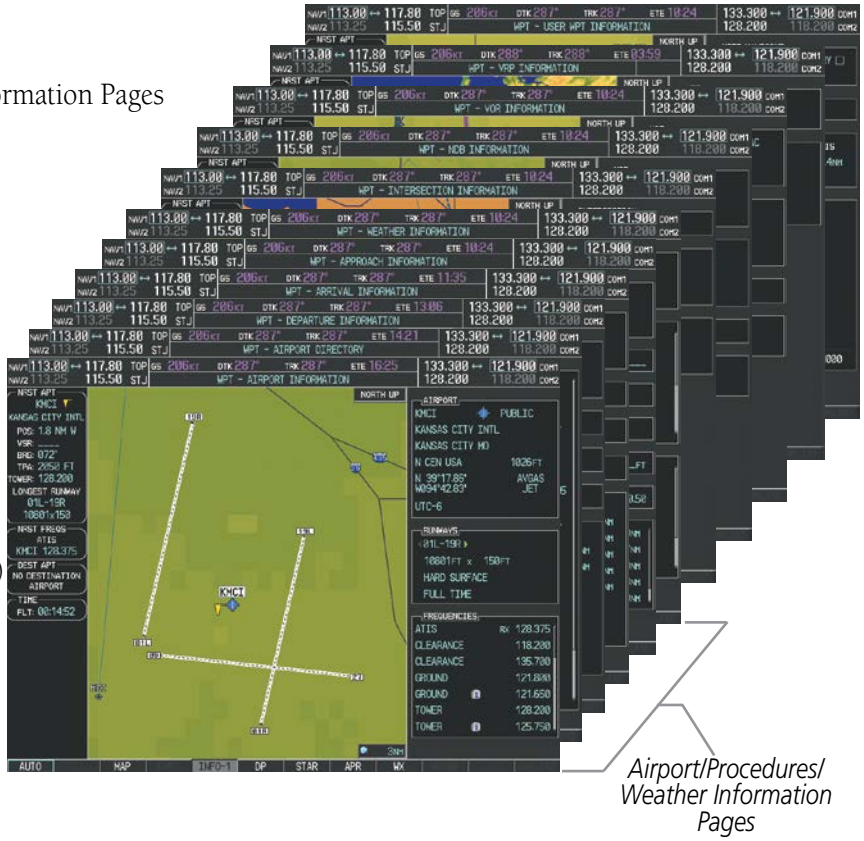


Figure 1-29 Waypoint Pages

- **Auxiliary Page Group (AUX)**

  Trip Planning

  Utility

  GPS Status

  System Setup

  XM Satellite pages *(optional)*

  - XM Information (**INFO** Softkey)
  - XM Radio (**RADIO** Softkey)

  Satellite Phone Pages *(optional)*

  - Telephone (**TEL** Softkey)
  - SMS (**SMS** Softkey)

  System Status

  Bluetooth Management

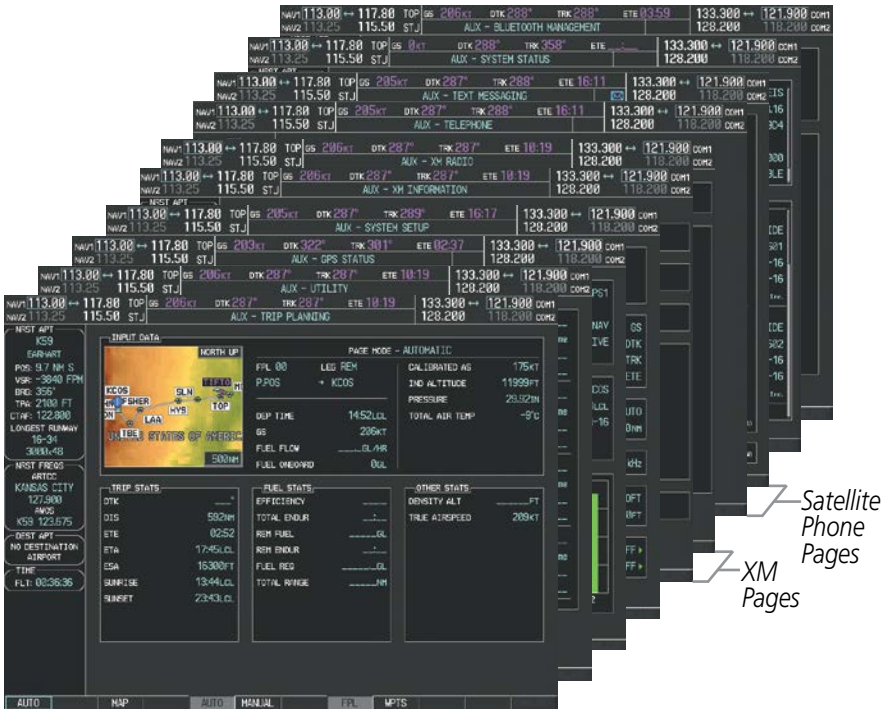


Figure 1-30 Auxiliary Pages

- **Nearest Page Group (NRST)**

  Nearest Airports

  Nearest Intersections

  Nearest NDB

  Nearest VOR

  Nearest VRP

  Nearest User Waypoints

  Nearest Frequencies

  Nearest Airspaces



Figure 1-31 Nearest Pages

In addition to the main page groups accessed exclusively using the **FMS** Knob, there are pages for flight planning (FPL) and loading procedures (PROC) which are accessed by key. In some instances, softkeys may be used to access the Procedure Loading pages.

The Flight Plan pages are accessed using the **FPL** Key on the MFD. Main pages within this group are selected by turning the small **FMS** Knob.

- **Flight Plan Page Group (FPL)**

  Active Flight Plan

  Flight Plan Catalog

  - Stored Flight Plan (**NEW** Softkey)

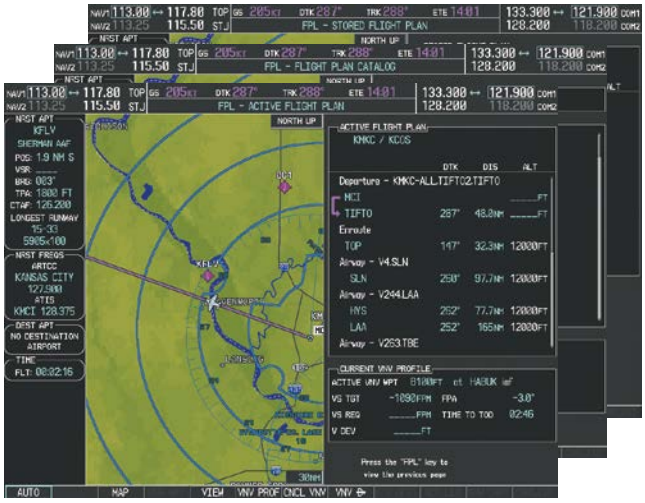


Figure 1-32 Flight Plan Pages

The Procedure Loading pages may be accessed at any time on the MFD by pressing the **PROC** Key. A menu is initialized, and when a departure, approach, or arrival is selected, the appropriate Procedure Loading page is opened. These pages can also be accessed from the Active and Stored Flight Plan pages using the LD softkeys. Turning the **FMS** Knob does not scroll through the Procedure Loading pages (note the single page icon in the lower right corner).

- **Procedure Loading Page Group (PROC)**

  Departure Loading

  Arrival Loading

  Approach Loading

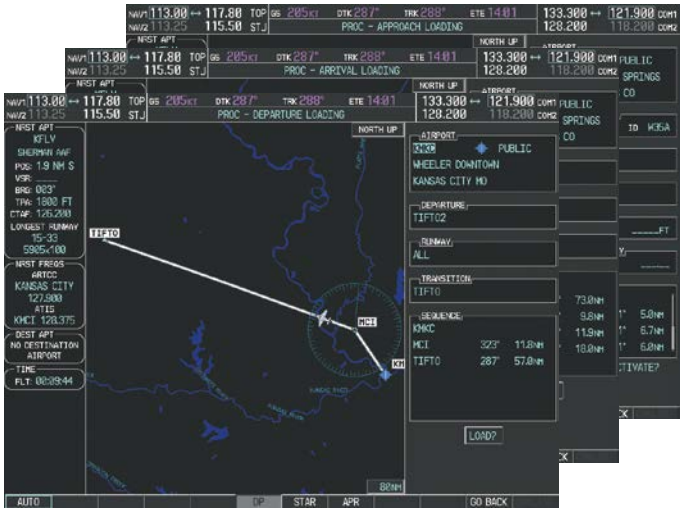


Figure 1-33 Procedure Loading Pages

Information on optional electronic checklist pages is offered later in this section. Checklist pages may be accessed from any page on the MFD using the **CHKLIST** Softkey.

SYSTEM SETTINGS

The System Setup Page allows management of the following system parameters:

- Date/time
- Displayed navigation angle reference, temperature, and position settings
- Baro transition alert (see Flight Instruments Section)
- Airspace alerts (see the Flight Management Section)
- Arrival alerts
- Audio alerts
- MFD Navigation Status Box fields (see the Flight Management Section)
- CDI scaling for GPS navigation source (see the Flight Instruments Section)
- COM channel spacing (see the Audio Panel and CNS Section)
- Criteria for displaying nearest airports (see the Flight Management Section)

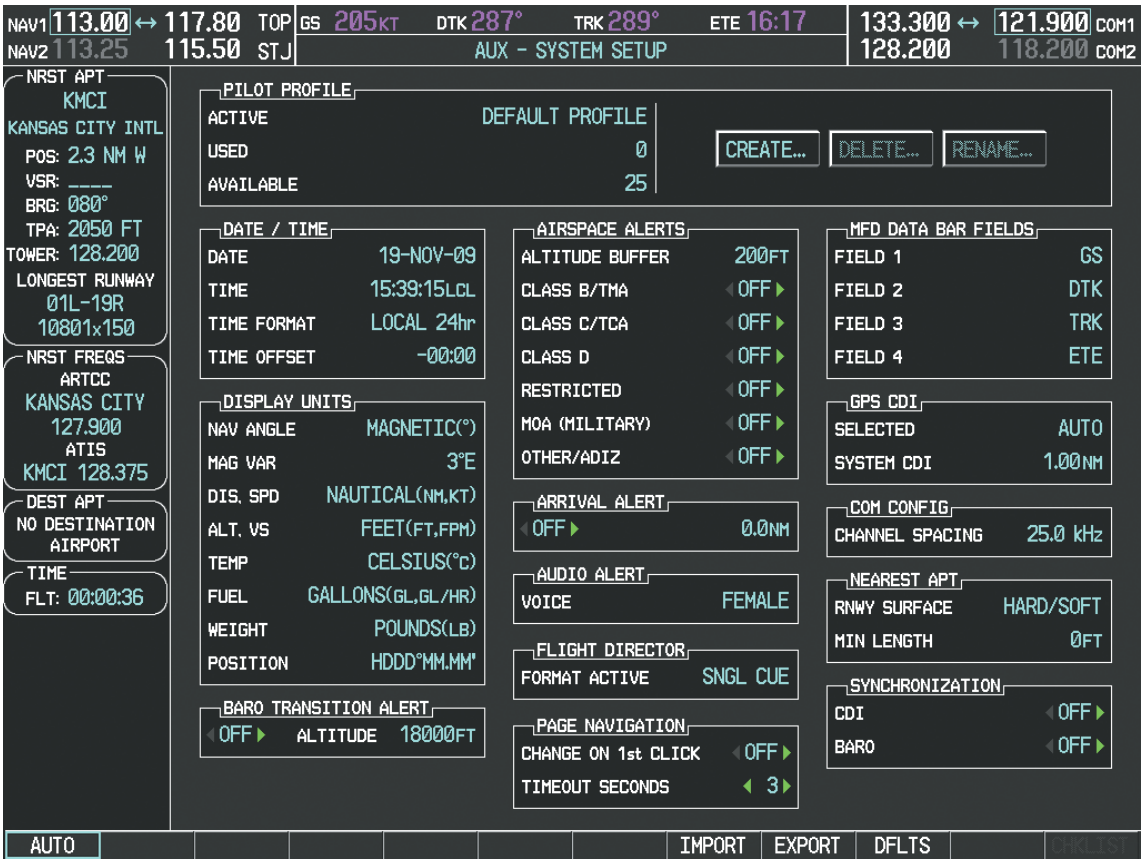


Figure 1-34 System Setup Page

Restoring system setup defaults:

1) Use the **FMS** Knob to select the AUX - System Setup Page.
2) Press the **DFLTS** Softkey.

   Or:

1) Use the **FMS** Knob to select the AUX - System Setup Page.
2) Press the **MENU** Key.
3) Highlight 'Restore Defaults' and press the **ENT** Key.

PILOT PROFILES

System settings may be saved under a pilot profile. When the system is powered on, the last selected pilot profile is shown on the MFD Power-up Screen (Figure 1-5). The G900X can store up to 25 profiles; the currently active profile, the amount of memory used, and the amount of memory available are shown at the top of the System Setup Page in the box labeled 'Pilot Profile'. From here, pilot profiles may be created, selected, renamed, or deleted.

Creating a profile:

1) Use the **FMS** Knob to select the AUX - System Setup Page.
2) Press the **FMS** Knob momentarily to activate the flashing cursor.
3) Turn the large **FMS** Knob to highlight 'CREATE' in the Pilot Profile Box.
4) Press the **ENT** Key. A 'Create Profile' window is displayed.
5) Use the **FMS** Knob to enter a profile name up to 16 characters long and press the **ENT** Key. Pilot profile names cannot begin with a blank as the first letter.
6) In the next field, use the small **FMS** Knob to select the desired settings upon which to base the new profile. Profiles can be created based on Garmin factory defaults, default profile settings (initially based on Garmin factory defaults unless edited by the pilot), or current system settings.
7) Press the **ENT** Key.
8) With 'CREATE' highlighted, press the **ENT** Key to create the profile

   Or:

   Use the large **FMS** Knob to select 'CREATE and ACTIVATE' and press the **ENT** Key to activate the new profile.
9) To cancel the process, select 'CANCEL' with the large FMS Knob and press the **ENT** Key.

Selecting an active profile:

1) Use the **FMS** Knob to select the AUX - System Setup Page.
2) Press the **FMS** Knob momentarily to activate the flashing cursor.
3) Turn the large **FMS** Knob to highlight the active profile field in the Pilot Profile Box.
4) Turn the small **FMS** Knob to display the pilot profile list and highlight the desired profile.
5) Press the **ENT** Key. The G900X loads and displays the system settings for the selected profile.

Renaming a profile:

1) Use the **FMS** Knob to select the AUX - System Setup Page.
2) Press the **FMS** Knob momentarily to activate the flashing cursor.

3) Turn the large **FMS** Knob to highlight 'RENAME' in the Pilot Profile Box.
4) Press the **ENT** Key.
5) In the 'Rename Profile' window, turn the **FMS** Knob to select the profile to rename.
6) Press the **ENT** Key.
7) Use the **FMS** Knob to enter a new profile name up to 16 characters long and press the **ENT** Key.
8) With 'RENAME' highlighted, press the **ENT** Key.
9) To cancel the process, use the large **FMS** Knob to select 'CANCEL' and press the ENT Key.

Deleting a profile:

1) Use the **FMS** Knob to select the AUX - System Setup Page.
2) Press the **FMS** Knob momentarily to activate the flashing cursor.
3) Turn the large **FMS** Knob to highlight 'DELETE' in the Pilot Profile Box.
4) Press the **ENT** Key.
5) In the 'Delete Profile' window, turn the **FMS** Knob to select the profile to delete.
6) Press the **ENT** Key.
7) With 'DELETE' highlighted, press the **ENT** Key.
8) To cancel the process, use the large **FMS** Knob to select 'CANCEL' and press the **ENT** Key.

If an SD card is inserted into the top slot of the MFD, pilot profiles may imported from the SD card into the system, or exported from the system to the SD card.

Because system settings may vary from one airframe to another, always verify system settings from an imported profile are consistent with the desired settings.

Importing a profile from an SD card:

1) Insert an SD card containing the pilot profile(s) into the top card slot on the MFD.
2) Turn the **FMS** Knob to select the AUX - System Setup Page.
3) Select the **IMPORT** Softkey.

Or:

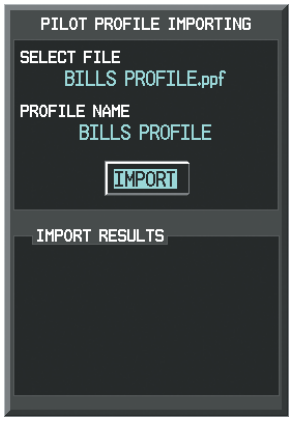
a) Press the **MENU** Key.
b) Turn the **FMS** Knob to highlight 'Import Pilot Profile' and press the **ENT** Key.

4) The system displays the Pilot Profile Importing window with 'IMPORT' highlighted. To change the selected profile to be imported from the SD card (shown as 'SELECT FILE'), turn the large FMS Knob to highlight the profile file name, then turn the small **FMS** Knob to highlight a profile from the list, and press the **ENT** Key.
5) If desired, the profile name to be used after profile has been imported can be changed by turning the **FMS** Knob to highlight the 'PROFILE NAME' field, then use the large and small **FMS** Knobs to enter the name, and press the **ENT** Key. Imported profile names cannot begin with a blank space or be named 'DEFAULT', 'GARMIN DEFAULTS' or 'DEFAULT SETTINGS'.

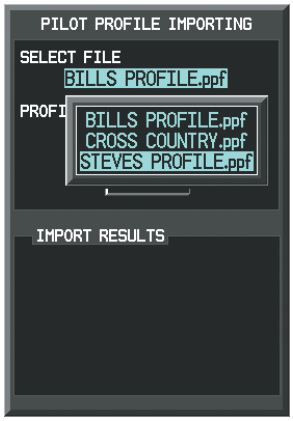
6) With 'IMPORT' highlighted, press the **ENT** Key.

7) If the imported profile name is the same as an existing profile on the system, the system displays an 'Overwrite existing file? OK or CANCEL' prompt. Press the **ENT** Key to replace profile on the system with the profile imported from the SD card, or turn the **FMS** Knob to highlight 'CANCEL' and press the **ENT** Key to return to the Pilot Profile Importing window.

8) If successful, the system displays 'Pilot profile import succeeded.' in the IMPORT RESULTS window below. With 'OK' highlighted, press the **ENT** or **CLR** Keys or press the **FMS** Knob to return to the AUX - System Setup Page. The imported profile becomes the active profile.



Pilot Profile Importing and Import Results Window



Pilot Profiles Available for Import from SD Card ('STEVE'S PROFILE' Selected)



Import Successful

Figure 1-35 Pilot Profile Import (AUX - System Setup Page)

Exporting a profile to an SD card:

1) Insert the SD card for storing the Pilot Profile into the top card slot on the MFD.

2) Turn the **FMS** Knob to select the AUX - System Setup Page.

3) If necessary, activate the desired pilot profile to export. Only the currently active Pilot Profile can be exported.

4) Select the **EXPORT** Softkey. The system displays the Pilot Profile Exporting window.

Or:

a) Press the **MENU** Key.

b) Turn the **FMS** Knob to highlight 'Export Pilot Profile' and press the **ENT** Key.

5) To export the pilot profile using the current supplied name, press the **ENT** Key with 'EXPORT' highlighted. To change the profile file name turn the large **FMS** Knob to highlight the 'SELECT FILE' field, then enter the new name with the large and small FMS Knobs, then press the **ENT** Key. Then press the **ENT** Key with 'EXPORT' highlighted.

6) If the profile name to be exported is the same as an existing profile file name on the SD card, the system displays an 'Overwrite existing file? OK or CANCEL' prompt. Press the **ENT** Key to replace the profile on the SD card with the profile to be exported, or turn the FMS Knob to highlight 'CANCEL' and press the **ENT** Key to return to the Pilot Profile Exporting window without exporting the profile.

7) If successful, the EXPORT RESULTS window displays 'Pilot profile export succeeded.' With 'OK' highlighted, press the **ENT** or **CLR** Keys, or press the **FMS** Knob to return to the AUX - System Setup Page.



Pilot Profile Exporting Window, Enter a Name to Use for Exported Profile



Export Successful

Figure 1-36 Pilot Profile Export on the AUX - System Setup Page

DATE/TIME

The system time is displayed in the lower right corner of the PFD(s). Time and date format (local 12-hr, local 24-hr, or UTC) are modified on the System Setup Page. Universal Coordinated Time (UTC; also called Greenwich Mean Time (GMT) or Zulu) date and time are calculated directly from the GPS satellites signals and cannot be changed. An offset is provided to add or subtract the desired amount of time (hours:minutes) from UTC to define current local time.

Configuring the system time:

1) Use the **FMS** Knob to select the AUX - System Setup Page.
2) Press the **FMS** Knob to activate the cursor.
3) Turn the large **FMS** Knob to highlight the 'Time Format' field.
4) Turn the small **FMS** Knob to select the desired format and press the **ENT** Key to confirm selection. The 'Time Offset' field is highlighted (for local time formats).
5) Use the **FMS** Knob to enter the desired time offset (±HH:MM) and press the **ENT** Key to confirm selection.

DISPLAY UNITS

Units in which various quantities are displayed on the G900X screens can be changed on the System Setup Page.

Changing a display units setting:

1) Use the **FMS** Knob to select the AUX - System Setup Page on the MFD.
2) Press the **FMS** Knob to activate the cursor.
3) Turn the large **FMS** Knob to highlight the desired field in the 'Display Units' box.
4) Turn the small **FMS** Knob to select from a list of measurement units and press the **ENT** Key when the desired unit is highlighted.

Category	Settings	Affected Quantities	Exceptions
Navigation Angle	Magnetic* True User	Heading Course Bearing Track Desired Track Wind direction (Trip Planning Page)	
Distance and Speed	Metric Nautical**	Crosstrack error (HSI) Bearing distances (information windows) DME distance (information window) Flight plan distances Map ranges DIS, GS, TAS, XTK fields (Navigation Status Box) All distances on MFD Altitude buffer distance (System Setup) Arrival Alert trigger distance (System Setup) All speeds on MFD	Airspeed Indicator True Airspeed (PFD) Wind speed vector Map range (Traffic Page, Terrain Proximity/TAWS Page) CDI scaling (System Setup) Fuel range calculation (EIS)
Altitude and Vertical Speed	Feet* Meters	All altitudes on MFD All elevations on MFD	Altimeter Vertical Speed Indicator VNV altitudes (Active Flight Plan)
Temperature	Celsius Fahrenheit*	All temperatures on PFD(s) Total Air Temperature (Trip Planning Page)	Engine Indication System (EIS)
Fuel and Fuel Flow	Gallons***	Fuel parameters (Trip Planning Page)	Engine Indication System (EIS)
Weight	Pounds* Kilograms	N/A	N/A
Position	HDDD°MM.MM'* HDDD°MM'SS.S"	All positions	N/A

* *Default setting*
** *Contact a Garmin-authorized service center to change this setting*
*** *Not configurable*

Table 1-1 Display Units Settings (System Status Page)

AIRSPACE ALERTS

The Airspace Alert feature provides a message alert when the aircraft is approaching or near a controlled or special-use airspace. The altitude buffer setting increases the range above or below an airspace for which an alert is generated; the default value is 200 feet. Alerts for the following airspaces can be turned on/off from the System Setup Page:

- Class B/TMA
- Class C/TCA
- Class D
- Restricted
- MOA (Military)
- Other airspaces

Turning Airspace Alerts off does not affect the alerts listed on the Nearest Airspaces Page or the airspace boundaries depicted on the Navigation Map Page.

Turning an airspace alert on or off:

1) Use the **FMS** Knob to select the System Setup Page.
2) Press the **FMS** Knob momentarily to activate the flashing cursor.
3) Turn the large **FMS** Knob to highlight the desired field in the 'Airspace Alerts' Box.
4) Turn the small **FMS** Knob clockwise to turn the airspace alert ON or counterclockwise to turn the alert OFF.

Changing the altitude buffer distance setting:

1) Use the **FMS** Knob to select the System Setup Page.
2) Press the **FMS** Knob momentarily to activate the flashing cursor.
3) Turn the large **FMS** Knob to highlight the altitude buffer field in the 'Airspace Alerts' Box.
4) Enter an altitude buffer value and press the **ENT** Key.

ARRIVAL ALERTS

Arrival alerts provide notification upon reaching a specified distance from the final destination (the direct-to waypoint or the last waypoint in a flight plan). Once this trigger distance (up to 99.9 units) has been reached, the Navigation Status Box on the PFD(s) display(s) an "Arrival at [waypoint]" message.

Enabling/disabling arrival alerting and changing the trigger distance:

1) Use the **FMS** Knob to select the System Setup Page.
2) Press the **FMS** Knob momentarily to activate the flashing cursor.
3) Turn the large **FMS** Knob to select the ON/OFF field in the 'Arrival Alert' Box.
4) Turn the small **FMS** Knob clockwise to turn the airspace alert ON or counterclockwise to turn the alert OFF.
5) Turn the large **FMS** Knob to highlight the distance field in the 'Arrival Alert' Box.
6) Enter a trigger distance and press the **ENT** Key.

AUDIO ALERTS

The gender of the voice used to announce audio alerts may be set to male or female on the System Setup Page. See the Appendices for voice alerts.

Changing the audio alert voice:

1) Use the **FMS** Knob to select the AUX - System Setup Page.

2) Press the **FMS** Knob momentarily to activate the flashing cursor.

3) Turn the large **FMS** Knob to highlight the voice in the Audio Alert Box.

4) Turn the small **FMS** Knob to display and highlight the desired voice and press the **ENT** Key.

MFD DATA BAR FIELDS

By default, the Navigation Status Box on the MFD is set to display ground speed (GS), distance to next waypoint (DIS), estimated time enroute (ETE), and enroute safe altitude (ESA). See the FMS section for more details on other information that can be displayed.

GPS CDI

The GPS CDI Box on the System Setup Page allows the pilot to define the scale for the Course Deviation Indicator (CDI) when GPS is the selected navigation source and also displays the current system value for the CDI scale. The range values represent full scale deflection for the CDI to either side. The default setting is 'Auto' (refer to the CDI description in the Flight Instruments Section for information on CDI scaling).

If a lower CDI scale setting is selected (i.e., 1.0 or 0.3 nm), the higher scale settings are not selected during any phase of flight. Note that the Receiver Autonomous Integrity Monitoring (RAIM) protection limits follow the selected CDI scale and corresponding flight phase.

Changing the selected GPS CDI setting:

1) Use the **FMS** Knob to select the AUX - System Setup Page on the MFD.

2) Press the **FMS** Knob to activate the cursor.

3) Turn the large **FMS** Knob to highlight 'Selected' in the 'GPS CDI' box.

4) Turn the small **FMS** Knob to highlight the desired setting (2 nm, 1 nm, 0.3 nm, Auto) and press the **ENT** Key.

COM CONFIGURATION

The COM Configuration Box on the System Setup Page allows the pilot to select 8.33 kHz or 25.0 kHz COM frequency channel spacing.

Changing COM channel spacing:

1) Use the **FMS** Knob to select the System Setup Page.

2) Press the **FMS** Knob momentarily to activate the flashing cursor.

3) Turn the large **FMS** Knob to highlight the channel spacing field in the COM Configuration Box.

4) Turn the small **FMS** Knob to select the desired spacing and press the **ENT** Key.

NEAREST AIRPORTS

The Nearest Airports Box on the System Setup Page defines the minimum runway length and surface type used when determining the nine nearest airports to display on the MFD Nearest Airports Page. A minimum runway length and/or surface type can be entered to prevent airports with small runways or runways that are not of appropriate surface from being displayed. Default settings are 0 feet (or meters) for runway length and "any" for runway surface type.

Selecting nearest airport surface matching criteria (any, hard only, hard/soft, water):

1) Use the **FMS** Knob to select the System Setup Page.
2) Press the **FMS** Knob momentarily to activate the flashing cursor.
3) Turn the large **FMS** Knob to highlight the runway surface field in the Nearest Airports Box.
4) Turn the small **FMS** Knob to select the desired runway option (any, hard only, hard/soft, water) and press the **ENT** Key.

Selecting nearest airport minimum runway length matching criteria:

1) Use the **FMS** Knob to select the System Setup Page.
2) Press the **FMS** Knob momentarily to activate the flashing cursor.
3) Turn the large **FMS** Knob to highlight the minimum length field in the Nearest Airport Box.
4) Enter the minimum runway length (zero to 99,999 feet) and press the **ENT** Key.

CDI/BARO SYNCHRONIZATION

See the Flight Instruments section for a discussion on synchronizing both PFD's Course Deviation Indicators and the altimeter barometric settings.

SYSTEM UTILITIES

For flight planning purposes, timers, trip statistics, and a scheduler feature are provided on the AUX - Utility Page. The timers available include a stopwatch-like generic timer, a total time in flight timer, and a record of the time of departure. Trip statistics—odometer, trip odometer, and average trip and maximum groundspeeds—are displayed from the time of the last reset. A scheduler feature is also provided so the pilot can enter reminder messages to be displayed at specified intervals in the Alerts Window on the PFD(s) (see Figure 1-38).

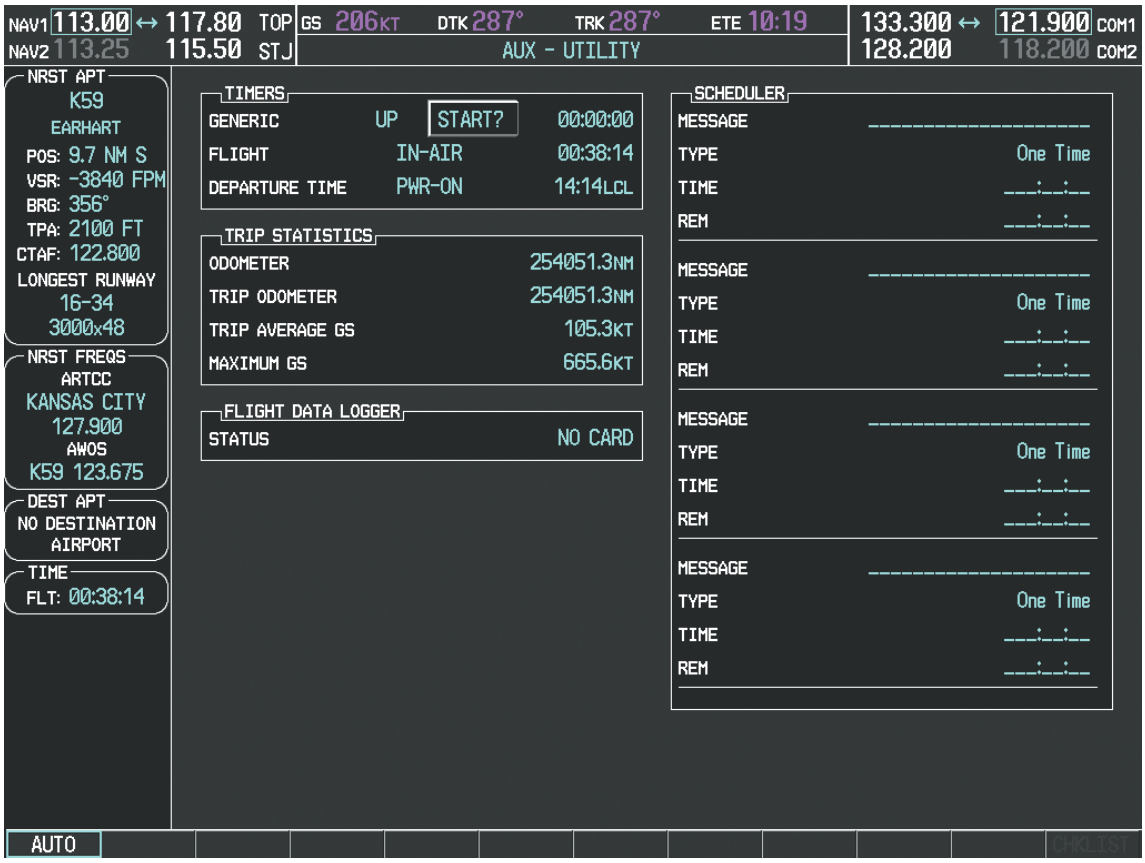


Figure 1-38 Utility Page

TIMERS

The generic timer can be set to count up or down from a specified time (HH:MM:SS). When the countdown on the timer reaches zero the digits begin to count up from zero. If the timer is reset before reaching zero on a countdown, the digits are reset to the initial value. If the timer is counting up when reset, the digits are zeroed.

Setting the generic timer:

1) Use the **FMS** Knob to select the AUX - Utility Page.
2) Press the **FMS** Knob momentarily to activate the flashing cursor.
3) Turn the small **FMS** Knob to select the timer counting direction (UP/DN) and press the **ENT** Key.

4) If a desired starting time is desired:
   a) Use the large **FMS** Knob to highlight the HH:MM:SS field.
   b) Use the **FMS** Knob to enter the desired time and press the **ENT** Key.
5) Turn the large **FMS** Knob to highlight 'START?' and press the **ENT** Key to start the timer. The field changes to 'STOP?'.
6) To stop the timer, press the **ENT** Key with 'STOP?' highlighted. The field changes to 'RESET?'.
7) To reset the timer, press the **ENT** Key with 'RESET?' highlighted. The field changes back to 'START?' and the digits are reset.

The flight timer can be set to count up from zero starting at system power-up or from the time that the aircraft lifts off; the timer can also be reset to zero at any time.

Setting the flight timer starting criterion:

1) Use the **FMS** Knob to select the AUX - Utility Page.
2) Press the **FMS** Knob momentarily to activate the flashing cursor.
3) Turn the large **FMS** Knob to highlight the field next to the flight timer.
4) Turn the small **FMS** Knob to select the starting criterion (PWR-ON or IN-AIR) and press the **ENT** Key.

Resetting the flight timer:

1) Use the **FMS** Knob to select the AUX - Utility Page.
2) Press the **MENU** Key.
3) With 'Reset Flight Timer' highlighted, press the **ENT** Key.

The G900X records the time at which departure occurs, measured from system power-up or aircraft lift off. The displayed departure time can also be reset to display the current time at the point of reset. The format in which the time is displayed is controlled from the System Setup Page.

Setting the departure timer starting criterion:

1) Use the **FMS** Knob to select the AUX - Utility Page.
2) Press the **FMS** Knob momentarily to activate the flashing cursor.
3) Turn the large **FMS** Knob to highlight the field next to the departure time.
4) Turn the small **FMS** Knob to select the starting criterion (PWR-ON or IN-AIR) and press the **ENT** Key.

Resetting the departure time:

1) Use the **FMS** Knob to select the AUX - Utility Page.
2) Press the **MENU** Key.
3) Use the **FMS** Knob to highlight 'Reset Departure Time' and press the **ENT** Key.

TRIP STATISTICS

The odometer and trip odometer record the total mileage traveled from the last reset; these odometers can be reset independently. Resetting the trip odometer also resets the average trip groundspeed. Maximum groundspeed for the period of time since the last reset is also displayed.

Resetting trip statistics readouts:

1) Use the **FMS** Knob to select the AUX - Utility Page.
2) Press the **MENU** Key. The following reset options for trip statistics are displayed:
   - Reset Trip ODOM/AVG GS—Resets trip average ground speed readout and odometer
   - Reset Odometer—Resets odometer readout only
   - Reset Maximum Speed—Resets maximum speed readout only
   - Reset All—Resets flight timer, departure timer, odometers, and groundspeed readouts
3) Use the **FMS** Knob to highlight the desired reset option and press the **ENT** Key. The selected parameters are reset to zero and begin to display data from the point of reset.

SCHEDULER

The scheduler feature can be used to enter and display reminder messages (e.g., "Change oil", "Switch fuel tanks", "Overhaul"). Messages can be set to display based on a specific date and time (event), once the message timer reaches zero (one-time; default setting), or recurrently whenever the message timer reaches zero (periodic). Message timers set to periodic alerting automatically reset to the original timer value once the message is displayed. When power is cycled, messages are retained until deleted, and message timer countdown is restarted.

Entering a scheduler message:

1) Use the **FMS** Knob to select the AUX - Utility Page.
2) Press the **FMS** Knob momentarily to activate the flashing cursor.
3) Turn the large **FMS** Knob to highlight the first empty scheduler message naming field.
4) Use the **FMS** Knob to enter the message text to be displayed in the Alerts Window and press the **ENT** Key.
5) Press the **ENT** Key again or use the large **FMS** Knob to move the cursor to the field next to 'Type'.
6) Turn the small **FMS** Knob to select set the message alert type:
   - Event—Message issued at the specified date/time
   - One-time—Message issued when the message timer reaches zero (default setting)
   - Periodic—Message issued each time the message timer reaches zero
7) Press the **ENT** Key again or use the large **FMS** Knob to move the cursor to the next field.
8) For periodic and one-time message, use the **FMS** Knob to enter the timer value (HHH:MM:SS) from which to countdown and press the **ENT** Key.

9) For event-based messages:

a) Use the **FMS** Knob to enter the desired date (DD-MMM-YYY) and press the **ENT** Key.

b) Press the **ENT** Key again or use the large **FMS** Knob to move the cursor to the next field.

c) Use the **FMS** Knob to enter the desired time (HH:MM) and press the **ENT** Key.

10) Press the **ENT** Key again or use the large **FMS** Knob to move the cursor to enter the next message.

Deleting a scheduler message:

1) Use the **FMS** Knob to select the AUX - Utility Page.

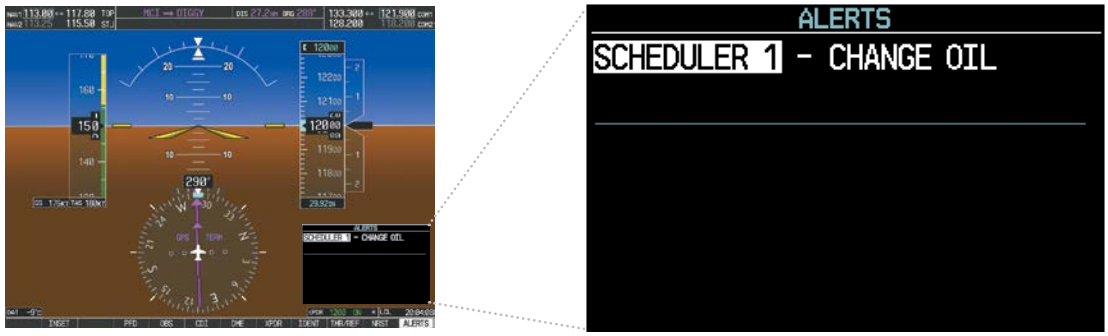
2) Press the **FMS** Knob momentarily to activate the flashing cursor.

3) Turn the large **FMS** Knob to highlight the name field of the scheduler message to be deleted.

4) Press the **CLR** Key to clear the message text. If the **CLR** Key is pressed again, the message is restored.

5) Press the **ENT** Key to confirm message deletion.

Scheduler messages appear in the Alerts Window on the PFD(s) and cause the **ALERTS** Softkey label to change to 'ADVISORY'. Pressing the **ADVISORY** Softkey opens the Alerts Window and acknowledges the scheduler message. The softkey reverts to the 'ALERTS' label and when pressed, the Alerts Window is removed from the display and the scheduler message is deleted from the message list.



PFD

Figure 1-39 PFD Alerts Window

ELECTRONIC CHECKLISTS (OPTIONAL)

NOTE: *The checklists presented in this section are for example only and may not reflect checklists actually available. The information described in this section is not intended to replace the checklist information described in the aircraft-specific Pilot's Operating Handbook (POH).*

NOTE: *Garmin is not responsible for the content of the checklists. User-defined checklists are created by the kitplane builder. Download the Garmin G900X Checklist Editor program from myGarmin.com for information on how to create and upload checklists.*

The MFD is able to display optional electronic checklists which allow a pilot to quickly find the proper procedure on the ground and during each phase of flight. The G900X accesses the checklists from an SD card inserted into the bezel slot (see Figure 1-3). If the SD card contains an invalid checklist file or no checklist, the Power-up Screen displays 'Invalid Checklist File' or 'Checklist File Not Present' and the **CHKLIST** Softkey is not available.

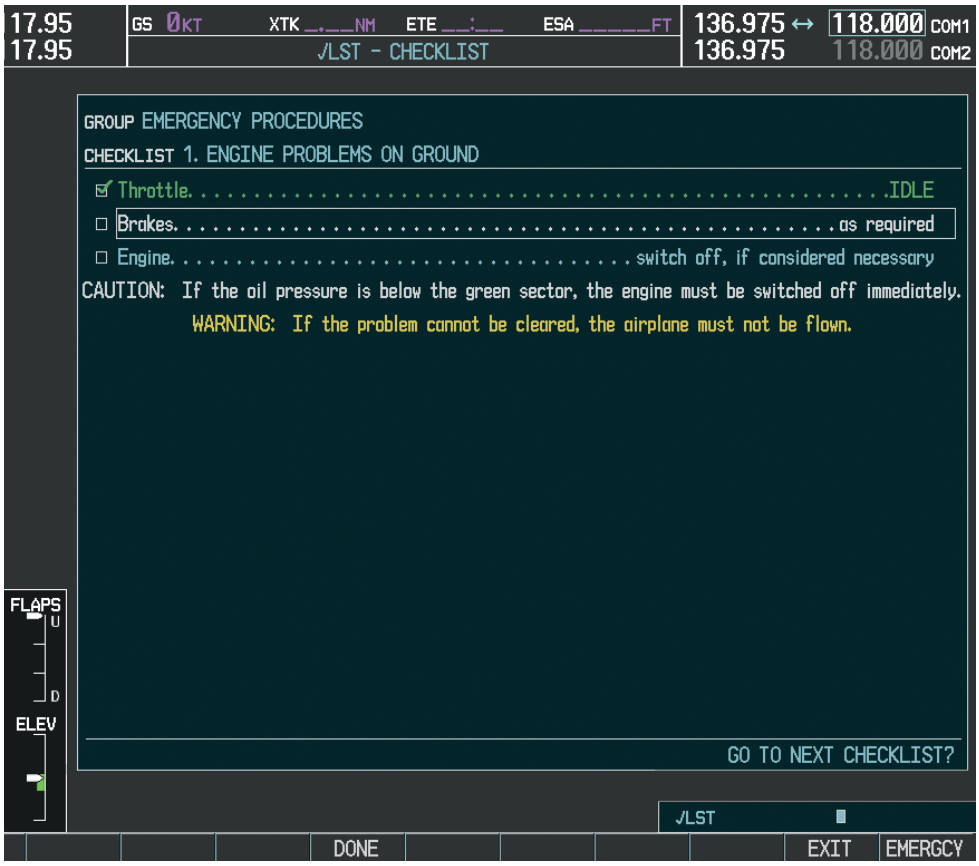


Figure 1-40 Checklist Page Example

Accessing and navigating checklists:

1) From any page, press the **CHKLIST** Softkey.
2) Turn the large **FMS** Knob to select the 'GROUP' field.
3) Turn the small **FMS** Knob to select the desired procedure and press the **ENT** Key.
4) Turn the large **FMS** Knob to select the 'Checklist' field.
5) Turn the **FMS** Knob to select the desired checklist and press the **ENT** Key.
6) Turn the **FMS** Knob to scroll through the checklist and highlight the desired checklist item (has a hollow white box for checkmark).

   The following colors are used for checklist items:

   - Cyan - Items has not been highlighted
   - White - Item is highlighted for selection
   - Green - Item has been selected
   - Amber - Warning notes

7) Press the **ENT** Key or **DONE** Softkey to select the highlighted checklist item (item turns green and a checkmark is placed in the box next to the item). The next item is automatically highlighted for selection.

   Press the **CLR** Key to remove a check mark from an item.

8) Once the last item in a checklist is selected, 'Go to the next checklist?' is highlighted. Press the **ENT** Key to advance to the next checklist displayed.
9) Press the **EXIT** Softkey or hold down the **CLR** Key momentarily to exit the Checklist Page and return to the page last viewed.

Immediately accessing emergency procedures:

1) From any page, press the **CHKLIST** Softkey.
2) Press the **EMERGCY** Softkey.

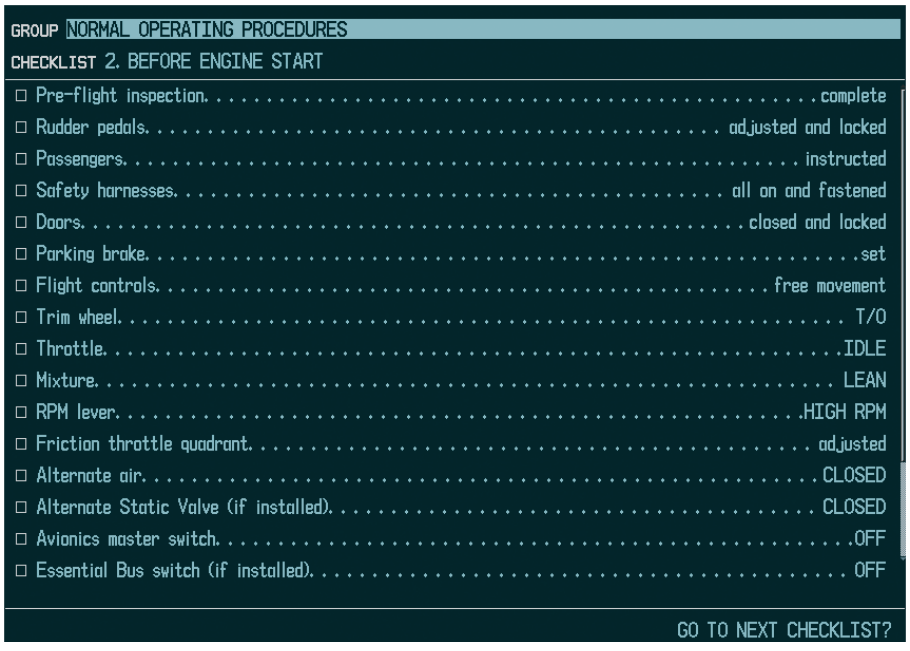


Figure 1-41 Sample Checklist

1.7 DISPLAY BACKLIGHTING

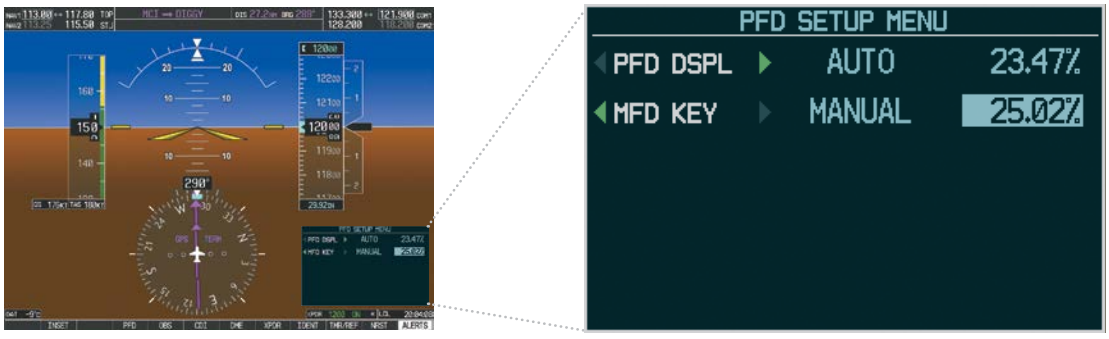
Backlighting of the PFD(s) and MFD, Audio Panel keys, and Control Unit keys can be adjusted automatically or manually. The automatic setting (default) uses photocells to adjust for ambient lighting conditions. Photocell calibration curves are pre-configured to optimize display appearance through a broad range of cockpit lighting conditions. In normal display mode, backlighting can only be adjusted from the PFD(s). In Reversionary Mode, it can be adjusted from the remaining display(s).

Adjusting display backlighting manually:

1) Press the PFD **MENU** Key to display the PFD Setup Menu. 'AUTO' is now highlighted next to 'PFD DSPL'. No other window can be displayed on the PFD while the PFD Setup Menu is displayed. Pressing the **MENU** Key while any other PFD window is displayed does not display the PFD Setup Menu.
2) Turn the small **FMS** Knob to select 'MANUAL' and press the **ENT** Key. The intensity value is now highlighted.
3) Use the **FMS** Knob to enter the desired backlighting then press the **ENT** Key.
4) Turn the large **FMS** Knob to highlight 'AUTO' next to 'MFD DSPL' and repeat steps 2-4.
5) To remove the menu, press the **CLR** or **MENU** Key.

Adjusting key backlighting manually:

1) Press the PFD **MENU** Key to display the PFD Setup Menu. 'AUTO' is now highlighted next to 'PFD DSPL'.
2) Turn the large **FMS** Knob to highlight 'PFD DSPL'.
3) Turn the small **FMS** Knob in the direction of the green arrowhead to display 'PFD KEY'.
4) Turn the large **FMS** Knob to highlight 'AUTO'.
5) Turn the small **FMS** Knob to select 'MANUAL' and press the **ENT** Key. The intensity value is now highlighted.
6) Use the **FMS** Knob to enter the desired backlighting and press the **ENT** Key.
7) Turn the large **FMS** Knob to highlight 'MFD DSPL'.
8) Turn the small **FMS** Knob in the direction of the green arrowhead to display 'MFD KEY' and repeat steps 4-7.
9) To remove the menu, press the **CLR** or **MENU** Key.



PFD

Figure 1-42 PFD Setup Menu

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SECTION 2 FLIGHT INSTRUMENTS

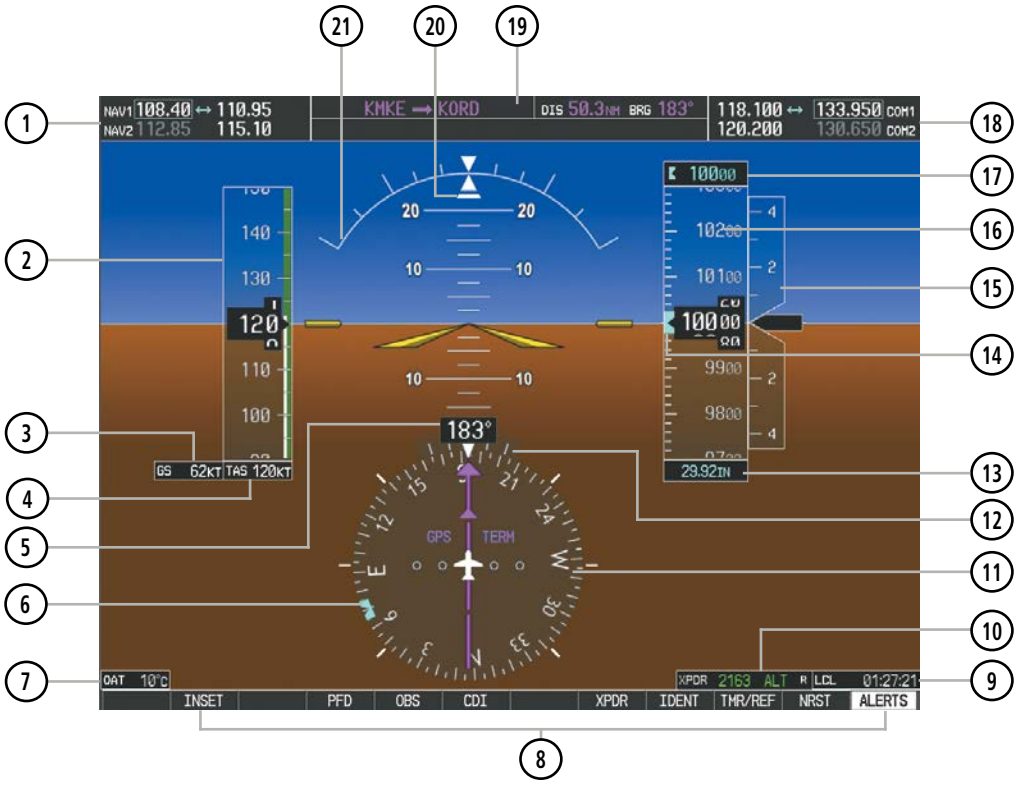
WARNING: *In the event that the airspeed, attitude, altitude, or heading indications become unusable, refer to the backup instruments if installed.*

Increased situational awareness is provided by replacing the traditional instruments on the panel with an easy-to-scan Primary Flight Display (PFD) that features a large horizon, airspeed, attitude, altitude, vertical speed, and course deviation information. In addition to the flight instruments, navigation, communication, terrain, traffic, and weather information are also presented on the PFD and explained in other sections of this Pilot's Guide.

The following flight instruments and supplemental flight data are displayed on the PFD:

- Airspeed Indicator, showing
  - True airspeed
  - Airspeed awareness ranges
  - Trend vector
  - Reference flags
- Attitude Indicator with slip/skid indication
- Altimeter, showing
  - Trend vector
  - Barometric setting
  - Selected Altitude
- Vertical Deviation, Glideslope, and Glidepath Indicators
- Vertical Speed Indicator (VSI)
- Horizontal Situation Indicator, showing
  - Heading and course indications
  - Turn Rate Indicator
  - Navigation source
  - Course Deviation Indicator (CDI)
  - Bearing pointers and information windows
- Outside Air Temperature (OAT)
- Timer/References Window, showing
  - Generic timer
  - Vspeed values and flags
  - Barometric minimum descent altitude (MDA; or decision height, DH)
- System time
- Wind data
- Vertical Navigation indications

The PFD also displays various alerts and annunciations.



1. *NAV Frequency Box*
2. *Airspeed Indicator*
3. *Ground Speed*
4. *True Airspeed*
5. *Current Heading*
6. *Selected Heading Bug*
7. *Outside Air Temperature (OAT)*
8. *Softkeys*
9. *System Time*
10. *Transponder Data Box*
11. *Horizontal Situation Indicator (HSI)*
12. *Turn Rate Indicator*
13. *Altimeter Barometric Setting*
14. *Selected Altitude Bug*
15. *Vertical Speed Indicator (VSI)*
16. *Altimeter*
17. *Selected Altitude*
18. *COM Frequency Box*
19. *Navigation Status Box*
20. *Slip/Skid Indicator*
21. *Attitude Indicator*

Figure 2-1 Primary Flight Display (Default)



1. *Traffic Annunciation*
2. *Selected Heading*
3. *Wind Data*
4. *Inset Map*
5. *Bearing Information Windows*
6. *Minimum Descent Altitude/Decision Height*
7. *Flight Plan Window*
8. *Annunciation Window*
9. *Selected Course*
10. *Vertical Speed Required*
11. *Vertical Deviation Indicator (VDI)*
12. *Marker Beacon Annunciation*
13. *Current VNV Target Altitude*
14. *Terrain Annunciation*

Figure 2-2 Primary Flight Display (Additional Information)

2.1 FLIGHT INSTRUMENTS

AIRSPEED INDICATOR

NOTE: *Refer to the documentation provided by the kitplane manufacturer for airspeed criteria and Vspeed values.*

The Airspeed Indicator displays airspeed on a rolling number gauge using a moving tape. The true airspeed (TAS) is displayed in knots below the Airspeed Indicator. The ground speed is displayed to the left of the TAS. The numeric labels and major tick marks on the moving tape are shown at intervals of 10 knots, while minor tick marks on the moving tape are indicated at intervals of 5 knots. Speed indication starts at 20 knots and the actual airspeed is displayed inside the black pointer. The pointer remains black until reaching never-exceed speed (V_{NE}), at which point it turns red.

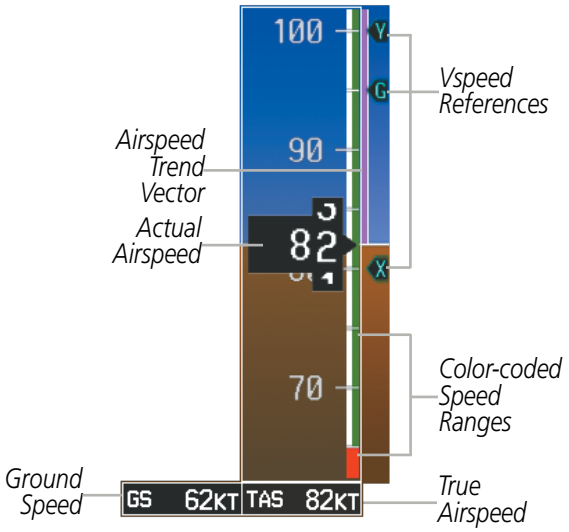


Figure 2-3 Airspeed Indicator



Figure 2-4 Red Pointer Showing Overspeed

A color-coded (red, white, green, yellow, and red/white 'barber pole") speed range strip is located on the moving tape. The colors denote flaps operating range, normal operating range, caution range, and never-exceed speed (V_{NE}). A red range is also present for low speed awareness.

The Airspeed Trend Vector is a vertical, magenta line that appears to the right of the color-coded speed range strip when airspeed is either accelerating or decelerating. One end of the magenta line is anchored to the tip of the airspeed pointer while the other end moves continuously up or down corresponding to the rate of acceleration or deceleration. For any constant rate of acceleration or deceleration, the moving end of the line shows approximately what the indicated airspeed value will be in six seconds. If the trend vector crosses V_{NE}, the text of the actual airspeed readout changes to yellow. The trend vector is absent if the speed remains constant or if any data needed to calculate airspeed is not available due to a system failure.

Vspeeds can be changed and their flags turned on/off from the Timer/References Window (Figure 2-5). When active (on), the Vspeeds are displayed at their respective locations to the right of the airspeed scale.

Changing Vspeeds and turning flags on/off:

1) Press the **TMR/REF** Softkey.
2) Turn the large **FMS** Knob to highlight the desired Vspeed.
3) Use the small **FMS** Knob to change the Vspeed in 1-kt increments (when a speed has been changed from a default value, an asterisk appears next to the speed).
4) Press the **ENT** Key or turn the large **FMS** Knob to highlight the ON/OFF field
5) Turn the small **FMS** Knob clockwise to ON or counterclockwise to OFF.
6) To remove the window, press the **CLR** Key or press the **TMR/REF** Softkey.



Figure 2-5 Timer/References Window

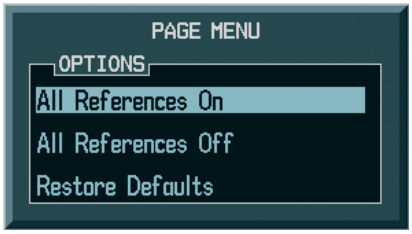


Figure 2-6 Timer/References Menu

Turning all Vspeed flags ON/OFF:

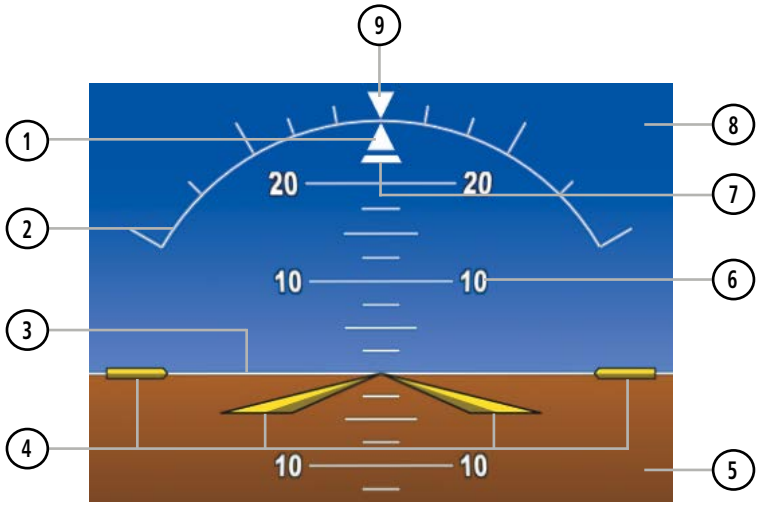
1) Press the **TMR/REF** Softkey.
2) Press the **MENU** Key.
3) To view all Vspeed flags, highlight 'All References On' and press the **ENT** Key (Figure 2-6).
4) To remove all Vspeed flags, turn the **FMS** Knob to highlight 'All References Off' and press the **ENT** Key.

Restoring all Vspeed defaults:

1) Press the **TMR/REF** Softkey.
2) Press the **MENU** Key.
3) Turn the **FMS** Knob to highlight 'Restore Defaults' and press the **ENT** Key.

ATTITUDE INDICATOR

Attitude information is displayed over a virtual blue sky and brown ground with a white horizon line. The Attitude Indicator displays the pitch (indicated by the yellow symbolic aircraft on the pitch scale), roll, and slip/skid information.



1. *Roll Pointer*
2. *Roll Scale*
3. *Horizon Line*
4. *Aircraft Symbol*
5. *Land Representation*
6. *Pitch Scale*
7. *Slip/Skid Indicator*
8. *Sky Representation*
9. *Roll Scale Zero*

Figure 2-7 Attitude Indicator

The horizon line is part of the pitch scale. Above and below the horizon line, major pitch marks and numeric labels are shown for every 10°, up to 80°. Minor pitch marks are shown for intervening 5° increments, up to 25° below and 45° above the horizon line. Between 20° below to 20° above the horizon line, minor pitch marks occur every 2.5°. If the optional Synthetic Vision System (SVS) is activated, the pitch scale is reduced to 10° up and 7.5° down; refer to the Additional Features section for more information about SVS.

The inverted white triangle indicates zero on the roll scale. Major tick marks at 30° and 60° and minor tick marks at 10°, 20°, and 45° are shown to the left and right of the zero. Angle of bank is indicated by the position of the pointer on the roll scale.

The Slip/Skid Indicator is the bar beneath the roll pointer. The indicator moves with the roll pointer and moves laterally away from the pointer to indicate lateral acceleration Slip/skid is indicated by the location of the bar relative to the pointer.



Figure 2-8 Slip/Skid Indication

ALTIMETER

The Altimeter displays 600 feet of barometric altitude values at a time on a rolling number gauge using a moving tape. Numeric labels and major tick marks are shown at intervals of 100 feet. Minor tick marks are at intervals of 20 feet. The indicated altitude is displayed in the black pointer.

The Selected Altitude is displayed above the Altimeter in the box indicated by a selection bug symbol. A bug corresponding to this altitude is shown on the tape; if the Selected Altitude exceeds the range shown on the tape, the bug appears at the corresponding edge of the tape. The metric value, when selected, is displayed in a separate box above the Selected Altitude.

A magenta Altitude Trend Vector extends up or down the left of the altitude tape, the end resting at the approximate altitude to be reached in 6 seconds at the current vertical speed. The trend vector is not shown if altitude remains constant or if data needed for calculation is not available due to a system failure.

Setting the Selected Altitude:

Turn the **ALT** Knob to set the Selected Altitude (large knob for 1000-ft increments, small knob for 100-ft increments. When the altimeter is set to display Metric Units, the large knob adjusts the Selected Altitude in 500-meter increments; turn the small knob for 50-meter increments.

If set, the Minimum Descent Altitude/Decision Height (MDA/DH) value is also available for the Selected Altitude.

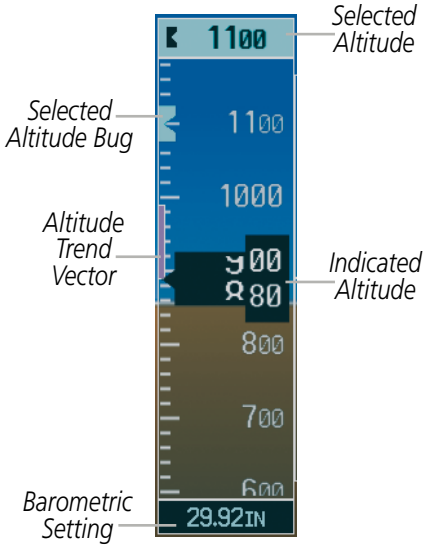


Figure 2-9 Altimeter

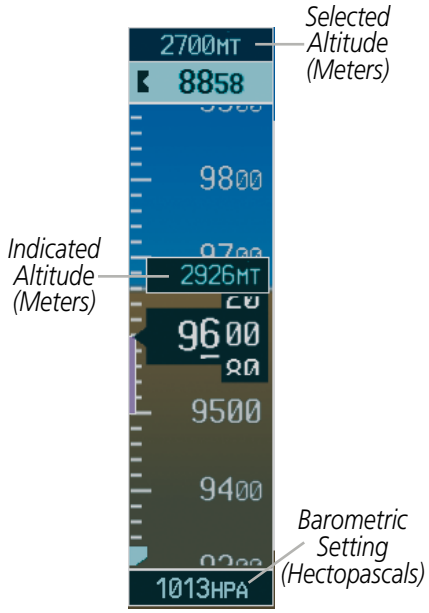


Figure 2-10 Altimeter (Metric Units)

Selected and current altitudes can also be displayed in meters (readouts displayed above the normal readouts in feet; Figure 2-10). Note that the altitude tape does not change scale.

Displaying altitude in meters:

1) Press the **PFD** Softkey to display the second-level softkeys.
2) Press the **ALT UNIT** Softkey.
3) Press the **METERS** Softkey to turn on metric altitude readouts.
4) Press the **BACK** Softkey to return to the top-level softkeys.

The barometric pressure setting is displayed below the Altimeter in inches of mercury (in Hg) or hectopascals (hPa) when metric units are selected. Adjusting the altimeter barometric setting creates discontinuities in VNV vertical deviation, moving the descent path. For large adjustments, it may take several minutes for the aircraft to re-establish on the descent path. If the change is made while nearing a waypoint with a VNV Target Altitude, the aircraft may not re-establish on the descent path in time to meet the vertical constraint.

Selecting the altimeter barometric pressure setting:

Turn the **BARO** Knob to select the desired setting.

Selecting standard barometric pressure (29.92 in Hg):

1) Press the **PFD** Softkey to display the second-level softkeys.
2) Press the **STD BARO** Softkey; STD BARO is displayed in barometric setting box.



Figure 2-11 Standard Barometric Altimeter Setting

Changing altimeter barometric pressure setting units:

1) Press the **PFD** Softkey to display the second-level softkeys.
2) Press the **ALT UNIT** Softkey.
3) Press the **IN** Softkey to display the barometric pressure setting in inches of mercury (in Hg).

   Or, press the **HPA** Softkey to display the barometric pressure setting in hectopascals (hPa; see Figure 2-10).
4) Press the **BACK** Softkey twice to return to the top-level softkeys.

In aircraft equipped with 3 displays, if the barometric altimeter settings differ between PFDs by more than 0.02 in Hg, the readouts turn yellow. Once the settings are synchronized (BARO turned on), they remain synchronized until the setting is turned off.

Synchronizing the altimeter barometric pressure settings (3 Display System Only):

1) Use the **FMS** Knob to select the AUX - System Setup Page.
2) Press the **FMS** Knob to activate the cursor.
3) Turn the large **FMS** Knob to highlight 'BARO' in the Synchronization box.
4) Turn the small **FMS** Knob clockwise to ON or counterclockwise to OFF.
5) Press the **FMS** Knob to remove the cursor.



Figure 2-12 Baro Sync Setting (AUX - System Setup Page)

A Baro Transition Alert is provided to alert the pilot to change the barometric pressure setting when crossing the transition altitude (in either direction). This is displayed by the barometric pressure setting flashing light blue when crossing the transition altitude. The flashing stops when the barometric pressure setting is changed.

Setting the Baro Transition Alert:

1) Use the **FMS** Knob to select the AUX - System Setup Page.
2) Press the **FMS** Knob to activate the cursor.
3) Turn the large **FMS** Knob to highlight 'OFF or ON' in the 'BARO TRANSITION ALERT' box.
4) Turn the small **FMS** Knob to turn the alert OFF or ON and press the **ENT** Key.
5) With the altitude field highlighted, turn the small **FMS** Knob to select the desired altitude and press the **ENT** Key.
6) To cancel the selection, press the **FMS** Knob.

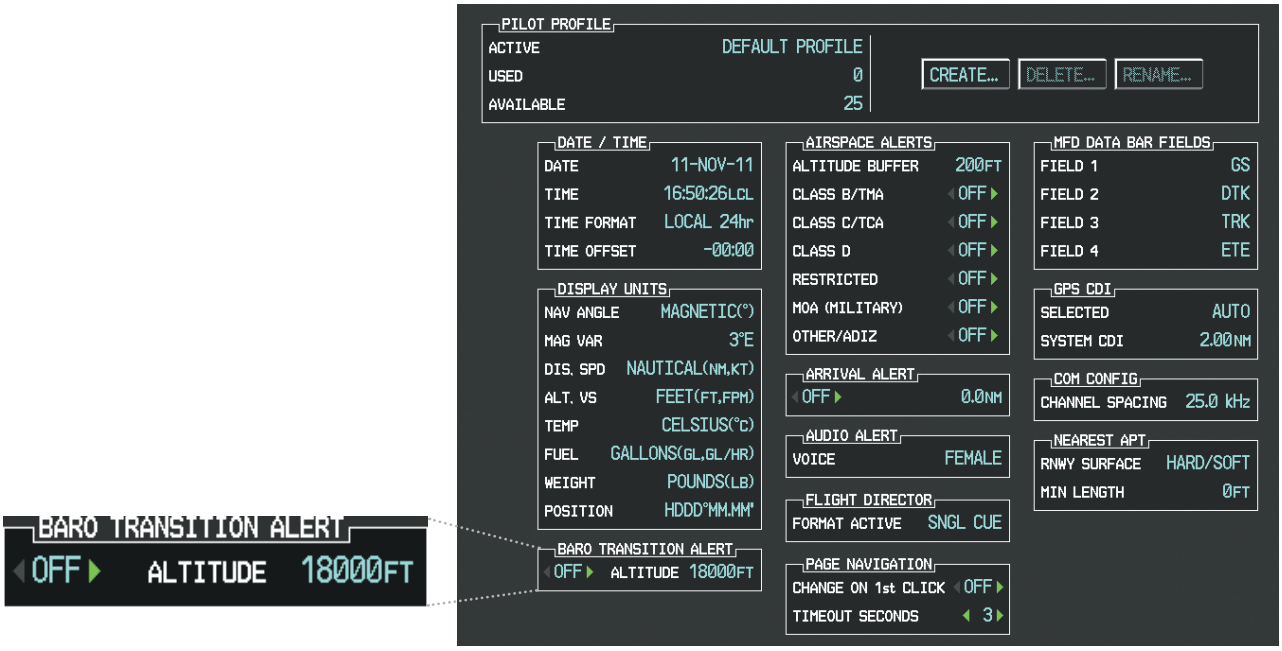


Figure 2-13 Baro Transition Alert (AUX - System Setup Page)

VERTICAL SPEED INDICATOR (VSI)

The Vertical Speed Indicator (VSI, Figure 2-14) displays the aircraft vertical speed using a non-moving tape labeled at 1000 and 2000 fpm with minor tick marks every 500 fpm. The current vertical speed is displayed in the pointer along the tape. Digits appear in the pointer when the climb or descent rate is greater than 100 fpm. If the rate of ascent/descent exceeds 2000 fpm, the pointer appears at the corresponding edge of the tape and the rate appears inside the pointer.

A magenta chevron bug is displayed as the Required Vertical Speed Indication (RVSI; Figure 2-14) for reaching a VNV Target Altitude once the "TOD [Top of Descent] within 1 minute" alert has been generated. Refer to Section 2.2, Supplemental Flight Data, for more information about VNV indications on the PFD.

VERTICAL DEVIATION

NOTE: *The Glidepath Indicator is only shown for aircraft with GIA 63W Integrated Avionics Units when SBAS is available.*

The Vertical Deviation Indicator (VDI; Figure 2-14) is a magenta chevron indicating the baro-VNV vertical deviation when Vertical Navigation (VNV) is being used. The VDI appears in conjunction with the "TOD within 1 minute" alert. The VDI is removed from the display if vertical deviation becomes invalid. See the Flight Management Section for details on VNV features, and refer to Section 2.2, Supplemental Flight Data, for more information about VNV indications on the PFD.

The Glideslope Indicator (Figure 2-15) appears to the left of the Altimeter when an ILS frequency is tuned in the active NAV field. A green diamond acts as the Glideslope Indicator, like a glideslope needle on a conventional indicator (except it does not appear during a localizer back course approach). If a localizer frequency is tuned and there is no glideslope, "NO GS" is displayed in place of the diamond.

The glidepath is analogous to the glideslope for GPS approaches supporting SBAS vertical guidance (LNAV+V, L/VNAV, LPV). When an approach of this type is loaded into the flight plan and GPS is the selected navigation source, the Glidepath Indicator (Figure 2-16) appears as a magenta diamond during the approach. If the approach type downgrades past the final approach fix (FAF), "NO GP" is displayed in place of the diamond.

Full-scale deflection (two dots) is 1000 feet.

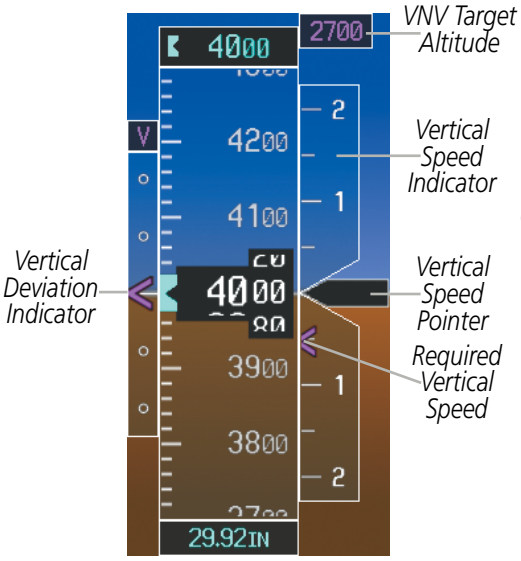


Figure 2-14 Vertical Speed and Deviation Indicators (VSI and VDI)

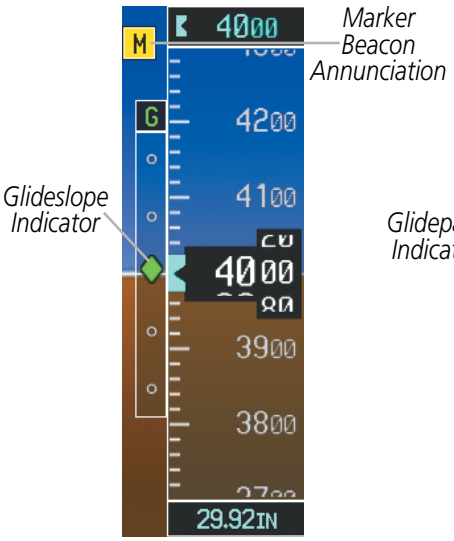


Figure 2-15 Glideslope Indicator

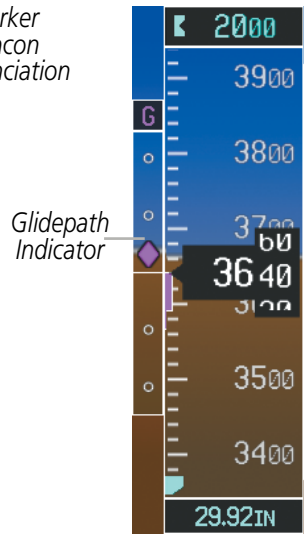


Figure 2-16 Glidepath Indicator

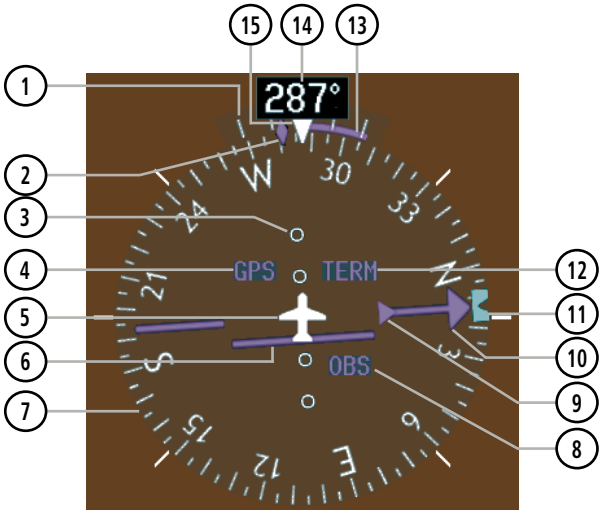
HORIZONTAL SITUATION INDICATOR (HSI)

The Horizontal Situation Indicator (HSI) displays a rotating compass card in a heading-up orientation. Letters indicate the cardinal points and numeric labels occur every 30°. Major tick marks are at 10° intervals and minor tick marks at 5° intervals. A digital reading of the current heading appears on top of the HSI, and the current track is represented on the HSI by a magenta diamond. The HSI also presents turn rate, course deviation, bearing, and navigation source information and is available in two formats (360° compass rose and 140° arc).

Changing the HSI display format:

1) Press the **PFD** Softkey.
2) Press the **HSI FRMT** Softkey.
3) Press the **360 HSI** or **ARC HSI** Softkey.

The 360° HSI contains a Course Deviation Indicator (CDI), with a Course Pointer, To/From Indicator, and a sliding deviation bar and scale. The course pointer is a single line arrow (GPS, VOR1, and LOC1) or a double line arrow (VOR2 and LOC2) which points in the direction of the set course. The To/From arrow rotates with the course pointer and is displayed when the active NAVAID is received.



1. *Turn Rate Indicator*
2. *Current Track Indicator*
3. *Lateral Deviation Scale*
4. *Navigation Source*
5. *Aircraft Symbol*
6. *Course Deviation Indicator (CDI)*
7. *Rotating Compass Rose*
8. *OBS Mode Active*
9. *To/From Indicator*
10. *Course Pointer*
11. *Selected Heading Bug*
12. *Flight Phase*
13. *Turn Rate/Heading Trend Vector*
14. *Current Heading*
15. *Lubber Line*

Figure 2-17 Horizontal Situation Indicator (HSI)

The Arc HSI is a 140° expanded section of the compass rose. The Arc HSI contains a Course Pointer, To/From Indicator, a sliding deviation indicator (the To/From and deviation indicators are combined), and a deviation scale. Upon station passage, the To/From Indicator flips and points to the tail of the aircraft, just like a conventional To/From flag. Depending on the navigation source, the CDI on the Arc HSI can appear in two different ways: an arrowhead (GPS, VOR, OBS) or a diamond (LOC).



Figure 2-18 Arc HSI

The Selected Heading is shown to the upper left of the HSI for 3 seconds after being adjusted The light blue bug on the compass rose corresponds to the Selected Heading. While the HSI is displayed as an arc, if the Selected Heading Bug is adjusted off the shown portion of the compass rose, the digital reading displayed.

Adjusting the Selected Heading:

Turn the **HDG** Knob to set the Selected Heading.

Press the **HDG** Knob to synchronize the bug to the current heading.

The Selected Course is shown to the upper right of the HSI for 3 seconds after being adjusted. While the HSI is displayed as an arc, the Selected Course is displayed whenever the Course Pointer is not within the 140° currently shown.

Adjusting the Selected Course:

Turn the **CRS** Knob to set the Selected Course.

Press the **CRS** Knob to re-center the CDI and return the course pointer to the bearing of the active waypoint or navigation station (see OBS Mode for adjusting a GPS course).

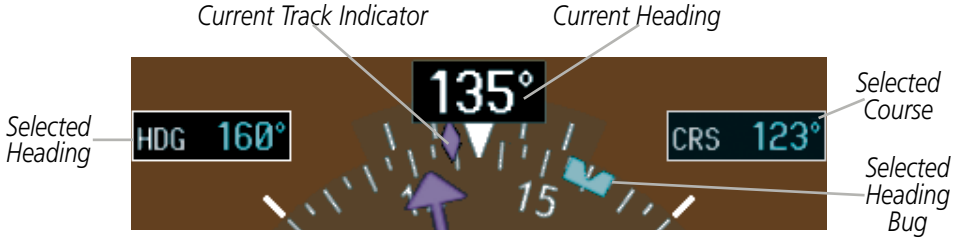


Figure 2-19 Heading and Course Indications

Navigation angles (track, heading, course, bearing) are corrected to the computed magnetic variation ('Mag Var') or referenced to true north (denoted 'T'), set on the AUX - System Setup Page. When an approach referenced to true north has been loaded into the flight plan, the system generates a message to change the navigation angle setting to 'True' at the appropriate time.



Figure 2-20 Heading and Course Indications (True)

Changing the navigation angle setting:

1) Use the **FMS** Knob to select the AUX - System Setup Page on the MFD.
2) Press the **FMS** Knob to activate the cursor.
3) Turn the large **FMS** Knob to highlight 'Nav Angle' in the 'Display Units' box.
4) Turn the small **FMS** Knob to highlight the desired setting and press the **ENT** Key.
   - TRUE - References angles to true north (denoted with 'T')
   - MAGNETIC - Angles corrected to the computed magnetic variation ('Mag Var')
   - USER - Angle set according to user input

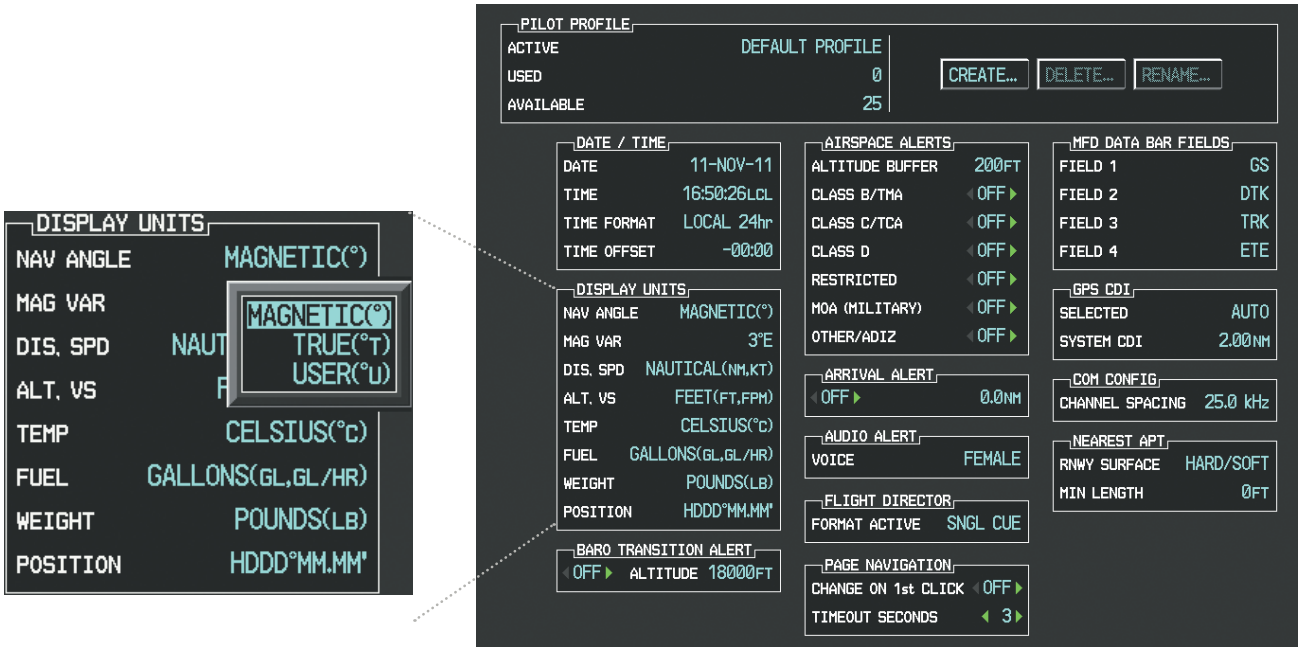


Figure 2-21 Navigation Angle Settings (AUX - System Setup Page)

TURN RATE INDICATOR

The Turn Rate Indicator is located directly above the rotating compass card. Tick marks to the left and right of the lubber line denote half-standard and standard turn rates. A magenta Turn Rate Trend Vector shows the current turn rate. The end of the trend vector gives the heading predicted in 6 seconds, based on the present turn rate. A standard-rate turn is shown on the indicator by the trend vector stopping at the standard turn rate tick mark, corresponding to a predicted heading of 18° from the current heading. At rates greater than 4 deg/sec, an arrowhead appears at the end of the magenta trend vector and the prediction is no longer valid.



Figure 2-22 Turn Rate Indicator and Trend Vector

BEARING INFORMATION

NOTE: *When the Arc HSI is displayed, the Bearing Information windows and pointers are disabled.*

NOTE: *ADF radio installation is optional.*

Two bearing pointers and associated information can be displayed on the HSI for NAV, GPS, and ADF sources by pressing the **PFD** Softkey then a **BRG** or **DME** Softkey. The bearing pointers are light blue and are single-line (BRG1) or double-line (BRG2). A pointer symbol is shown in the information windows to indicate the navigation source. The bearing pointers never override the CDI and are visually separated from the CDI by a white ring. Bearing pointers may be selected but not necessarily visible due to data unavailability.

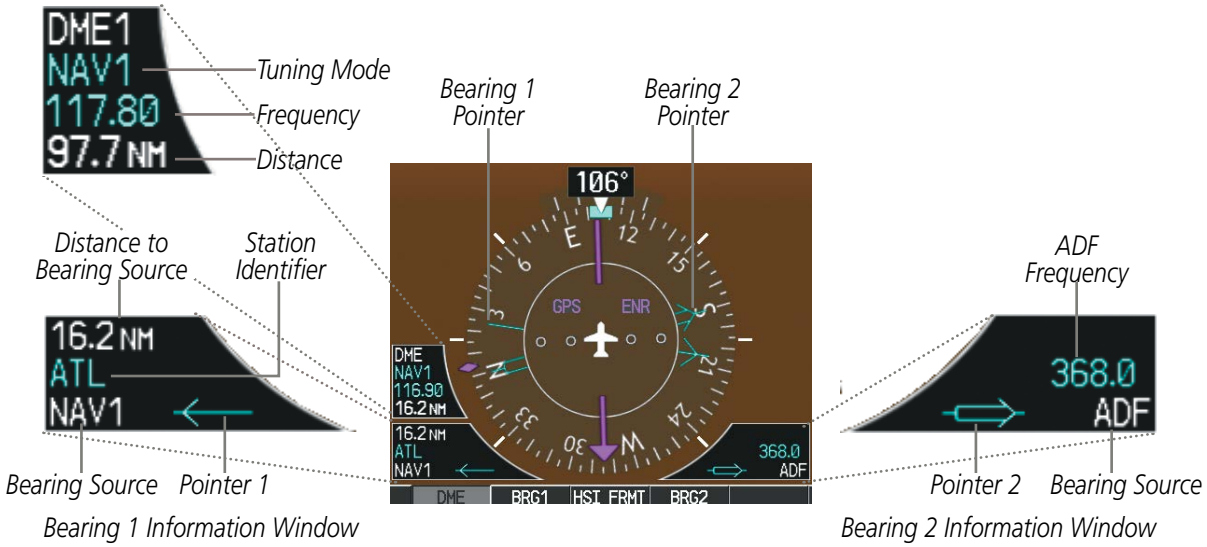


Figure 2-23 HSI with Bearing and Distance Information

When a bearing pointer is displayed, the associated information window is also displayed. The Bearing Information Windows are displayed at the lower sides of the HSI and give the following information:

- Bearing source (NAV, GPS, optional ADF)
- Pointer icon (BRG1 = single line, BRG2 = double line)
- Frequency (NAV, optional ADF)
- Station/waypoint identifier (NAV, GPS)
- GPS-derived great circle distance to bearing source

When the NAV radio is tuned to an ILS frequency the bearing source and the bearing pointer is removed from the HSI. When NAV1 or NAV2 is the selected bearing source, the frequency is replaced by the station identifier when the station is within range. If GPS is the bearing source, the active waypoint identifier is displayed instead of a frequency.

The bearing pointer is removed from the HSI and NO DATA is displayed in the information window if the NAV radio is not receiving a VOR station or if GPS is the bearing source and an active waypoint is not selected.

Selecting bearing display and changing sources:

1) Press the **PFD** Softkey.
2) Press a **BRG** Softkey to display the desired bearing pointer and information window with a NAV source.
3) Press the **BRG** Softkey again to change the bearing source to GPS.
4) To remove the bearing pointer and information window, press the **BRG** Softkey again.

DME INFORMATION WINDOW

NOTE: *DME radio installation is optional.*

The DME Information Window (Figure 2-23) is displayed above the BRG1 Information Window on the 360° HSI and in a box above and along side the Arc HSI. It shows the DME label, tuning mode (NAV1, NAV2, or HOLD), frequency, and distance. When a signal is invalid, the distance is replaced by –.– – NM Refer to the Audio Panel and CNS Section for information on tuning the DMEs.

Displaying the DME Information Window:

1) Press the **PFD** Softkey.
2) Press the **DME** Softkey to display the DME Information Window.
3) To remove the DME Information Window, press the **DME** Softkey again.

COURSE DEVIATION INDICATOR (CDI)

NOTE: *If a heading change of greater than 105° with respect to the course is made, the CDI on the Arc HSI switches to the opposite side of the deviation scale and displays reverse sensing.*

The Course Deviation Indicator (CDI) moves left or right from the course pointer along a lateral deviation scale to display aircraft position relative to the course. If the course deviation data is not valid, the CDI is not displayed.

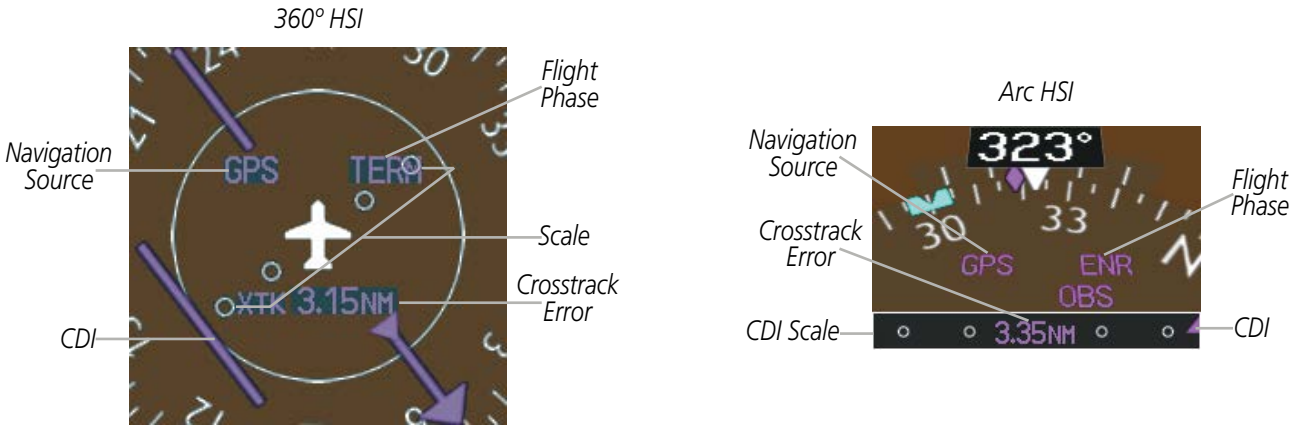


Figure 2-24 Course Deviation Indicator

The CDI can display two sources of navigation: GPS or NAV (VOR, localizer). Color indicates the current navigation source: magenta (for GPS) or green (for VOR and LOC). The full scale limits for the CDI are defined by a GPS-derived distance when coupled to GPS. When coupled to a VOR or localizer (LOC), the CDI has the same angular limits as a mechanical CDI. If the CDI exceeds the maximum deviation on the scale (two dots) while coupled to GPS, the crosstrack error (XTK) is displayed below the white aircraft symbol.

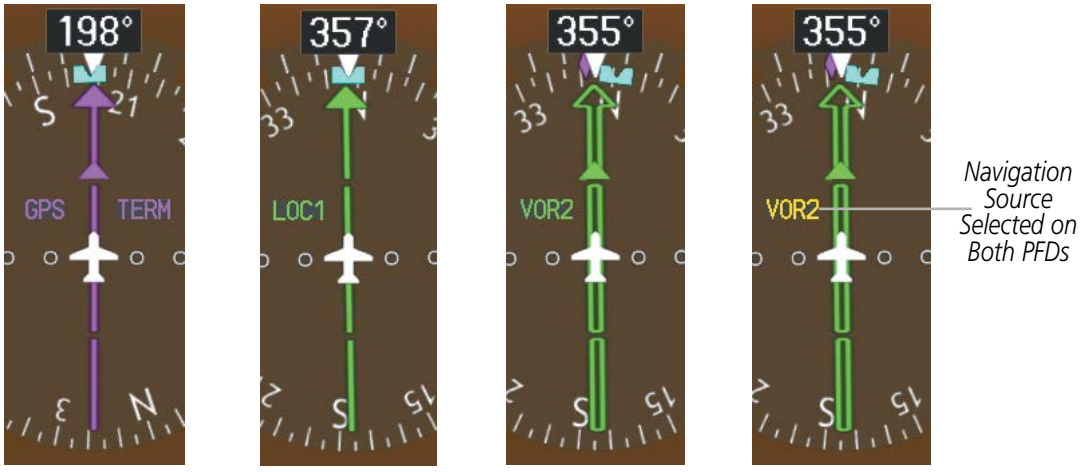


Figure 2-25 Navigation Sources

Changing navigation sources:

1) Press the **CDI** Softkey to change from GPS to VOR1 or LOC1. This places the light blue tuning box over the NAV1 standby frequency in the upper left corner of the PFD.
2) Press the **CDI** Softkey again to change from VOR1 or LOC1 to VOR2 or LOC2. This places the light blue tuning box over the NAV2 standby frequency.
3) Press the **CDI** Softkey a third time to return to GPS.

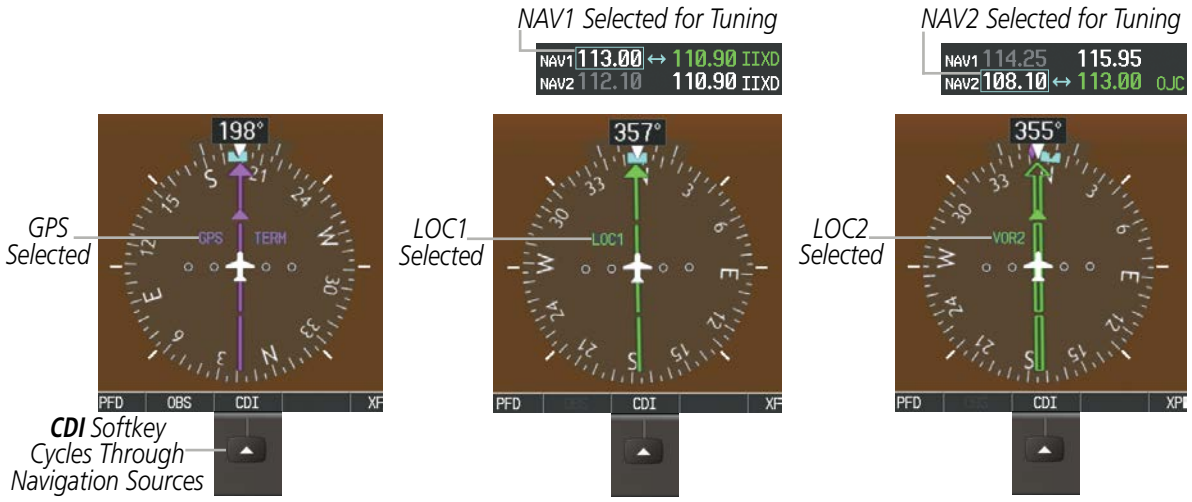


Figure 2-26 Selecting a Navigation Source

The system automatically switches from GPS to LOC navigation source and changes the CDI scaling accordingly when all of the following occur:

- A localizer or ILS approach has been loaded into the active flight plan
- The final approach fix (FAF) is the active leg, the FAF is less than 15 nm away, and the aircraft is moving toward the FAF
- A valid localizer frequency has been tuned
- The GPS CDI deviation is less than 1.2 times full-scale deflection

GPS steering guidance is still provided after the CDI automatically switches to LOC until LOC capture, up to the Final Approach Fix (FAF) for an ILS approach, or until GPS information becomes invalid. Activating a Vector-to-Final (VTF; see the Flight Management Section) also causes the CDI to switch to LOC navigation source; GPS steering guidance is not provided after this switch.

In aircraft equipped with 3 displays, if the same VOR/LOC navigation source is selected on both PFDs, the navigation source annunciation turns yellow on both displays (unless synchronized). Once the CDIs are synchronized (CDI turned on), they remain synchronized for the entire flight.

Synchronizing the CDIs (3 Display Systems Only):

1) Use the **FMS** Knob to select the AUX - System Setup Page.
2) Press the **FMS** Knob to activate the cursor.
3) Turn the large **FMS** Knob to highlight 'CDI' in the Synchronization box.
4) Turn the small **FMS** Knob clockwise to ON or counterclockwise to OFF.
5) Press the **FMS** Knob to remove the cursor.



Figure 2-27 CDI Sync Settings (AUX - System Setup Page)

GPS CDI SCALING

When GPS is the selected navigation source, the flight plan legs are sequenced automatically and annunciations appear on the HSI for the flight phase. Flight phase annunciations are normally shown in magenta, but when cautionary conditions exist the color changes to yellow. If the current leg in the flight plan is a heading leg, 'HDG LEG' is annunciated in magenta beneath the aircraft symbol.

The current GPS CDI scale setting is displayed as 'System CDI' on the AUX - System Setup Page and the full-scale deflection setting may also be changed (2.0 nm, 1.0 nm, 0.3 nm, or Auto) from this page. If the selected scaling is smaller than the automatic setting for enroute and terminal phases, the CDI is scaled accordingly and the selected setting is be displayed rather than the flight phase annunciation.

Changing the selected GPS CDI setting:

1) Use the **FMS** Knob to select the AUX - System Setup Page on the MFD.
2) Press the **FMS** Knob to activate the cursor.
3) Turn the large **FMS** Knob to highlight the 'SELECTED' field in the 'GPS CDI' box.
4) Turn the small **FMS** Knob to highlight the desired setting and press the **ENT** Key.
5) To cancel the selection, press the **FMS** Knob or the **CLR** Key.

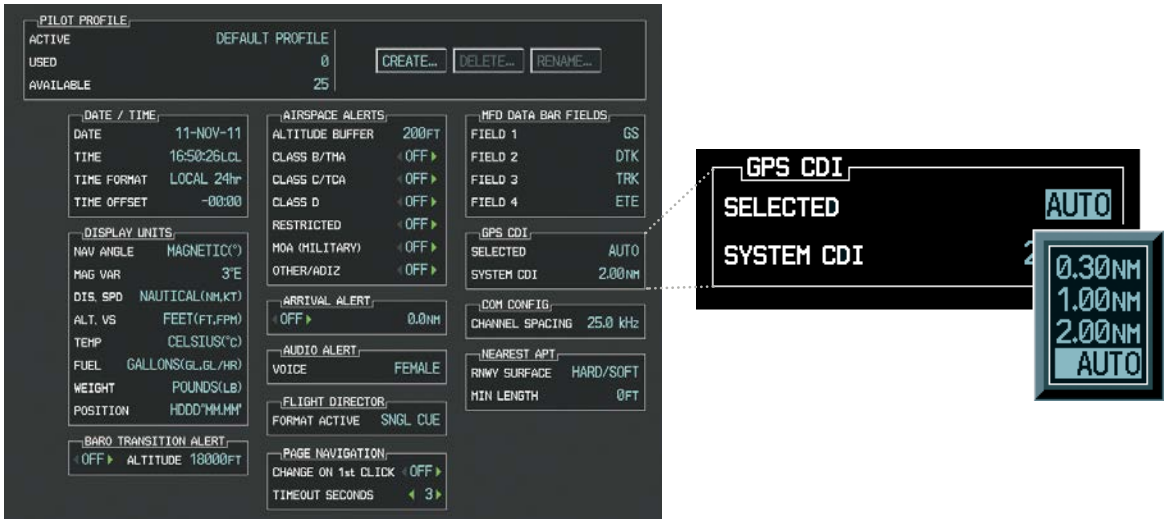


Figure 2-28 GPS CDI Settings (AUX - System Setup Page)

When set to 'Auto' (default), the GPS CDI scale automatically adjusts to the desired limits based upon the current phase of flight (Figure 2-29, Table 2-1).

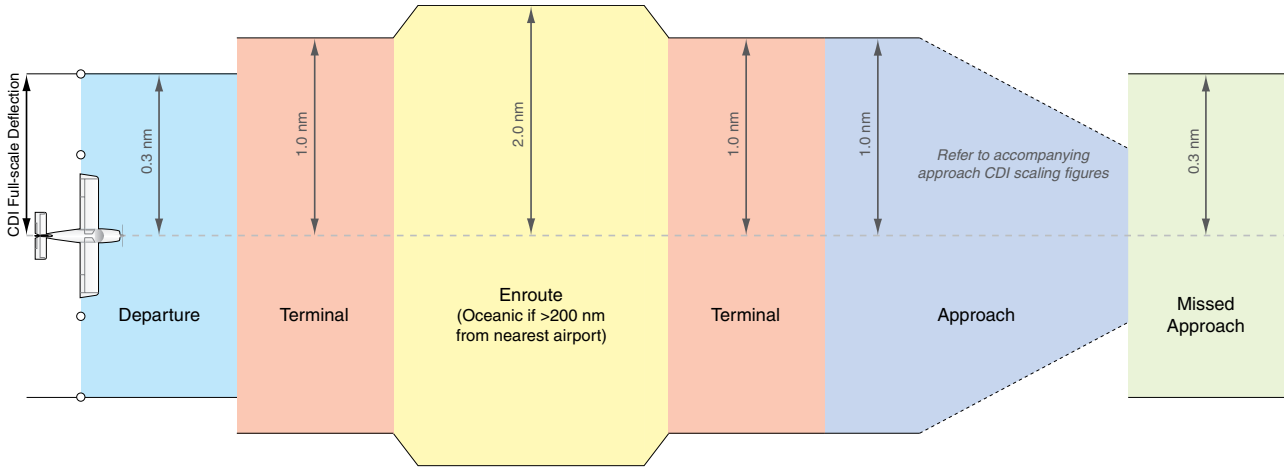


Figure 2-29 Automatic CDI Scaling

- When a departure procedure is active, the CDI is scaled for ***departure*** (0.3 nm).
- The system switches from departure to ***terminal*** CDI scaling (1.0 nm) under the following conditions:
  - The next leg in the procedure is not aligned with the departure runway
  - The next leg in the departure procedure is not CA, CD, CF, CI, CR, DF, FA, FC, FD, FM, IF, or TF (see Glossary for leg type definitions)
  - After any leg in the departure procedure that is not CA or FA
- At 30 nm from the departure airport, the ***enroute*** phase of flight is automatically entered and CDI scaling changes to 2.0 nm over a distance of 1.0 nm, except under the following conditions:
  - When navigating with an active departure procedure, the flight phase and CDI scale will not change until the aircraft arrives at the last departure waypoint (if more than 30 nm from the departure airport) or the leg after the last departure waypoint has been activated or a direct-to waypoint is activated.
- If after completing the departure procedure the nearest airport is more than 200 nm away from the aircraft and the approach procedure has not yet commenced, the CDI is scaled for ***oceanic*** flight (2.0 nm).
- Within 31 nm of the destination airport (***terminal*** area), the CDI scale gradually ramps down from 2.0 nm to 1.0 nm over a distance of 1.0 nm; except under the following conditions:
  - Upon reaching the first waypoint of an arrival route that is more than 31 nm from the destination airport, the flight phase changes to terminal and the CDI scale begins to transition down from 2.0 nm to 1.0 nm over a distance of 1.0 nm.
- During ***approach***, the CDI scale ramps down even further (see Figures 2-30 and 2-31). This transition normally occurs within 2.0 nm of the final approach fix (FAF). The CDI switches to approach scaling automatically once the approach procedure is activated or if Vector-to-Final (VTF) is selected.
  - If the active waypoint is the FAF, the ground track and the bearing to the FAF must be within 45° of the final approach segment course.
  - If the active waypoint is part of the missed approach procedure, the active leg and preceding missed approach legs must be aligned with the final approach segment course and the aircraft must not have passed the turn initiation point.

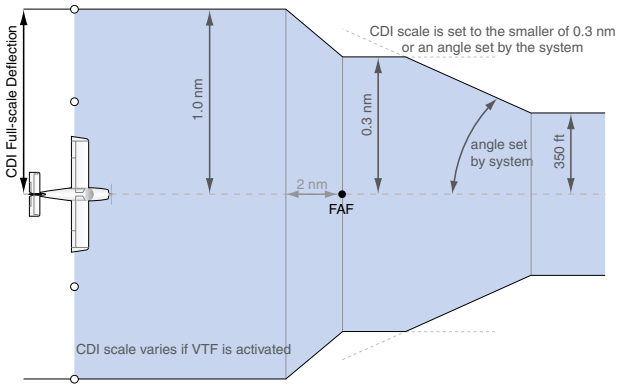


Figure 2-30 Typical LNAV and LNAV+V Approach CDI Scaling

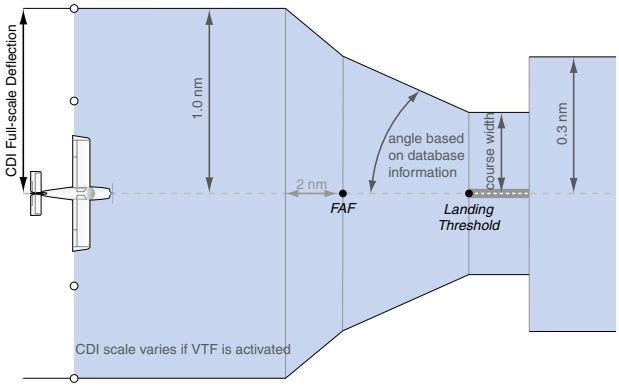


Figure 2-31 Typical LNAV/VNAV and LPV Approach CDI Scaling

- When a ***missed approach*** is activated, the CDI scale changes to 0.3 nm.
- The system automatically switches back to ***terminal*** scaling under the following conditions:
  - The next leg in the missed approach procedure is not aligned with the final approach path
  - The next leg in the missed approach procedure is not CA, CD, CF, CI, CR, DF, FA, FC, FD, FM, IF, or TF
  - After any leg in the missed approach procedure that is not CA or FA

Flight Phase	Annunciation*	Automatic CDI Full-scale Deflection
Departure	DPRT	0.3 nm
Terminal	TERM	1.0 nm
Enroute	ENR	2.0 nm
Oceanic	OCN	2.0 nm
Approach LNAV LNAV+V	LNAV LNAV+V	1.0 nm decreasing to 350 feet depending on variables (see Figure 2-25)
Approach LNAV/VNAV LPV LP LP+V	L/VNAV LPV LP LP+V	1.0 nm decreasing to a specified course width, then 0.3 nm, depending on variables (see Figure 2-26)
Missed Approach	MAPR	0.3 nm

** Flight phase annunciations are normally shown in magenta, but when cautionary conditions exist the color changes to yellow.*

Table 2-1 Automatic GPS CDI Scaling

OBS MODE

NOTE: *VNV is inhibited while automatic waypoint sequencing has been suspended.*

Enabling Omni-bearing Selector (OBS) Mode suspends the automatic sequencing of waypoints in a GPS flight plan (GPS must be the selected navigation source), but retains the current "active-to" waypoint as the navigation reference even after passing the waypoint. 'OBS' is annunciated to the lower right of the aircraft symbol when OBS Mode is selected.

While OBS Mode is enabled, a course line is drawn through the "active-to" waypoint on the moving map. If desired, the course to/from the waypoint can now be adjusted. When OBS Mode is disabled, the GPS flight plan returns to normal operation with automatic sequencing of waypoints, following the course set in OBS Mode. The flight path on the moving map retains the modified course line.

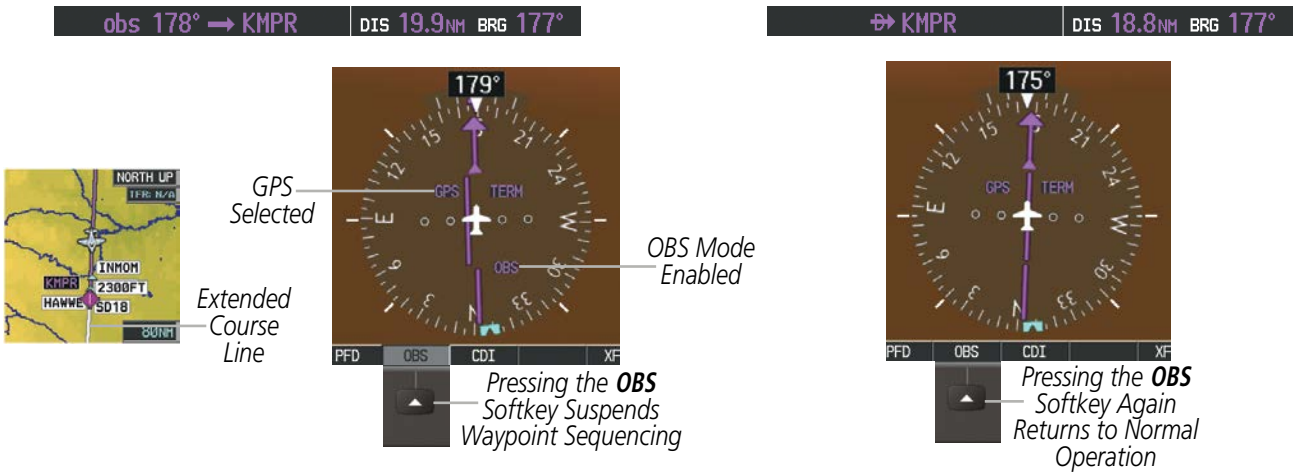


Figure 2-32 Omni-bearing Selector (OBS) Mode

Enabling/disabling OBS Mode while navigating a GPS flight plan:

1) Press the **OBS** Softkey to select OBS Mode.
2) Turn the **CRS** Knob to select the desired course to/from the waypoint. Press the **CRS** Knob to synchronize the Selected Course with the bearing to the next waypoint.
3) Press the **OBS** Softkey again to return to automatic waypoint sequencing.

As the aircraft crosses the missed approach point (MAP), automatic approach waypoint sequencing is suspended. 'SUSP' appears on the HSI at the lower right of the aircraft symbol. The **OBS** Softkey label changes to indicate the suspension is active as shown in Figure 2-33. Pressing the **SUSP** Softkey, deactivates the suspension and resumes automatic sequencing of approach waypoints.

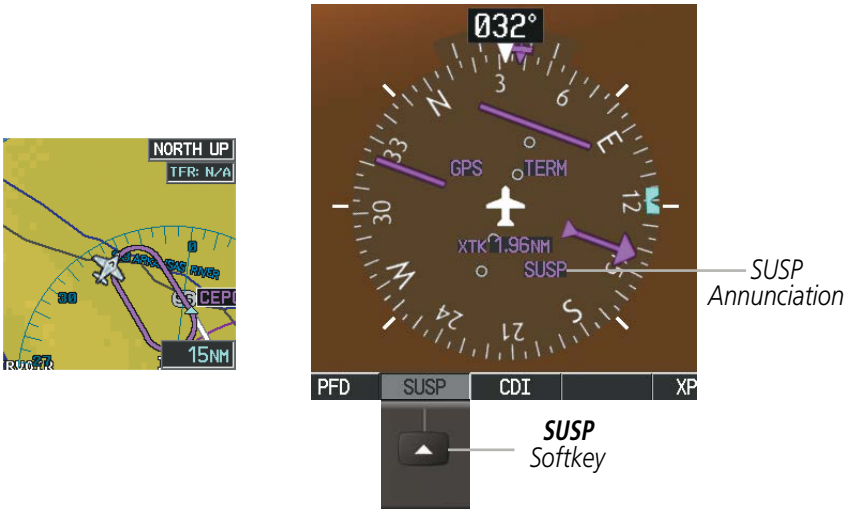


Figure 2-33 Suspending Automatic Waypoint Sequencing

2.2 SUPPLEMENTAL FLIGHT DATA

NOTE: *Selecting the **DFLTS** Softkey (a second-level PFD softkey) turns off metric Altimeter display, the Inset Map, and wind data display.*

In addition to the flight instruments, the PFD also displays various supplemental information, including the Outside Air Temperature (OAT), wind data, and Vertical Navigation (VNV) indications.

OUTSIDE AIR TEMPERATURE

The Outside Air Temperature (OAT) is displayed in degrees Celsius (°C) in the lower left of the PFD under normal display conditions. During reversionary display conditions with EIS the OAT is displayed to the right of the flap indicator; reversionary display conditions without EIS the OAT is shown below the true airspeed.

Normal Display



Reversionary Mode with EIS



Reversionary Mode without EIS



Figure 2-34 Outside Air Temperature

WIND DATA

Wind direction and speed (relative to the aircraft) in knots can be displayed in a window to the upper left of the HSI. When the window is selected for display, but wind information is invalid or unavailable, the window shows "NO WIND DATA". Wind data can be displayed in three different ways:

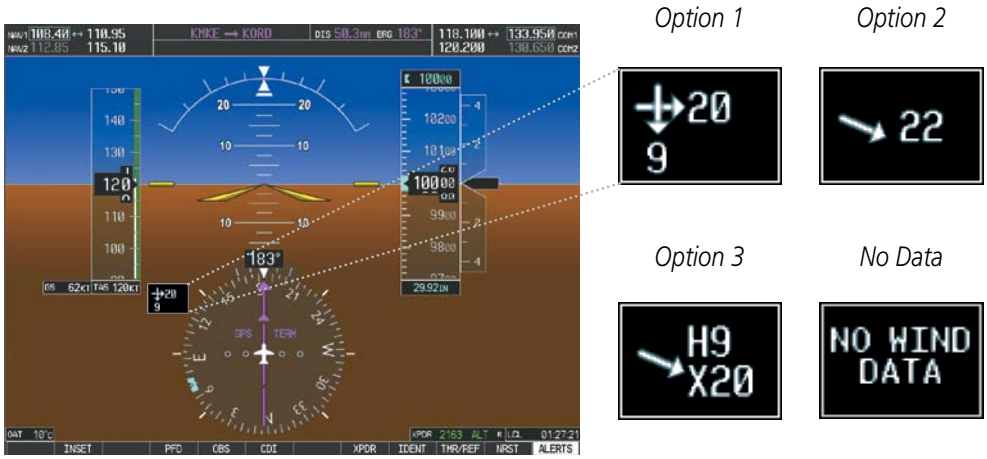


Figure 2-35 Wind Data

Displaying wind data:

1) Press the **PFD** Softkey.
2) Press the **WIND** Softkey to show wind data display options.
3) Press one of the **OPTN** softkeys to change how wind data is displayed:
   - **OPTN 1**: Head and crosswind components
   - **OPTN 2**: Total wind direction and speed
   - **OPTN 3**: Total wind direction with headwind (H) or tailwind (T) and crosswind (X) speed components
4) To remove the window, press the **OFF** Softkey.

VERTICAL NAVIGATION (VNV) INDICATIONS

When a VNV flight plan has been activated, VNV indications (VNV Target Altitude, RVSI, VDI) appear on the PFD in conjunction with the "TOD within 1 minute" message and "Vertical track" voice alert. See the Flight Management Section for details on VNV features. VNV indications are removed from the PFD according to the criteria listed in Table 2-2.



Figure 2-36 Vertical Navigation Indications (PFD)

Criteria	VNV Indication Removed		
	Required Vertical Speed (RVSI)	Vertical Deviation (VDI)	VNV Target Altitude
Aircraft > 1 min before the next TOD due to flight plan change	X	X	X
VNV cancelled (**CNCL VNV** Softkey selected on MFD)	X	X	X
Distance to active waypoint cannot be computed due to unsupported flight plan leg type (see Flight Management Section)	X	X	X
Aircraft > 250 feet below active VNV Target Altitude	X	X	X
Current crosstrack or track angle error has exceeded limit	X	X	X
Active altitude-constrained waypoint can not be reached within maximum allowed flight path angle and vertical speed	X	X	

Table 2-2 VNV Indication Removal Criteria

2.3 PFD ANNUNCIATIONS AND ALERTING FUNCTIONS

The following annunciations and alerting functions are displayed on the PFD. Refer to Appendix A for more information on alerts and annunciations.

SYSTEM ALERTING

Messages appear in the Alerts Window (in the lower right corner of the PFD; Figure 2-37) when a warning, caution, advisory alert, or G900X message advisory occurs. System alert messages are provided for aware of G900X system problems or status and may not require pilot action. The Alerts Window allows system alerts to be displayed simultaneously. The **FMS** Knob can be used to scroll through the alert messages. The Alerts Window is enabled/disabled by pressing the **ALERTS** Softkey. If the window is already open when a new message is generated, pressing the **ALERTS** Softkey to acknowledge the message causes it to turn gray.

The **ALERTS** Softkey label changes to display the appropriate annunciation when an alert is issued. The annunciation flashes and the appropriate aural alert sounds until acknowledged by pressing the softkey. The softkey then reverts to the **ALERTS** Softkey label, and when pressed again opens the Alerts Window to display a descriptive message of the alert.

The Annunciation Window appears to the right of the Vertical Speed Indicator and displays abbreviated annunciation text for aircraft alerts. Text color is based on alert level: warnings appear in red, cautions in yellow, advisory alerts in white. New alerts, regardless of priority, are displayed at the top of the Annunciation Window, separated by a white line from acknowledged alerts. Once acknowledged, they are sequenced based on priority.

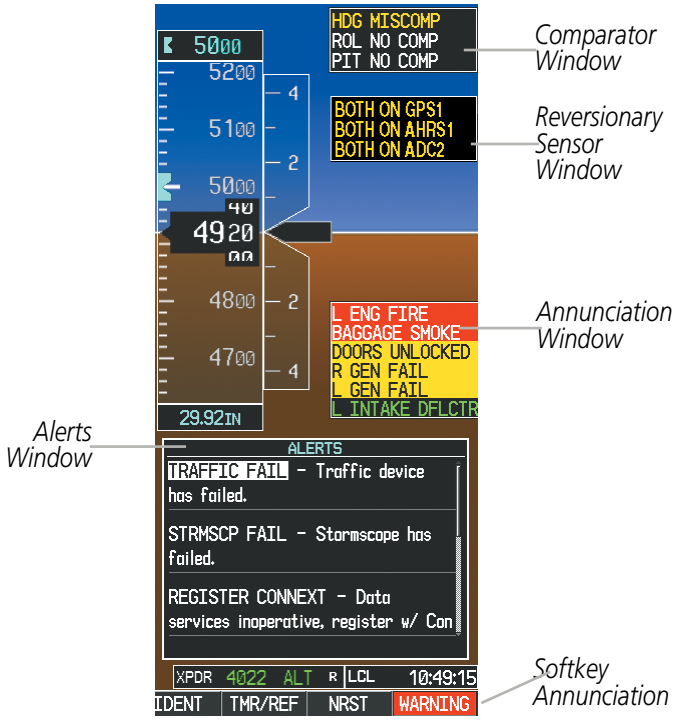


Figure 2-37 G900X Alerting System - 3 Display System

MARKER BEACON ANNUNCIATIONS

Marker Beacon Annunciations are displayed on the PFD to the left of the Selected Altitude. Outer marker reception is indicated in blue, middle in yellow, and inner in white. Refer to the Audio Panel and CNS Section for more information on Marker Beacon Annunciations.

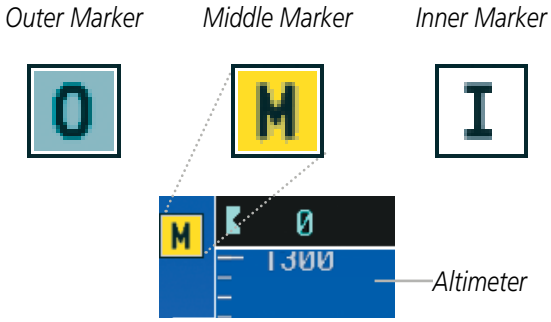


Figure 2-38 Marker Beacon Annunciations

TRAFFIC ANNUNCIATION

The G900X System displays traffic symbolically on the PFD Inset Map, the Navigation Map Page (MFD), and various other MFD page maps. Refer to the Hazard Avoidance Section and Appendix E for more details about the Traffic Information Service (TIS) and optional Traffic Advisory Systems (TAS). When a traffic advisory (TA) is detected, the following automatically occur:

- The PFD Inset Map is enabled and displays traffic
- A flashing black-on-yellow 'TRAFFIC' annunciation (Figures 2-39, 2-40) appears to the top left of the Attitude Indicator for five seconds and remains displayed until no TAs are detected in the area
- A single "Traffic" aural alert is generated, unless an optional Traffic Advisory System (TAS) is installed (refer to the applicable TAS documentation for alerts generated by TAS equipment)

  If additional TAs appear, new aural and visual alerts are generated.

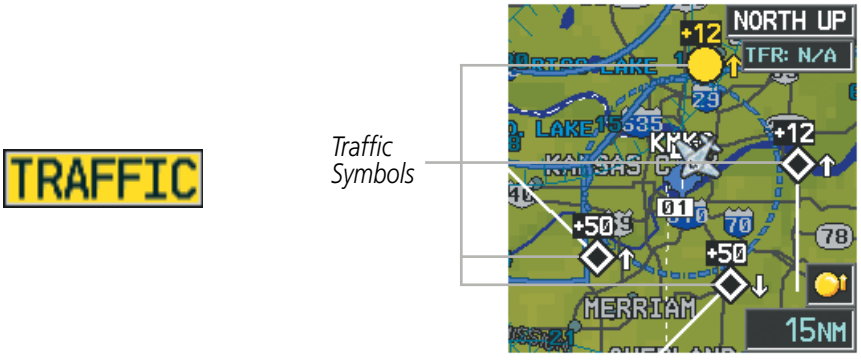


Figure 2-39 Traffic Annunciation and Inset Map with Traffic Displayed

TERRAIN ANNUNCIATIONS

Optional Terrain Awareness and Warning System (TAWS-B) or TERRAIN-SVS annunciations appear on the PFD to the upper left of the Altimeter. Refer to the Hazard Avoidance Section and Appendix A for information on terrain alerts and annunciations.

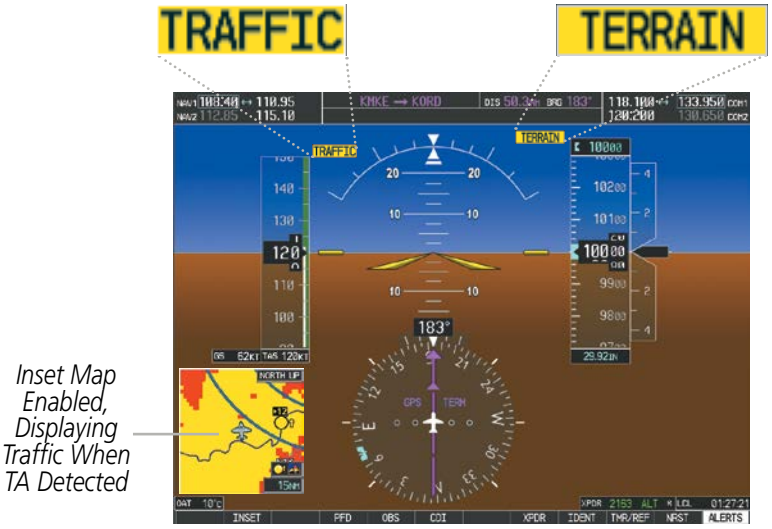


Figure 2-40 Traffic and Terrain Annunciations

ALTITUDE ALERTING

The Altitude Alerting function provides visual and aural alerts when the aircraft is approaching the Selected Altitude. Whenever the Selected Altitude is changed, the Altitude Alerter is reset. The Altitude Alerter is independent of the installed AFCS. The following occur when approaching the Selected Altitude:

- Upon passing through 1000 feet of the Selected Altitude, the Selected Altitude (shown above the Altimeter) changes to black text on a light blue background, flashes for 5 seconds, and an aural tone is generated.
- When the aircraft passes to within 200 ft of the Selected Altitude, the Selected Altitude changes to light blue text on a black background and flashes for 5 seconds.
- After reaching the Selected Altitude, if the aircraft flies outside the deviation band (±200 feet of the Selected Altitude), the Selected Altitude changes to yellow text on a black background, flashes for 5 seconds, and an aural tone is generated.



Figure 2-41 Altitude Alerting Visual Annunciations

LOW ALTITUDE ANNUNCIATION

NOTE: *The Low Altitude Annunciation is available only for aircraft with GIA 63W Integrated Avionics Units when SBAS is available. This annunciation is not shown for systems with TAWS-B or TERRAIN-SVS, unless TAWS-B or TERRAIN-SVS is inhibited.*

When the Final Approach Fix (FAF) is the active waypoint in a RNAV GPS approach using vertical guidance, a Low Altitude Annunciation may appear if the current aircraft altitude is at least 164 feet below the prescribed altitude at the FAF. A black-on-yellow 'LOW ALT' annunciation appears to the top right of the Altimeter, flashing for several seconds then remaining displayed until the condition is resolved.



Figure 2-42 Low Altitude on RNAV GPS Approach with Vertical Guidance

MINIMUM DESCENT ALTITUDE/DECISION HEIGHT ALERTING

For altitude awareness, a barometric Minimum Descent Altitude (MDA) or Decision Height (DH) can be set in the Timer/References Window and is reset when the power is cycled. When active, the altitude setting is displayed to the lower left of the Altimeter and with a bug at the corresponding altitude along the Altimeter (once the altitude is within the range of the tape).

The following visual annunciations occur when approaching the MDA/DH:

- When the aircraft altitude descends to within 2500 feet of the MDA/DH setting, the 'BARO MIN' box appears with the altitude in light blue text. The bug appears on the altitude tape in light blue once in range.
- When the aircraft passes through 100 feet of the MDA/DH, the bug and text turn white.
- Once the aircraft reaches the MDA/DH, the bug and text turn yellow and the aural alert, "Minimums Minimums", is generated.

Alerting is inhibited while the aircraft is on the ground and until the aircraft reaches 150 feet above the setting for the alert. If the aircraft proceeds to climb after having reached the MDA/DH, once it reaches 50 feet above the MDA/DH, alerting is disabled.

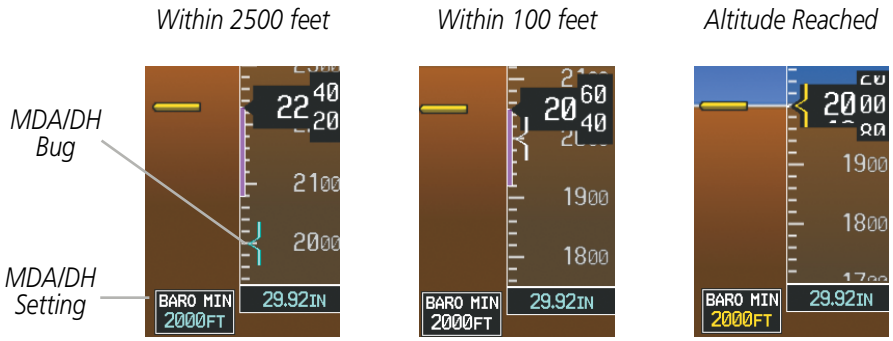


Figure 2-43 Minimum Descent Altitude/Decision Height Alerting Visual Annunciations

The MDA/DH may be set from the PFD. It is synchronized on both PFDs in a 3 Display System. The function is reset when the power is cycled.

Setting the barometric minimum descent altitude/decision height and bug:

1) Press the **TMR/REF** Softkey.
2) Turn the large **FMS** Knob to highlight the 'Minimums' field (Figure 2-44).
3) Turn the small **FMS** Knob to select 'BARO'. 'OFF' is selected by default. Press the **ENT** Key or turn the large **FMS** Knob to highlight the next field.
4) Use the small **FMS** Knob to enter the desired altitude (from zero to 16,000 feet).
5) To remove the window, press the **CLR** Key or press the **TMR/REF** Softkey.



Figure 2-44 MDA/DH Setting (Timer/References Window)

2.4 ABNORMAL OPERATIONS

ABNORMAL GPS CONDITIONS

The annunciations listed in Table 2-3 can appear on the HSI when abnormal GPS conditions occur; see Figure 2-45 for examples. Refer to the Flight Management Section for more information on Dead Reckoning Mode.

Annunciation	Location	Description
LOI	Lower left of aircraft symbol	Loss of Integrity Monitoring–GPS integrity is insufficient for the current phase of flight
INTEG OK	Lower left of aircraft symbol	Integrity OK–GPS integrity has been restored to within normal limits (annunciation displayed for 5 seconds)
DR	Upper right of aircraft symbol	Dead Reckoning–System is using projected position rather than GPS position to compute navigation data and sequence active flight plan waypoints

Table 2-3 Abnormal GPS Conditions Annunciated on HSI



Figure 2-45 Example HSI Annunciations

Dead Reckoning Mode causes the CDI to be displayed in yellow, then be removed from the display after 20 minutes (when GPS is the selected navigation source) and the following items on the PFD to be shown in yellow:

- Current Track Indicator
- Wind Data (calculated based on GPS information)
- Distances in the Bearing Information windows
- GPS bearing pointers

These items should be verified when operating in Dead Reckoning Mode as they become increasingly inaccurate over time.

UNUSUAL ATTITUDES

When the aircraft enters an unusual pitch attitude, red extreme pitch warning chevrons pointing toward the horizon are displayed on the Attitude Indicator, starting at 50° above and 30° below the horizon line.

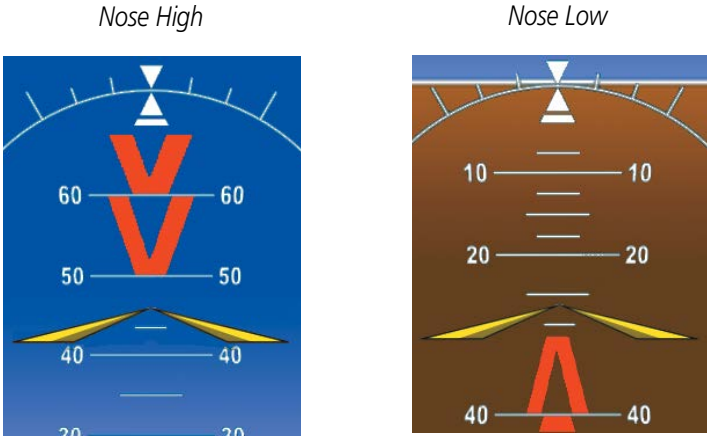


Figure 2-46 Pitch Attitude Warnings

If pitch exceeds +30°/-20° or bank exceeds 65°, some information displayed on the PFD is removed. The Altimeter and Airspeed, Attitude, Vertical Speed, and Horizontal Situation indicators remain on the display and the Bearing Information, Alerts, and Annunciation windows can be displayed during such situations. The following information is removed from the PFD (and corresponding softkeys are disabled) when the aircraft experiences unusual attitudes:

- Traffic Annunciations
- Inset Map
- Outside air temperature (OAT)
- Wind data
- Transponder Status Box
- System Time
- PFD Setup Menu
- Windows displayed in the lower right corner of the PFD:
  - Timer/References
  - Nearest Airports
  - Flight Plan
  - Alerts
  - Procedures
- Barometric Minimum Descent Altitude readout
- Vertical Deviation, Glideslope, and Glidepath Indicators
- Altimeter Barometric Setting
- Selected Altitude
- VNV Target Altitude

SECTION 3 ENGINE INDICATION SYSTEM

NOTE: *The G900X Engine Indication System (EIS) is established based on the installed engine selected during the software configuration process. Engine gauges, ranges, color bands, and caution and warning indications are established based on the engine manufacturer's recommended guidance.*

The G900X Engine Indication System (EIS) displays critical engine, electrical, fuel, and other system parameters on the left side of the MFD during normal operations (Figure 3-1). On piston aircraft only, EIS information can also be fully expanded to an entire page by pressing the **ENGINE** Softkey or turning the large **FMS** Knob to select the EIS - Engine Page.

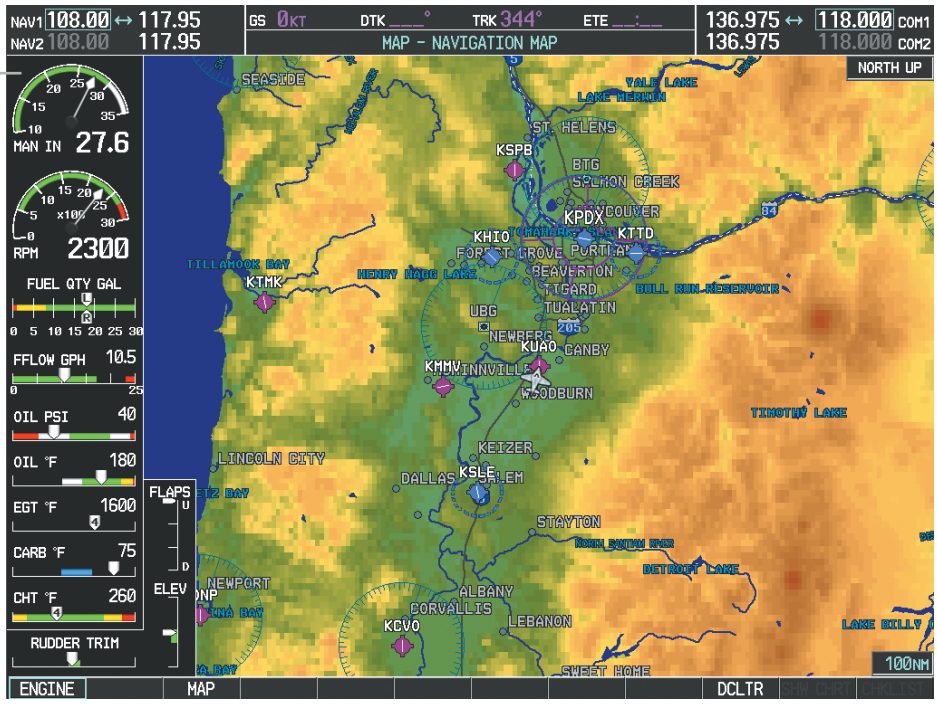


Figure 3-1 MFD with EIS display (RV-10 with O-540-series)

Green bands on the instruments indicate normal ranges of operation; amber and red bands indicate caution and warning, respectively. White or uncolored bands indicate areas outside of normal operation not yet in the caution or warning ranges. When unsafe operating conditions occur, the corresponding readouts flash to indicate cautions and warnings. If sensory data to an instrument becomes invalid or unavailable, a red "X" is displayed across the instrument.

EIS indicators shown depend on the engine installed and the aircraft model. The EIS is available for the engines listed in Table 3-1. Screenshots in this section attempt to depict example aircraft/engine combinations for which all sensors have been configured. Not all possible displays are shown, nor are the conditions shown on the indicators meant to depict realistic flight conditions.

Engine Manufacturer	EIS Supported Engine Models
Lycoming	IO-540-D4A5, D4B5, N1A5, T4A5D, T4C5D, V4A5D O-540-A* IO-360-A*, C*, D*, J*, K*, AIO-360* (200 hp) IO-360-M1A, M1B, B* (Except B1C, B1A), E*, F* (180 hp) O-360-A* (Except A1C, A4FN), C* (Except C2B, C2D) O-320- A*, B*, D*, E* (Except D2J) TIO-540-AE2A TEO-540 iE2 (FADEC)
Continental	TSIO-550-E IO-550-N IO-360-ES
Pratt & Whitney	PT6A-135A PT6A-67A

*All models

Table 3-1 G900X EIS Supported Engines

3.1 PISTON AIRCRAFT EIS

(1) Engine Manifold Pressure Gauge (MAN IN HG)
Displays manifold pressure in inches of Mercury (in Hg) to indicate engine power

(2) Tachometer (RPM)
Displays propeller speed in revolutions per minute (rpm)

(3) Fuel Quantity Indicator (FUEL QTY GAL)
Displays the amount of fuel in gallons (gal) for each side (left-L, right-R) of a standard fuel tank. Standard fuel tank quantities are based on published kitplane manufacturing data.

A cyan marker is displayed next to the selected fuel tank (optional)

Aircraft	Maximum Standard Fuel Quantity (gal) Per Side
IV/IV-P	55
ES	47.5
ES-P	52.5
Evolution	85
Legacy	32.5
RV-7/7A	21
RV-9/9A	18
RV-10	30
Seawind 300C	40
Velocity XL/TXL	35

Table 3-2 Maximum Indicated Fuel Quantities

(4) Fuel Flow Indicator (FFLOW GPH)
Displays fuel flow in gallons per hour (gph)

(5) Oil Pressure Indicator (OIL PSI)
Displays oil pressure in pounds per square inch (psi)

(6) Oil Temperature Indicator (OIL °F)
Displays oil temperature in degrees Fahrenheit (°F)

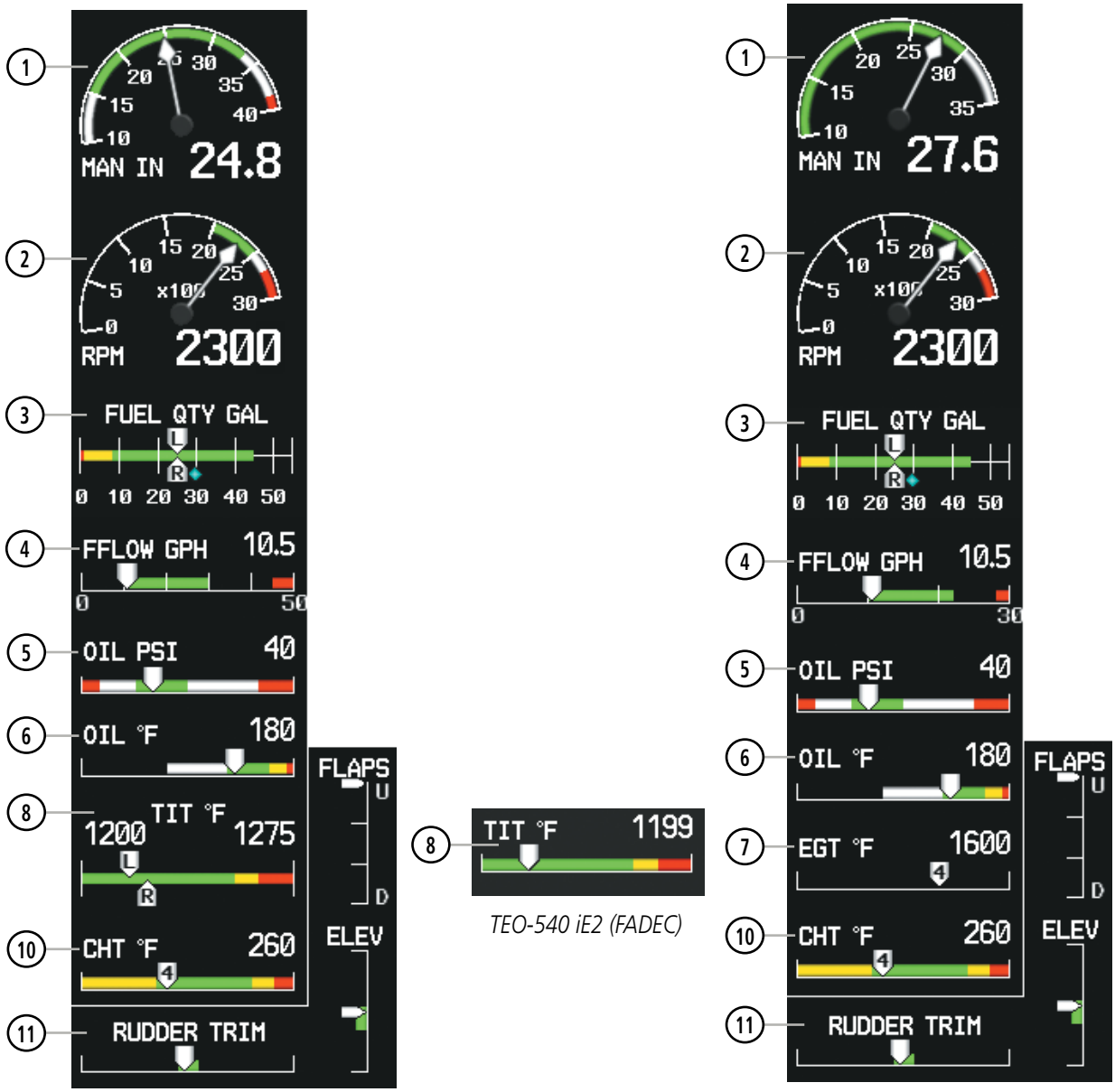
(7) Exhaust Gas Temperature Indicator (EGT °F)
Displays the Exhaust Gas Temperature of the hottest cylinder (number is shown in pointer) in °F

(8) Turbo Inlet Temperature Indicator (TIT °F)
TSIO-550-E, TIO-540-AE2A and TEO-540 iE2 (FADEC) only

TSIO-550-E and TIO-540-AE2A only: Displays the temperature for the right (R) and left (L) turbo inlets in °F; the left readout corresponds to the "L" indication, and the right readout to the "R" indication.

TEO-540 iE2 (FADEC) only: A single turbo inlet temperature is displayed in °F

(9) **Carburetor Temperature Indicator** *O-540-series, O-360-series, O-320-series*	Displays carburetor temperature in °F; the cyan range indicates where carburetor icing is most likely to occur
(10) **Cylinder Head Temperature Indicator (CHT °F)**	Displays the head temperature of the hottest cylinder (number is shown in pointer) in °F
(11) **Flap Position and Trim Indicators (FLAPS, ELEV TRIM, RUDDER TRIM, AILERON TRIM)**	Displays flap position and elevator, rudder, and aileron trim along slide bars Up to three trim indicators may be installed; aileron and rudder trim are mutually exclusive

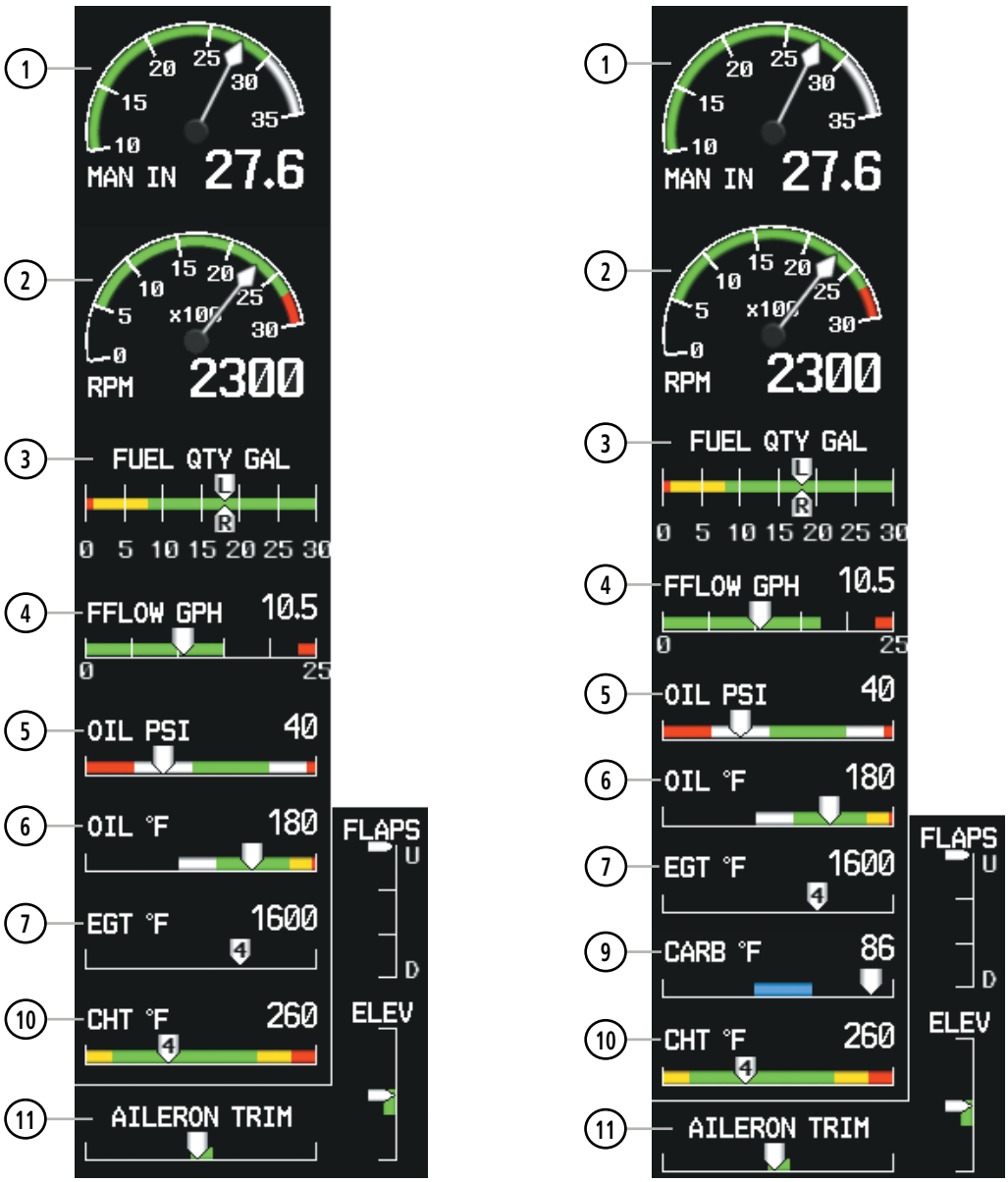


TSIO-550-E

TEO-540 iE2 (FADEC)

IO-550-N

Figure 3-2 EIS Displays (IV/IV-P Shown)



IO-540-series *O-540-series*

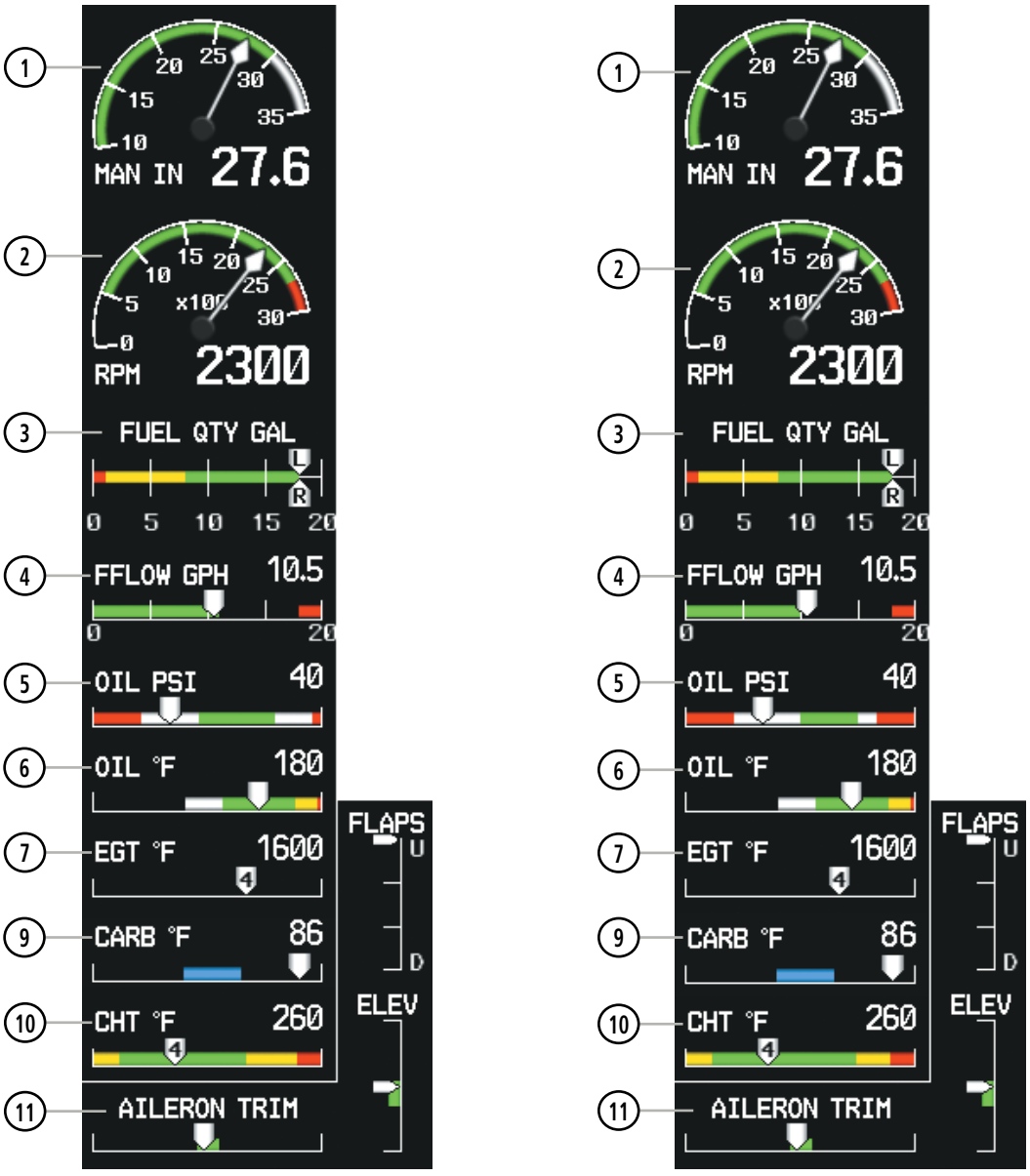
Figure 3-3 EIS Displays
(RV-10 Shown)



IO-360-series (180 hp)

IO-360-series (200 hp)

Figure 3-4 EIS Displays (RV-7/7A Shown)



O-360-series *O-320-series*

Figure 3-5 EIS Displays
(RV-9/9A Shown)

PISTON ENGINE PAGE

The EIS - Engine Page displays all engine, fuel, fuel calculation, electrical, and trim information. To access this page, press the **ENGINE** Softkey or turn the large **FMS** Knob and select the EIS - Engine Page.

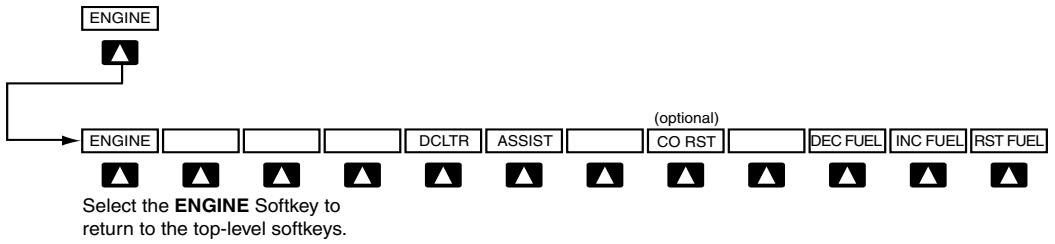


Figure 3-6 Engine Page Softkeys

Level 1	Level 2	Description
ENGINE		Displays EIS - Engine Page and second-level engine softkeys; press again to exit page
	DCLTR	Turns off CHT and EGT cylinder readouts
	ASSIST	Accesses Leaning Assist Mode
	CO RST	Resets CO Guardian; softkey available when carbon monoxide alert generated (*optional*)
	DEC FUEL	Decreases displayed fuel remaining in 1-gal increments
	INC FUEL	Increases displayed fuel remaining in 1-gal increments
	RST FUEL	Resets displayed fuel remaining to maximum fuel capacity for aircraft and fuel used to zero

① **Engine Manifold Pressure Gauge (MAN IN HG)** — Displays manifold pressure in inches of Mercury (in Hg) to indicate engine power

② **Tachometer (RPM)** — Displays propeller speed in revolutions per minute (rpm)

③ **Electrical Group (ELECTRICAL)** — Displays alternator (ALT A) and battery (BATT A) currents in amperes (A) and main (MAIN V) and essential (ESS V) bus voltages (V) for 14- or 28-V systems; an Auxiliary Ammeter can be displayed if an optional standby alternator or battery is installed

The ammeter scales are dependent on the installed alternator.

④ **Engine Temperature Group (TEMPERATURE)** — Displays exhaust gas (EGT) and head (CHT) temperatures of all cylinders in °F

TSIO-550-E, TIO-540-AE2A, and TEO-540 iE2 (FADEC) only: Displays Turbo Inlet Temperature (TIT) in °F

O-540-series, O-360-series, O-320-series: Displays carburetor temperature (CARB) in °F; the cyan range indicates where carburetor icing is most likely to occur

(5) Fuel Calculations Group (FUEL CALC)

Displays calculated fuel used (GAL USED), endurance (ENDUR), and range (in nautical miles, RANGE NM), and fuel efficiency (in statute miles per gallon, MPG) based on the displayed fuel remaining (GAL REM) and the fuel flow totalizer

(6) Trim and Flaps Group (FLAPS, ELEV TRIM, RUDDER TRIM, AILERON TRIM)

Displays flap position and elevator, rudder, and aileron trim along slide bars

Up to three trim indicators may be installed; aileron and rudder trim are mutually exclusive.

(7) Fuel Pressure Gauge (FUEL PSI)

Displays fuel pressure in pounds per square inch (psi)

(8) Fuel Quantity Gauges (L/R FUEL QTY GAL)

Displays the amount of fuel in gallons (gal) for each side of a standard fuel tank. Standard fuel tank quantities are based on published kitplane manufacturing data; refer to Table 3-2 for maximum indicator values.

A cyan marker is displayed next to the selected fuel tank (optional)

(9) Oil Temperature and Pressure Gauge (OIL °F PSI)

Displays oil temperature in degrees Fahrenheit (°F) and pressure in pounds per square inch (psi)

(10) Fuel Flow Gauge (FFLOW GPH)

Displays fuel flow in gallons per hour (gph)

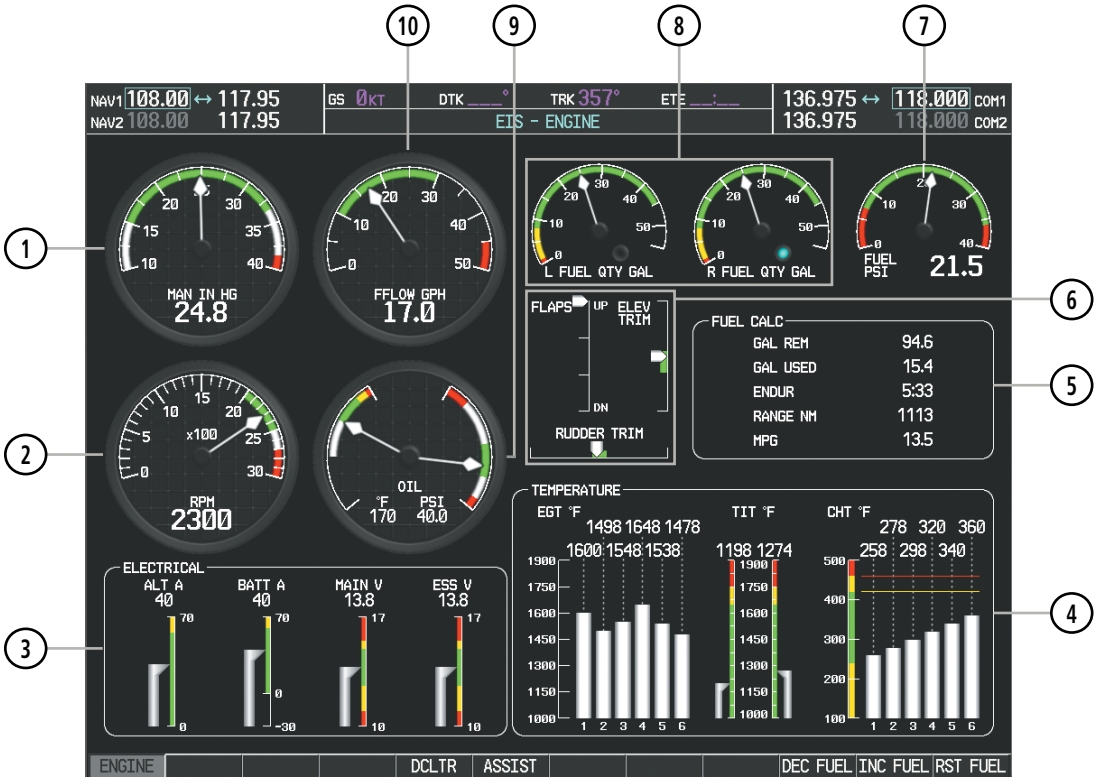


Figure 3-7 Engine Page (IV/IV-P with TSIO-550-E)

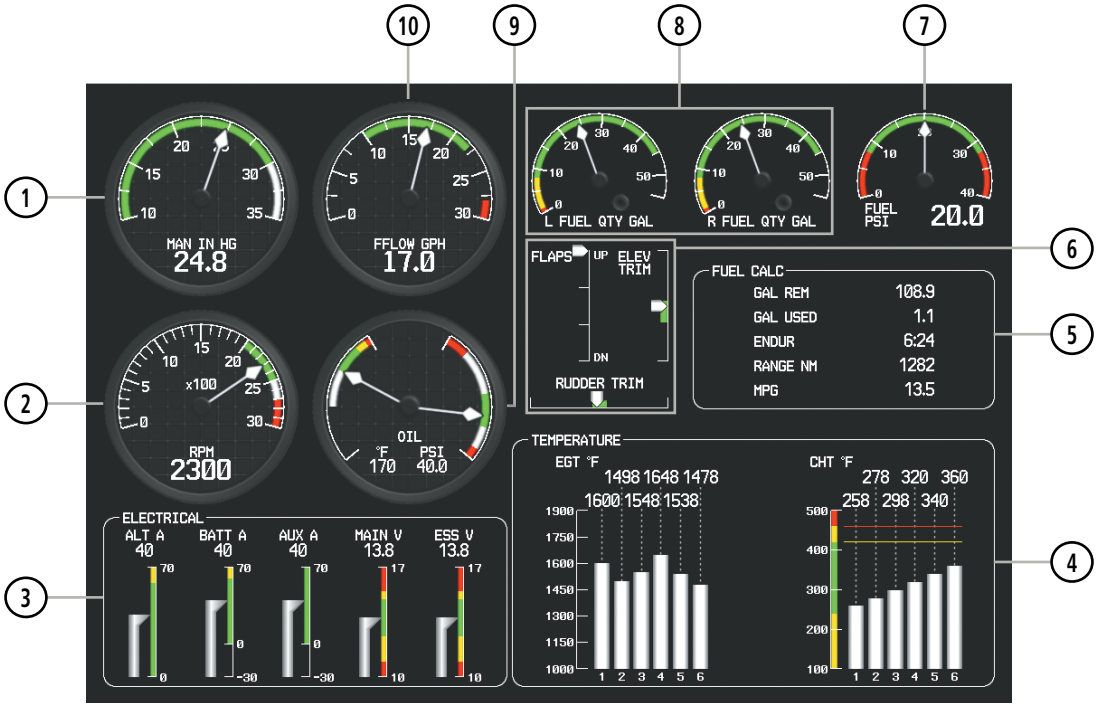


Figure 3-8 Engine Page (IV/IV-P with IO-550-N)

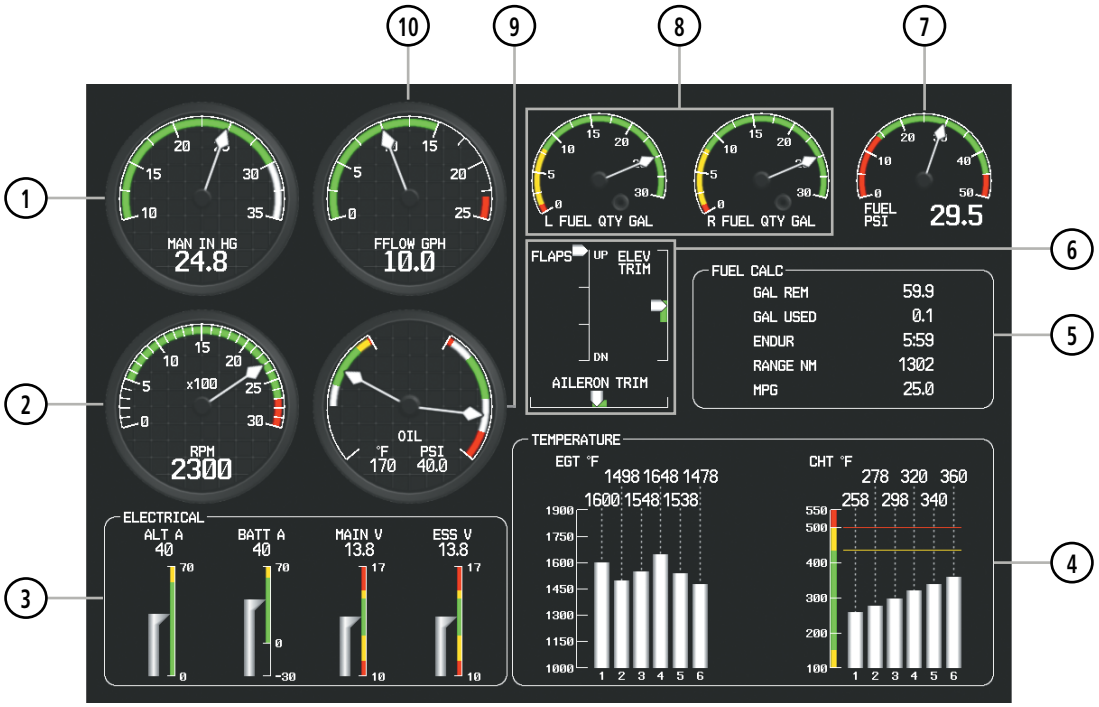


Figure 3-9 Engine Page (RV-10 with IO-540-series)

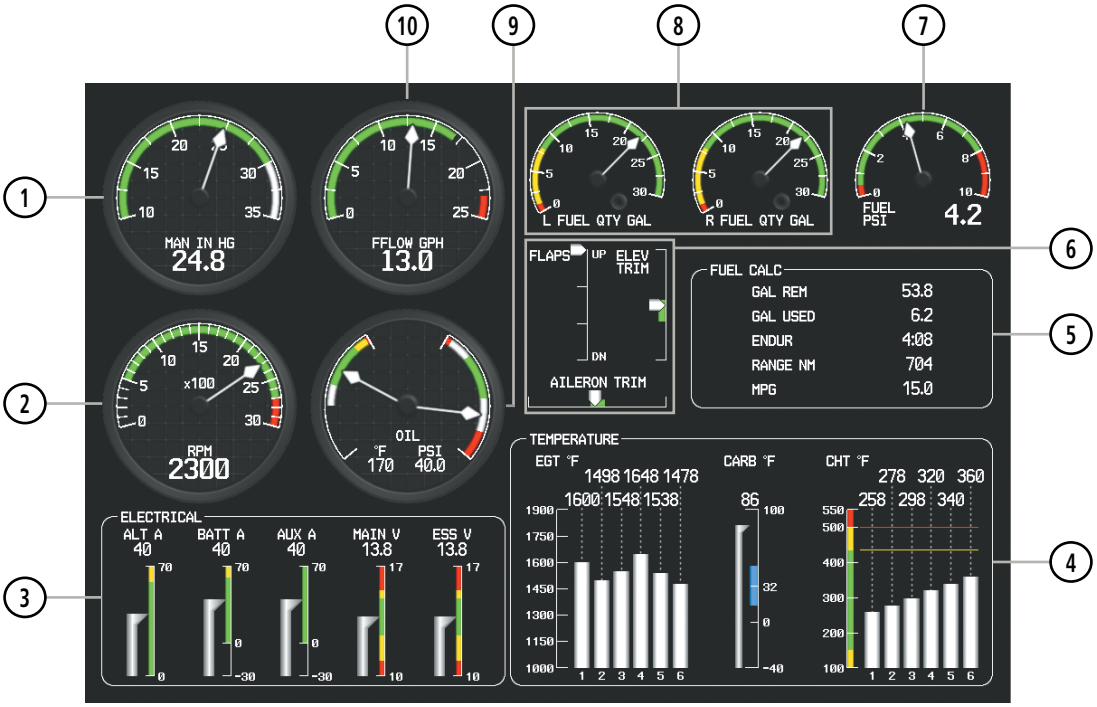


Figure 3-10 Engine Page (RV-10 with O-540-series)

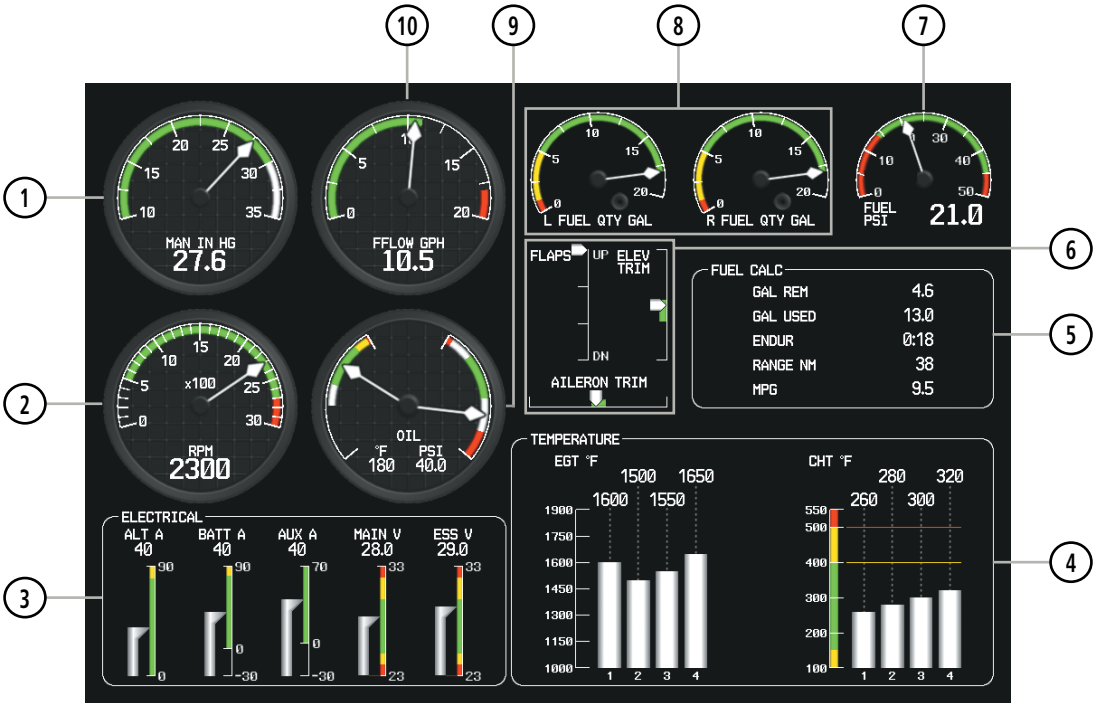


Figure 3-11 Engine Page (RV-9/9A with IO-360-series, 180 hp)

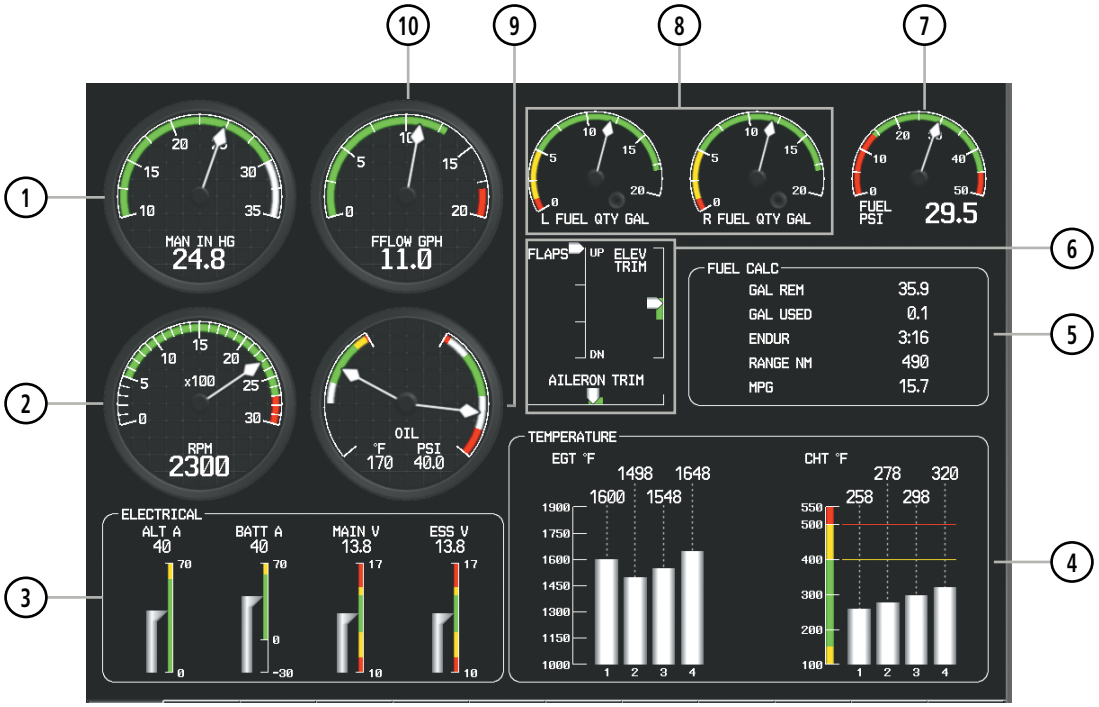


Figure 3-12 Engine Page (RV-9/9A with IO-360-series, 200 hp)

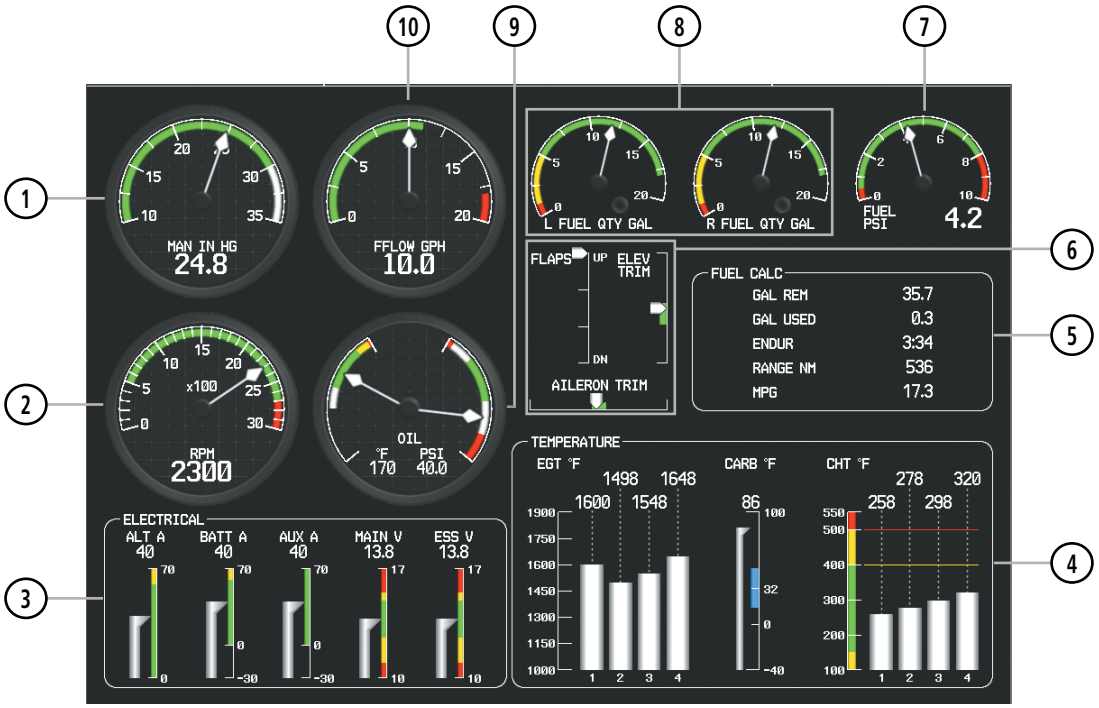


Figure 3-13 Engine Page (RV-9/9A with O-360-series)

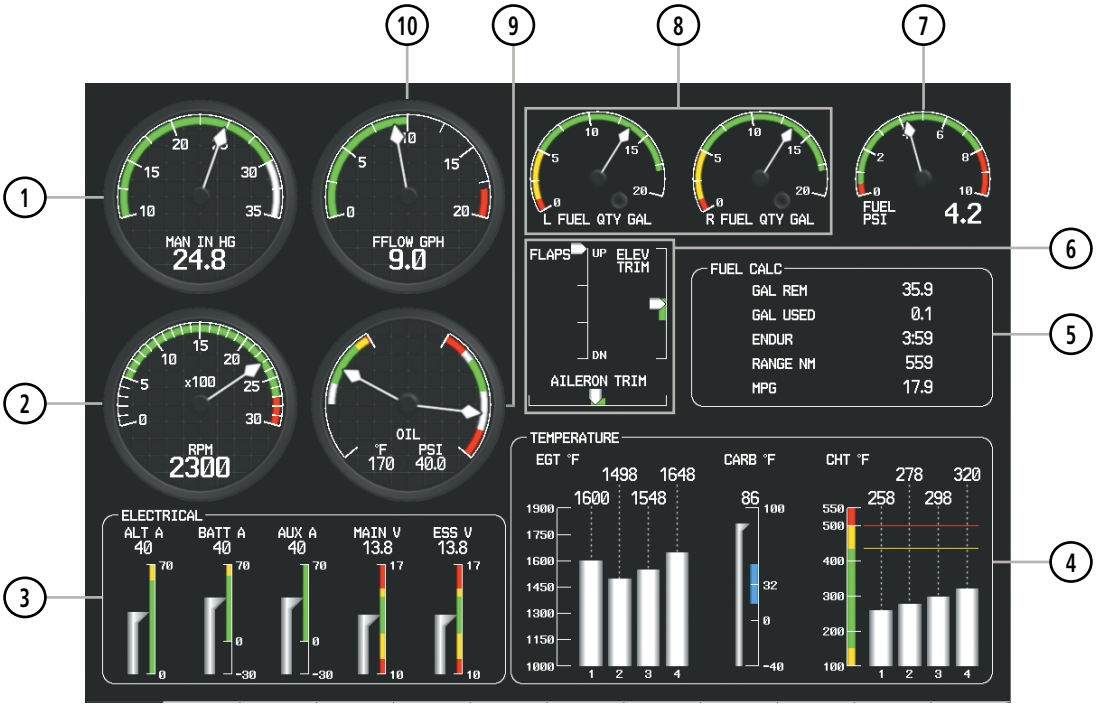


Figure 3-14 Engine Page (RV-9/9A with O-320-series)

ELECTRICAL

The Electrical Group uses vertical bar indicators to display currents for the alternator, battery, standby alternator or battery (optional), and voltages for the main and essential buses for 14- or 28-V systems. The ammeter scale(s) are dependent on the installed alternator (60-, 70-, 80-, 100-A).

The Auxiliary Ammeter scale is dependent upon the type of optional standby power installed: 0 to 70 A (alternator) or -30 to 70 A (battery).

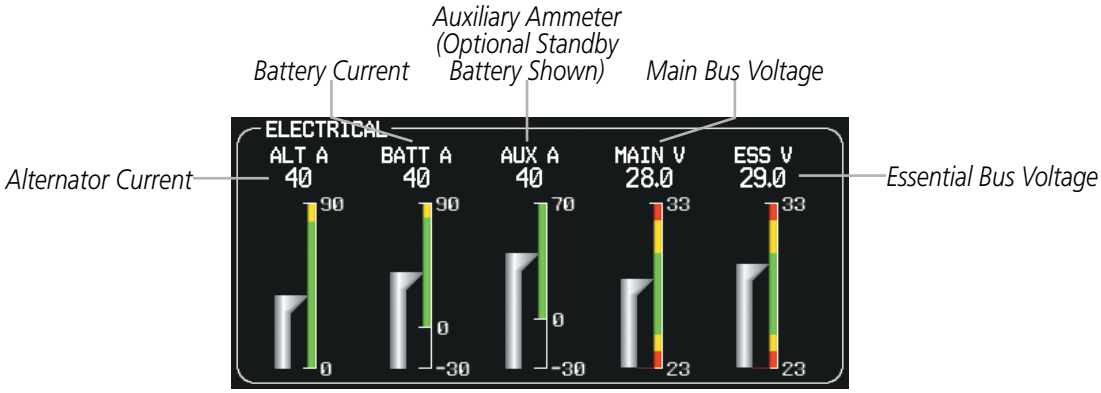


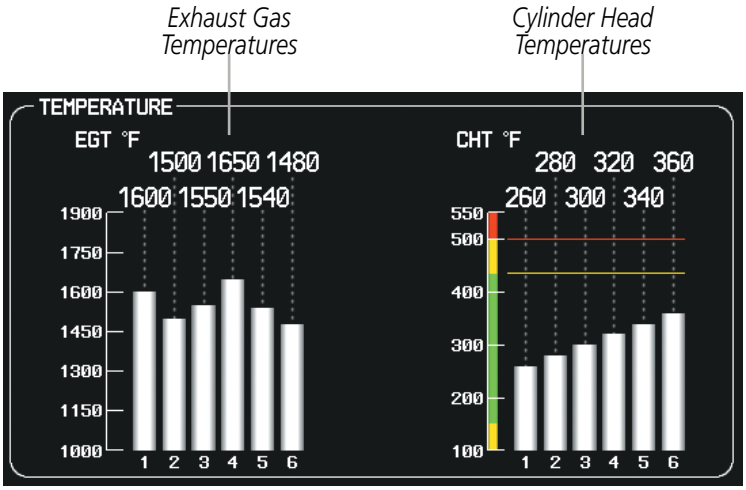
Figure 3-15 Electrical Group

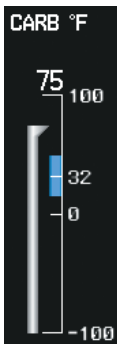
TEMPERATURES

Cylinder head (CHT) and exhaust gas (EGT) temperatures in degrees Fahrenheit are displayed for each cylinder using bar graphs and digital readouts. For the TSIO-550-E, TIO-540-AE2A, Turbo Inlet Temperatures (TIT) are shown on a sliding bar scale. For the TEO-540 iE2 (FADEC), a single Turbo Inlet Temperature is shown on a sliding bar scale. Carburetor temperature is shown for the O-540-series, O-360-series, and O-320-series.

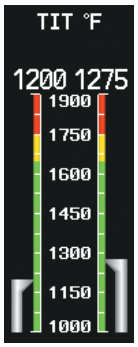
Removing/displaying temperature readouts:

On the Engine Page, press the **DCLTR** Softkey.

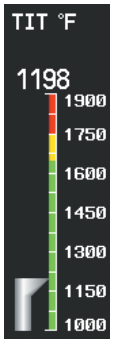




Carburetor Temperature (O-540-series, O-360-series, O-320-series)



Turbo Inlet Temperatures (TSIO-550-E, TIO-540-AE2A)



Turbo Inlet Temperature (TEO-540- iE2 (FADEC)

Figure 3-16 Engine Temperature Group

CO ALERT RESET

If the optional CO Guardian carbon monoxide detector issues a warning for high carbon monoxide levels, the **CO RST** Softkey is available on the Engine Page to reset the CO Guardian. Refer to the CO Guardian documentation for further information.



Figure 3-17 Carbon Monoxide Alert Reset

FUEL CALCULATIONS

NOTE: *Fuel calculations do not use the aircraft fuel quantity indicators and are calculated from the last time the fuel was reset.*

Fuel used (GAL USED), endurance (ENDUR), range (in nautical miles, RANGE NM), and fuel efficiency (in statute miles per gallon, MPG) are calculated based on the displayed fuel remaining (GAL REM) and the fuel flow totalizer. The calculated range also takes into account the aircraft's heading and the wind direction and speed.

Adjusting the fuel totalizer quantity:

On the Engine Page, use the **DEC FUEL** and **INC FUEL** softkeys to obtain the desired fuel remaining (GAL REM).

Resetting the fuel totalizer:

On the Engine Page, select the **RST FUEL** Softkey; this resets displayed fuel remaining (GAL REM) to the maximum fuel capacity for the aircraft and fuel used to zero.

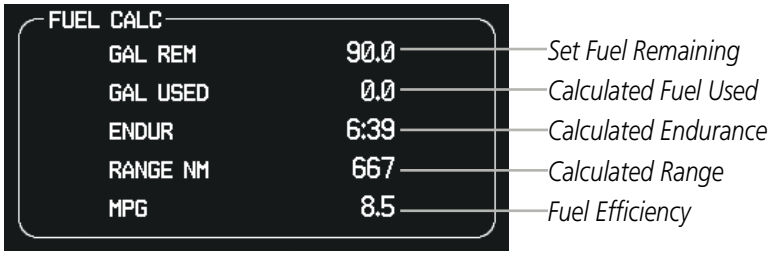


Figure 3-18 Fuel Calculations Group

A map feature related to the EIS Fuel Calculations is the Fuel Range Ring, which graphically illustrates the aircraft's remaining range based on the endurance (ENDUR), heading, groundspeed, and wind direction and speed. The solid green circle represents the range until all the remaining fuel is depleted. The dashed green

circle indicates the aircraft range until only reserve fuel remains. Once on reserve fuel, the range is indicated by a solid amber circle.

The Fuel Range Ring shifts position in relation to the aircraft according to wind effects. For example, more fuel is required for flying into a headwind, and the aircraft's decreased range in that direction is indicated by the Fuel Range Ring shifting toward the tail of the Aircraft Symbol.

The amount of reserve fuel (only for purposes of the Fuel Range Ring) is set on the Navigation Map Page Setup Menu in terms of remaining flight time. When enabled the Fuel Range Ring appears on the Navigation Map Page, the Weather Data Link Page, and PFD Inset Map.

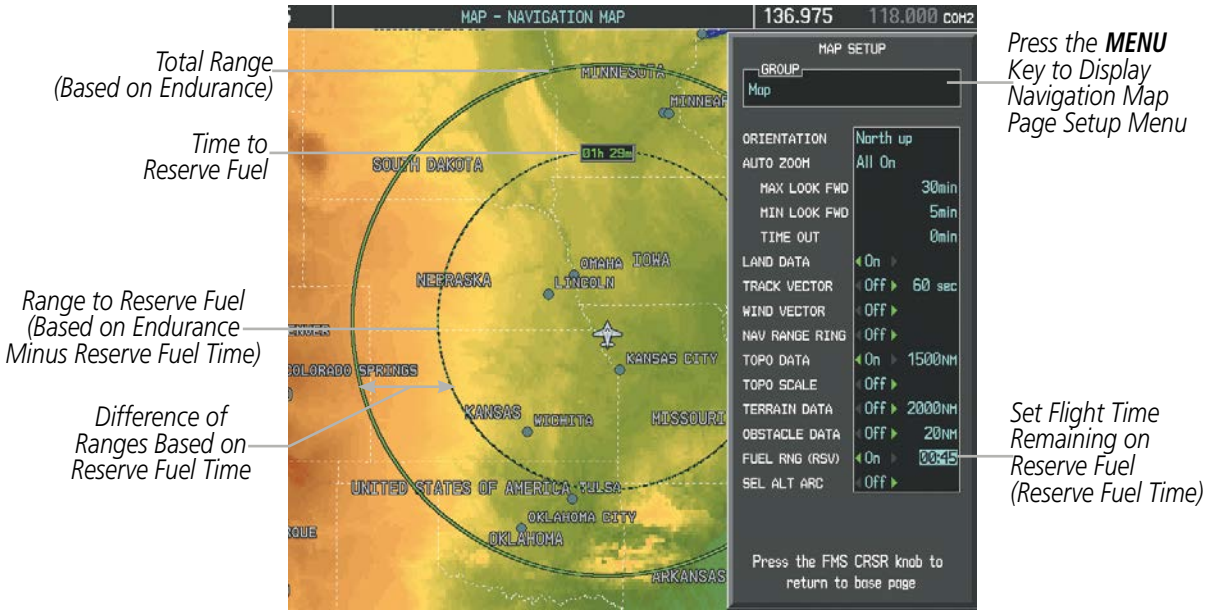


Figure 3-19 Fuel Range Ring and Setup

Enabling/disabling the Fuel Range Ring and selecting a reserve fuel time:

1) Display the Navigation Map Page (press and hold the **CLR** Key for 2 seconds to quickly select this map).
2) Press the **MENU** Key.
3) Highlight 'Map Setup' and press the **ENT** Key. The Map Setup Menu is displayed.
4) Use the small **FMS** Knob to select the 'Map' group and press the **ENT** Key.
5) Highlight the 'FUEL RNG (RSV)' field.
6) Turn the small **FMS** Knob to select 'On' or 'Off'.
7) Turn the large **FMS** Knob to highlight the reserve fuel time, how long the aircraft can fly after reaching the reserve fuel.
8) Enter the desired reserve fuel time (00:00 to 23:59; hours:minutes) and press the **ENT** Key.
9) Press the **FMS** Knob to return to the Navigation Map Page.

PISTON LEANING ASSIST MODE

A leaning assist function is available on the Engine Page to assist in the leaning process. While in Leaning Assist Mode, the EIS Display is shown along with the Fuel Flow Gauge, Fuel Calculations Group, and an expanded Engine Temperature Group.

Accessing Leaning Assist Mode:

1) Press the **ENGINE** Softkey to open the Engine Page.
2) Press the **ASSIST** Softkey to identify the peak.
3) Press the **ASSIST** Softkey again to exit Leaning Assist Mode.

TURBOCHARGED

Once the **ASSIST** Softkey is pressed, the peak of each TIT is indicated by a cyan bar which moves and remains at the peak Turbo Inlet Temperature. For the TEO-540 iE2 (FADEC), a single TIT is indicated.

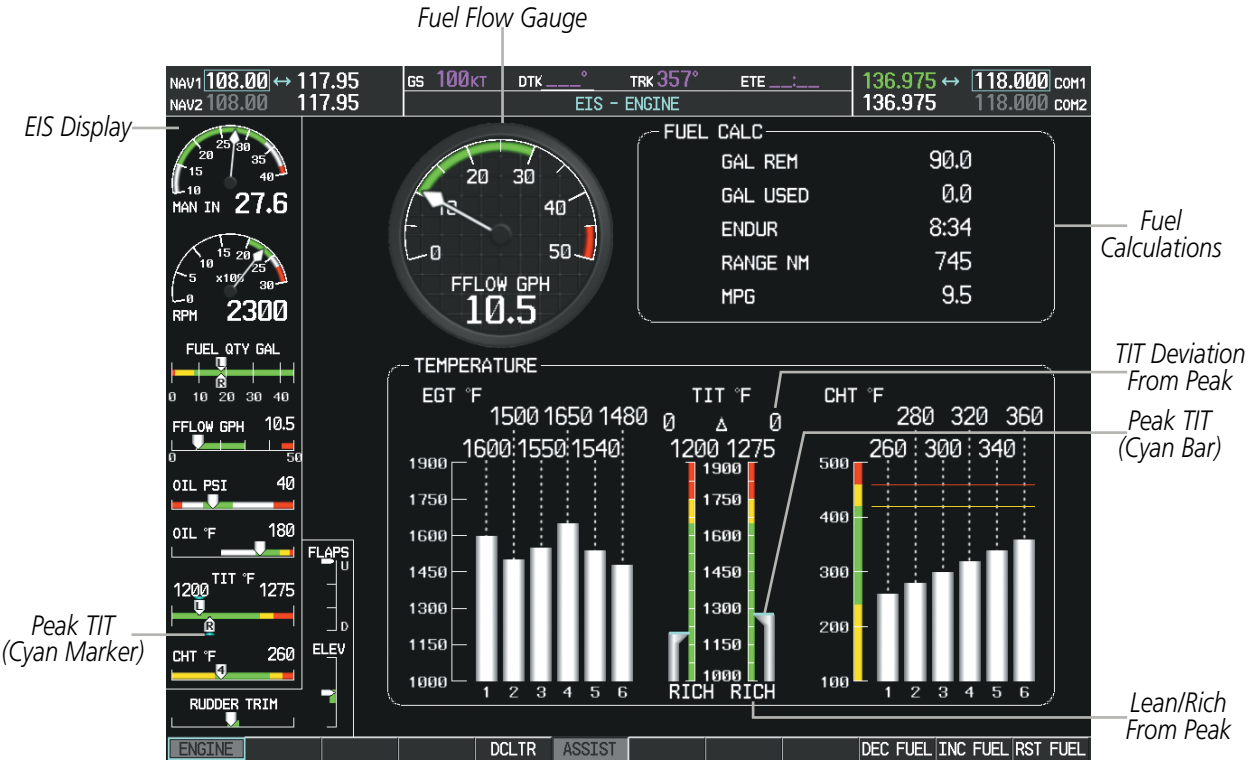


Figure 3-20 Leaning Assist Mode (IV/IV-P with TSIO-550-E)

NORMALLY-ASPIRATED

When the **ASSIST** Softkey is pressed, the system initially highlights the number and EGT readout of the cylinder with the hottest EGT. For the O-540-series, O-360-series, and O-320-series engines, the Carburetor Temperature Indicator is removed from the display.

When the first peak is detected, the cylinder numbers disappear, "1st" is annunciated in cyan below that cylinder's EGT bar, the temperature is marked in cyan on the graph, and the EGT readout is outlined.

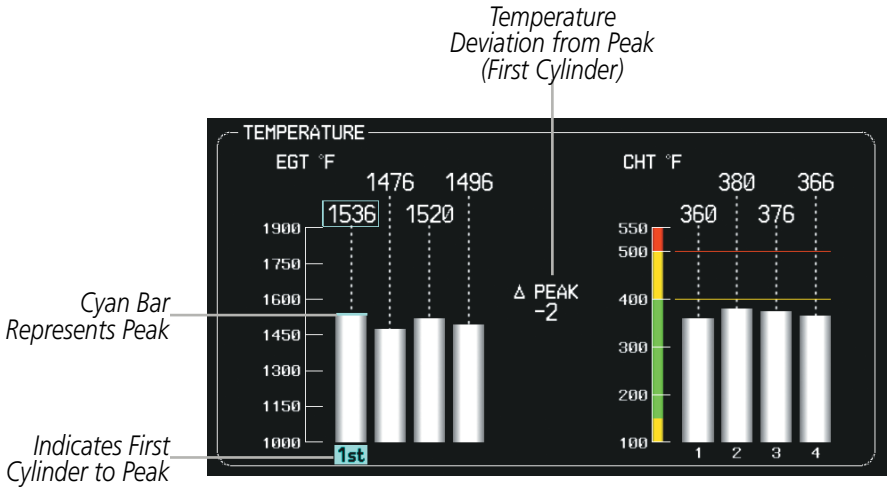


Figure 3-21 Leaning Assist Mode (IO-360-series)

The system continues to detect peak EGTs for each cylinder as the fuel flow is decreased and the peak of each cylinder's EGT is indicated by a cyan marker. The last cylinder to peak is denoted by the "Last" annunciation below its bar on the graph and the EGT readout is outlined in cyan.

PISTON EIS DISPLAY (REVERSIONARY MODE)

In the event of a PFD1, PFD2 (if installed) or MFD display failure, the display(s) operating in Reversionary Mode are configured to present PFD symbology together with the EIS Display (refer to the System Overview for information about display reversionary mode). In reversionary mode, the EIS is separated into three displays: Engine, Lean, and System

The Engine Display, in reversionary mode, is identical to the normal EIS Display on the MFD.

EIS Display



Figure 3-22 Reversionary Mode (ES Shown)

PISTON EIS SOFTKEYS (REVERSIONARY MODE)

In reversionary mode the Engine Display is shown by default. To return to the Engine Display from the Lean or System Display, press the **ENGINE** or **BACK** Softkey.

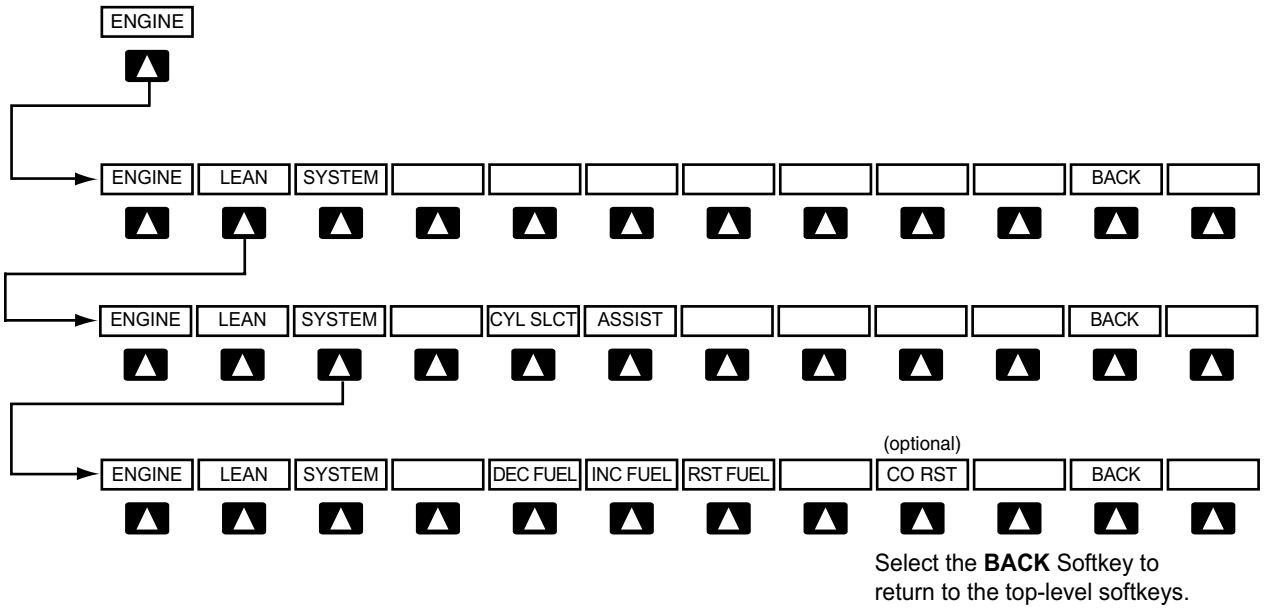


Figure 3-23 EIS Softkeys (Reversionary Mode – Piston Aircraft)

Level 1	Level 2	Level 3	Description
ENGINE			Displays second-level engine softkeys
	LEAN		Displays the EIS Lean Display
		CYL SLCT	Cycles through the cylinders to obtain information about a particular cylinder, shown in cyan on the bar graphs
		ASSIST	Accesses Leaning Assist Mode
	SYSTEM		Displays the EIS System Display
		DEC FUEL	Decreases displayed fuel remaining in 1-gal increments
		INC FUEL	Increases displayed fuel remaining in 1-gal increments
		RST FUEL	Resets displayed fuel remaining to maximum fuel capacity for aircraft and fuel used to zero
		CO RST	Resets CO Guardian; softkey available when carbon monoxide alert generated (*optional*)

PISTON LEAN DISPLAY (REVERSIONARY MODE)

The EIS Lean Display provides information and a user interface to perform engine leaning while in reversionary mode. Exhaust gas (EGT) and head (CHT) temperatures for each cylinder are displayed in bar graph form with a readout for the temperature of the selected cylinder shown below each graph. Turbine inlet temperature (TIT) is also shown for turbocharged aircraft.

Accessing the EIS Lean Display:

1) Press the **ENGINE** Softkey.
2) Press the **LEAN** Softkey.
3) To return to the default Engine Display, press the **ENGINE** or **BACK** Softkey.

By default, the cylinder with the hottest temperature is selected (number highlighted in cyan) when the **LEAN** Softkey is selected. Bars for cylinders with temperatures in the normal range are shown in white. On the CHT Bar Graph, a warning condition for a cylinder is indicated in red.

Since only one cylinder's EGT and CHT are displayed at a time, this information can be cycled through for each cylinder pressing the **CYL SLCT** Softkey; the selected cylinder's number is highlighted in cyan on the bar graphs. This softkey is disabled when Leaning Assist Mode is selected or when a cylinder experiences a warning (red) condition; the softkey remains disabled until the temperature returns to normal.

Monitoring the desired cylinder's temperatures:

From the Lean Display, press the **CYL SLCT** Softkey to cycle through each cylinder and view its temperature information. The selected cylinder number is highlighted in cyan.

While in Reversionary Mode, the leaning assist function is available from the Lean Display to assist in the leaning process.

Accessing Leaning Assist Mode:

1) Press the **ENGINE** Softkey.
2) Press the **LEAN** Softkey.
3) Press the **ASSIST** Softkey to identify the peak.
4) Press the **ASSIST** Softkey again to exit Leaning Assist Mode.

(1) **Engine Manifold Pressure Gauge (MAN IN HG)**	Displays manifold pressure in inches of Mercury (in Hg) to indicate engine power
(2) **Tachometer (RPM)**	Displays propeller speed in revolutions per minute (rpm)
(3) **Fuel Flow (FFLOW GPH)**	Displays fuel flow in gallons per hour (gph)
(4) **Turbo Inlet Temperature Indicator (TIT °F)** *TSIO-550-E, TIO-540-AE2A and TEO-540 iE2 (FADEC) only*	*TSIO-550-E and TIO-540-AE2A only:* Displays the temperature for the right (R) and left (L) turbo inlets in °F; the left readout corresponds to the "L" indication, and the right readout to the "R" indication. *TEO-540 iE2 only:* A single turbo inlet temperature is displayed in °F

(5) **Exhaust Gas Temperature Bar Graph (EGT °F)**	Displays exhaust gas temperatures (EGT) for all cylinders in °F; the readout is for the hottest cylinder
(6) **Cylinder Head Temperature Bar Graph (CHT °F)**	Displays head temperatures for all cylinders with a readout for the hottest cylinder in °F
(7) **Flap Position and Trim Indicators (FLAPS, ELEV TRIM, RUDDER TRIM, AILERON TRIM)**	Displays flap position and elevator, rudder, and aileron trim along slide bars Up to three trim indicators may be installed; aileron and rudder trim are mutually exclusive.

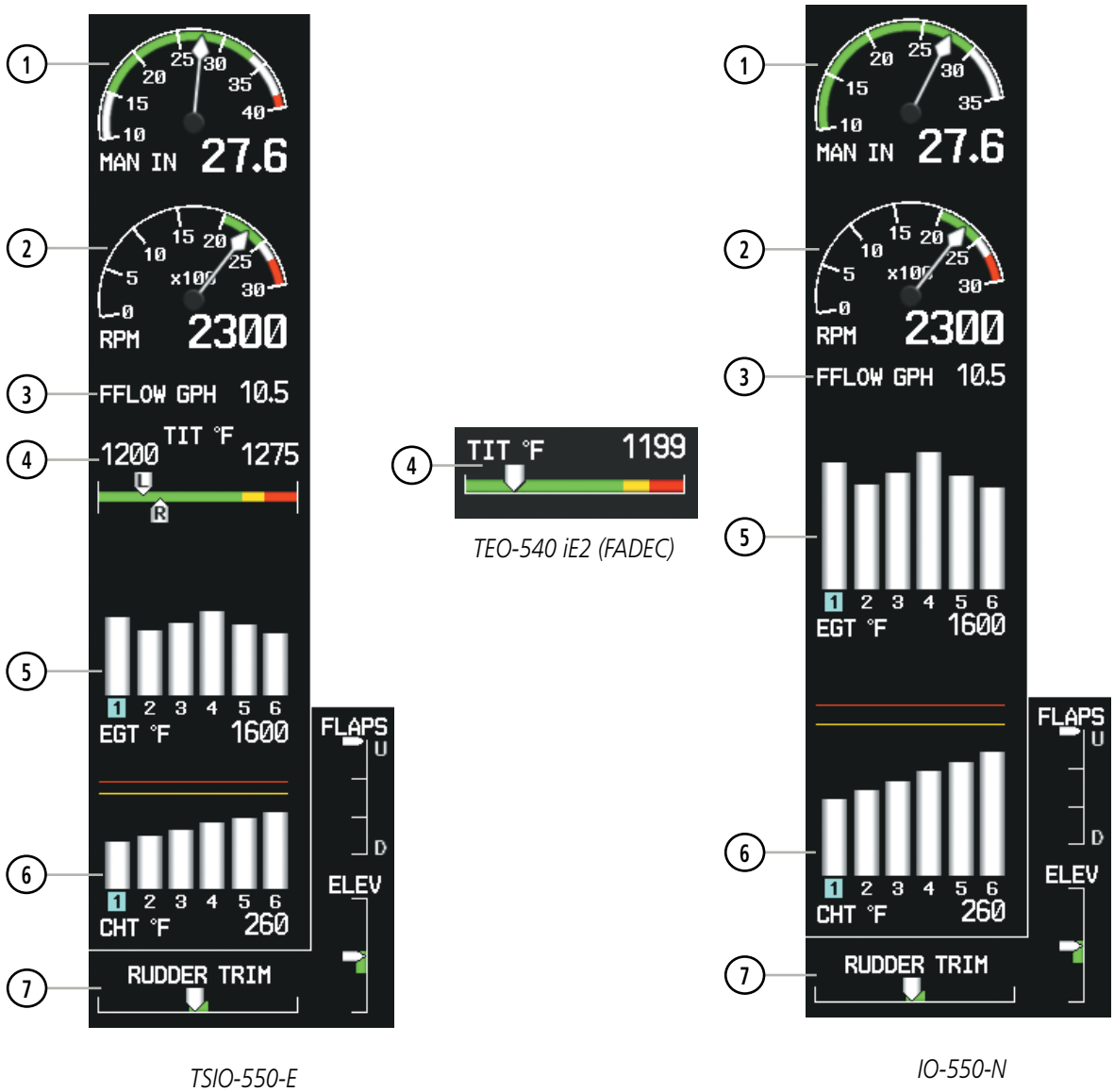
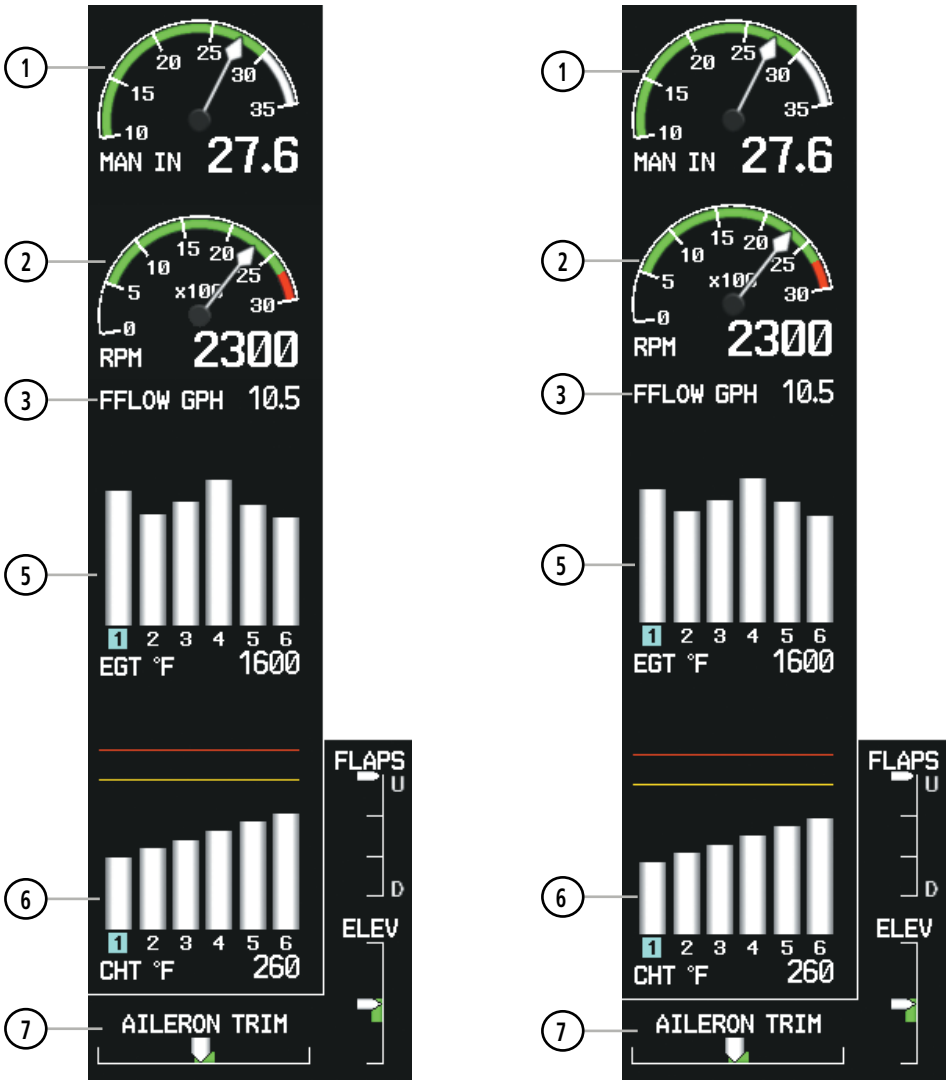
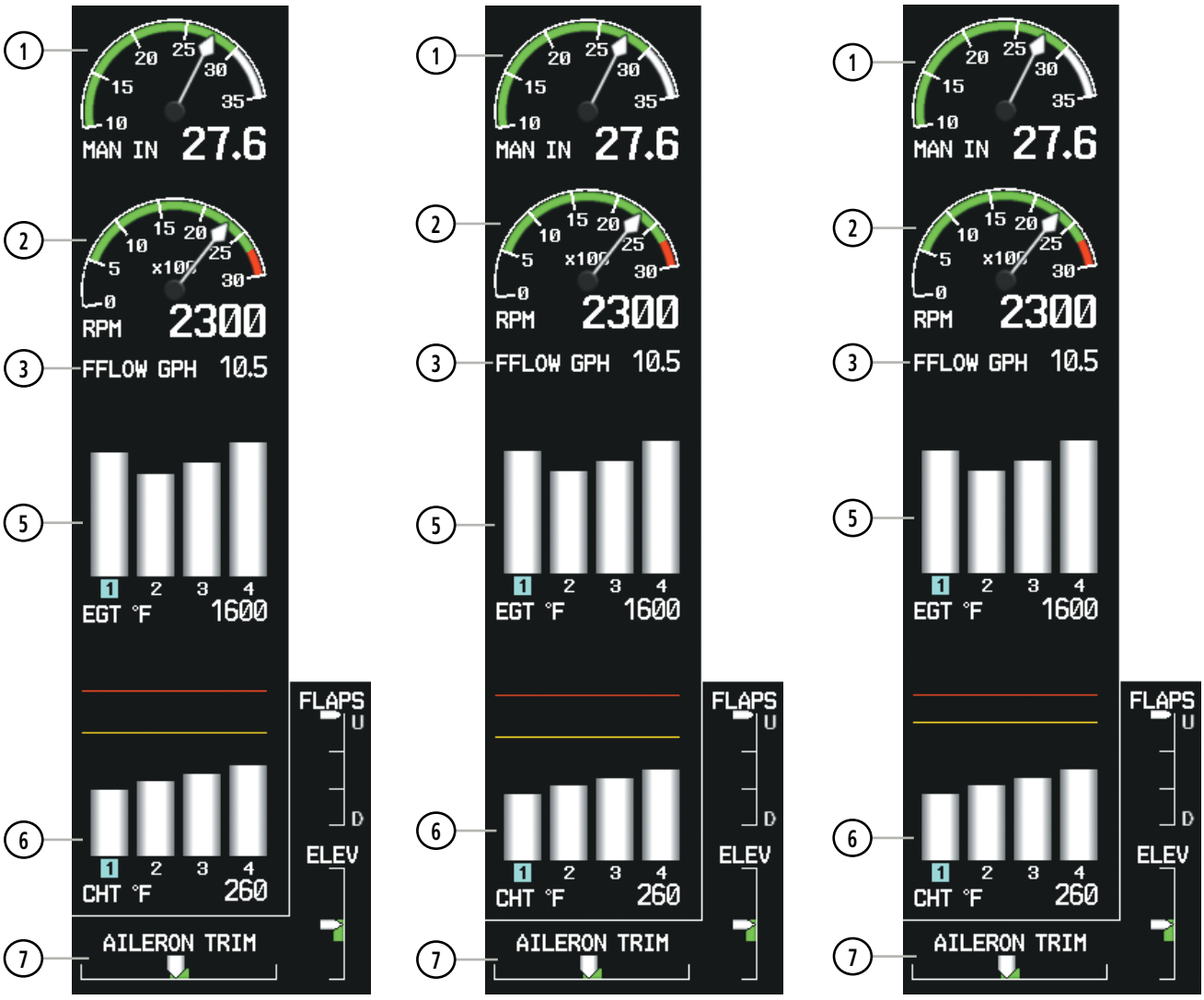


Figure 3-24 Lean Displays - Reversionary Mode (IV/IV-P Shown)



IO-540-series *O-540-series*

Figure 3-25 Lean Displays - Reversionary Mode
(RV-10 Shown)



IO-360-series *O-360-series* *O-320-series*

Figure 3-26 Lean Displays - Reversionary Mode (RV-9/9A)

PISTON SYSTEM DISPLAY (REVERSIONARY MODE)

NOTE: *Fuel calculations do not use the aircraft fuel quantity indicators and are calculated from the last time the fuel was reset.*

The EIS System Display shows the engine manifold pressure, tachometer, various system parameters, and fuel calculations. Fuel calculations are based on the displayed fuel remaining (GAL REM) and the fuel flow totalizer.

Accessing the EIS System Display:

1) Press the **ENGINE** Softkey.
2) Press the **SYSTEM** Softkey.
3) To return to the default Engine Display, press the **ENGINE** or **BACK** Softkey.

Adjusting the fuel totalizer quantity:

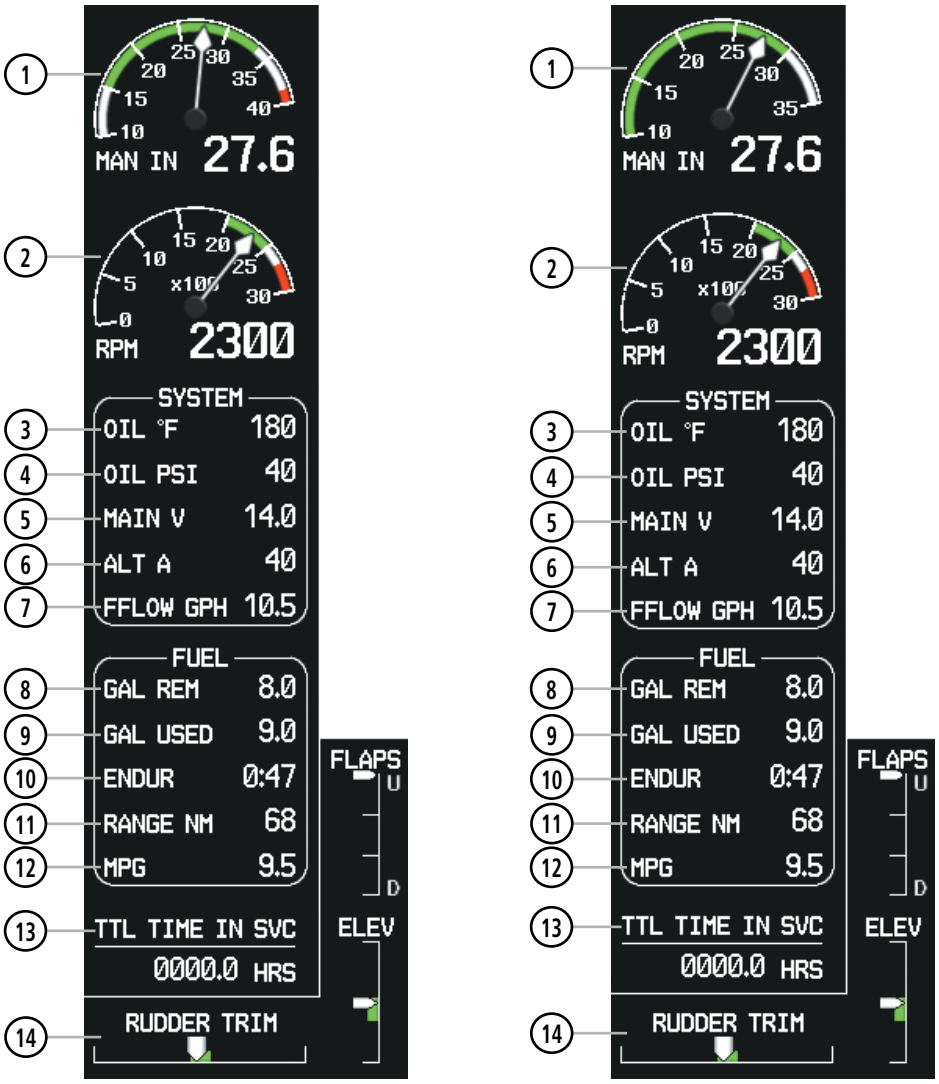
From the System Display, press the **DEC FUEL** or **INC FUEL** Softkey to adjust the fuel remaining (GAL REM).

Resetting the fuel totalizer:

From the System Display, press the **RST FUEL** Softkey. This resets totalizer-based fuel remaining to the aircraft's fuel capacity and the displayed fuel used (GAL USED) to zero

(1) **Engine Manifold Pressure Gauge (MAN IN)**	Displays manifold pressure in inches of Mercury (in Hg) to indicate engine power *Turbocharged Aircraft* – Maximum manifold pressure range displayed in red
(2) **Tachometer (RPM)**	Displays propeller speed in revolutions per minute (rpm); the red range indicates propeller overspeed
(3) **Oil Temperature (OIL °F)**	Displays oil temperature in degrees Fahrenheit (°F)
(4) **Oil Pressure (OIL PSI)**	Displays oil pressure in pounds per square inch (psi)
(5) **Main Bus Voltage (MAIN V)**	Displays the main bus voltage
(6) **Alternator Current (ALT A)**	Displays the alternator current in amperes (A)
(7) **Fuel Flow Indicator (FFLOW GPH)**	Displays fuel flow in gallons per hour (gph)
(8) **Calculated Fuel Remaining (GAL REM)**	Displays the amount of fuel remaining set by the pilot and adjusted for fuel burn
(9) **Calculated Fuel Used (GAL USED)**	Displays the calculated amount of fuel used based on the totalizer fuel flow

(10) **Calculated Endurance (ENDUR)**	Displays flight time remaining in hours:minutes (HH:MM) based on the calculated fuel remaining
(11) **Calculated Range (RANGE NM)**	Displays aircraft range in nautical miles (nm) based on the calculated fuel remaining, the aircraft's heading, and the wind direction and speed
(12) **Calculated Fuel Efficiency (MPG)**	Displays aircraft fuel efficiency in statute miles per gallon (MPG)
(13) **Engine Hours (Tach) (TTL TIME IN SVC)**	Displays the total time in hours (hrs) the engine has been in service
(14) **Flap Position and Trim Indicators (FLAPS, ELEV TRIM, RUDDER TRIM, AILERON TRIM)**	Displays flap position and elevator, rudder, and aileron trim along slide bars Green ranges of the trim bars represent correct takeoff trim positions.



TSIO-550-E *IO-550-N*

Figure 3-27 System Displays - Reversionary Mode (IV/IV-P Shown)

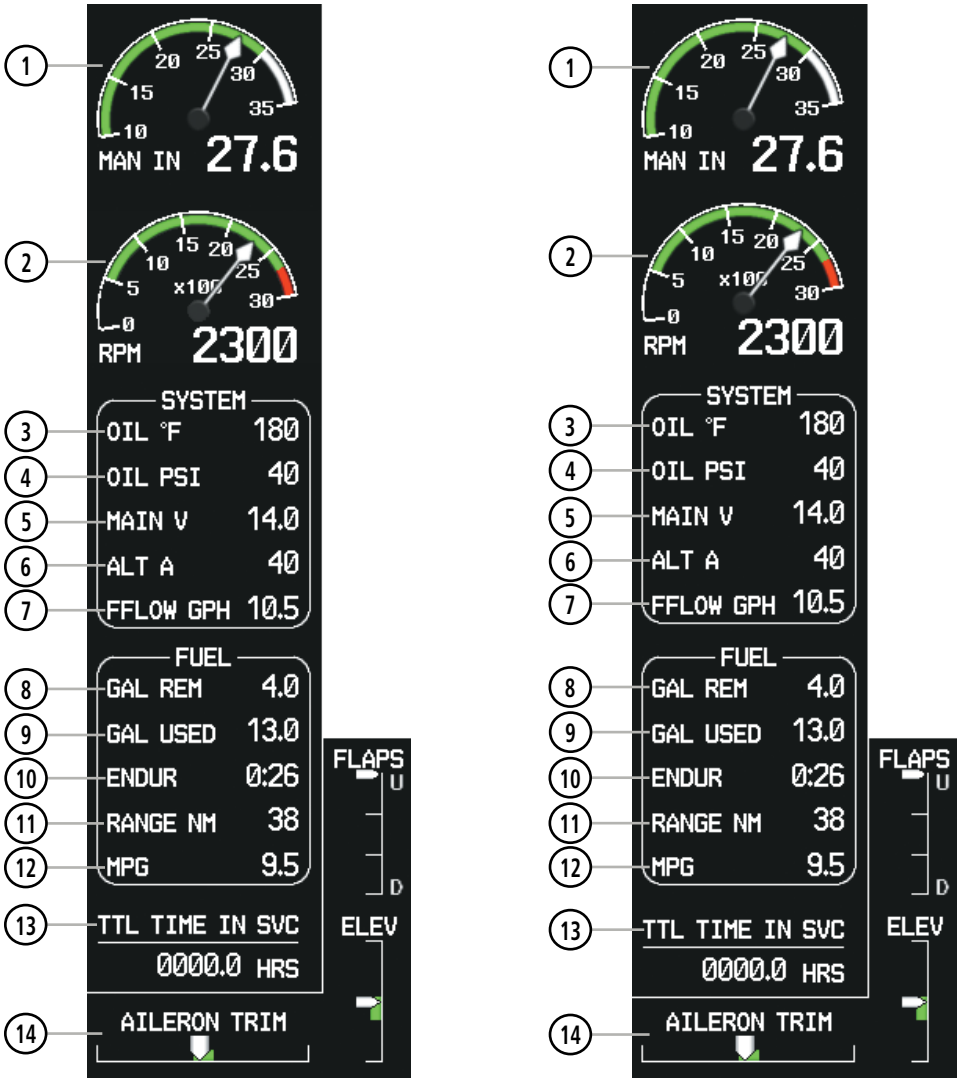
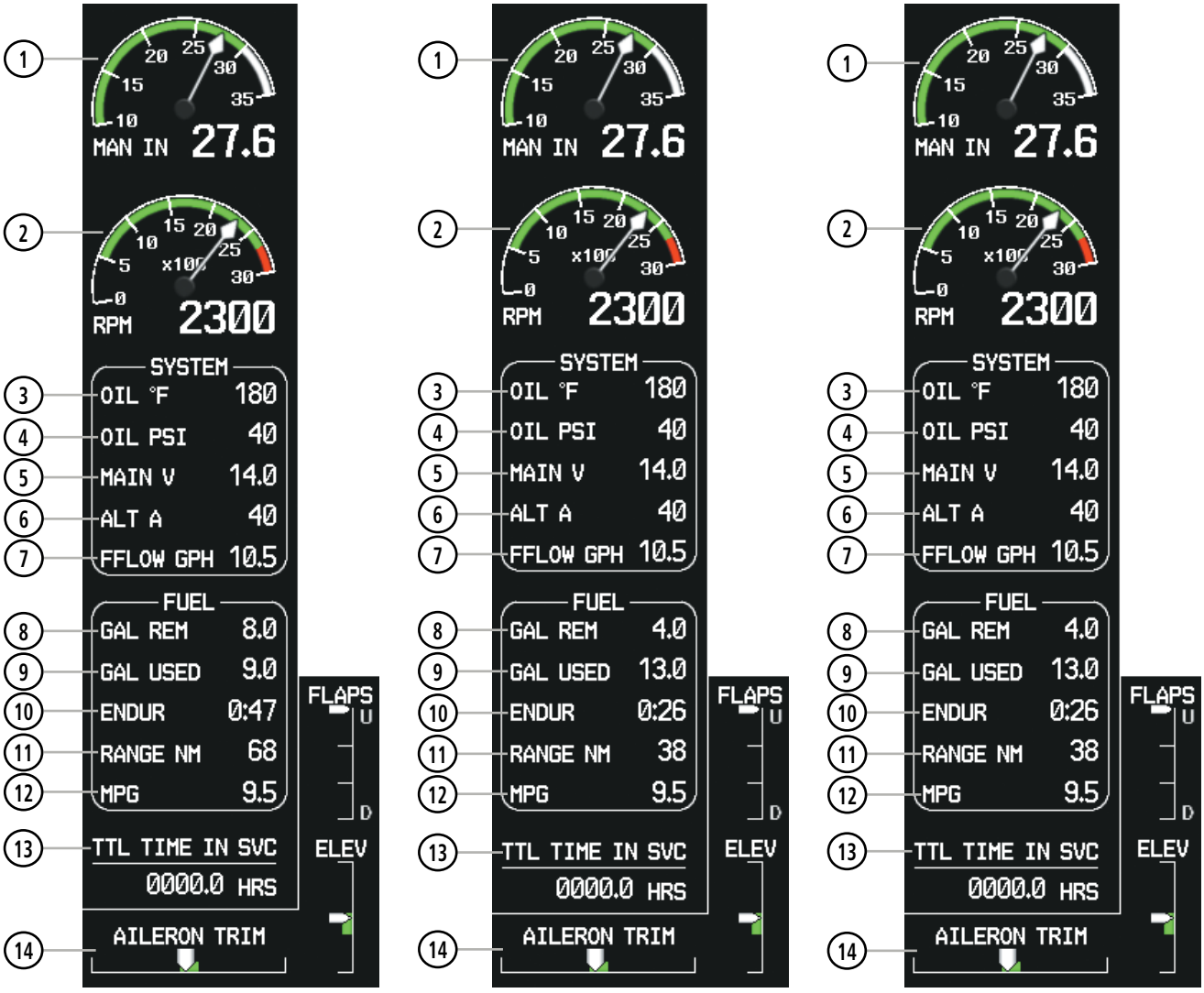


Figure 3-28 System Displays - Reversionary Mode (RV-10) Shown)



IO-360-series *O-360-series* *O-320-series*

Figure 3-29 System Displays - Reversionary Mode (RV-9/9A Shown)

3.2 TURBOPROP AIRCRAFT EIS

(1) **Torque Gauge (TRQ FT-LB)**	Displays engine torque in foot-pounds (ft-lb)
(2) **Interstage Turbine Temperature Gauge (ITT °C)**	Displays Interstage Turbine Temperature (ITT) in degrees Celsius (°C) When the engine is not running, 'OFF' is annunciated above the ITT readout; this changes to 'STRT' upon engine start. No annunciation is shown when the engine is running normally (see Figure 3-30).
(3) **Propeller Speed Gauge (NP RPM)**	Displays propeller speed in revolutions per minute (rpm)
(4) **Gas Generator Speed Gauge (NG %)**	Displays gas generator speed as a percentage
(5) **Fuel Flow (FFLOW GPH)**	Displays current fuel flow in gallons per hour (gph)
(6) **Oil Pressure Indicator (OIL PSI)**	Displays engine oil pressure in pounds per square inch (psi)
(7) **Oil Temperature Indicator (OIL °C)**	Displays engine oil temperature in °C
(8) **Ammeter (AMPS)**	Displays DC current in amperes (amps) for the generator (G) and the alternator (A)
(9) **Voltmeter (VOLTS)**	Displays DC bus voltages
(10) **Fuel Quantity Indicator (FUEL QTY)**	Displays quantities of fuel in gallons in the left (L) and right (R) tanks

Aircraft	Maximum Standard Fuel Quantity (gal) Per Side
Evolution	85
Epic LT	144

Table 3-3 Maximum Indicated Fuel Quantities

(11) **Aileron and Rudder Trim Bars (AIL, RUD)**	Aileron and rudder trim are indicated with pointers along slide bars; the white bars indicate takeoff trim positions
Elevator Trim Bar (ELEV)	Elevator trim is indicated with a pointer along a slide bar; takeoff trim position is indicated with a white bar and T/O label
Flap Position Indicator (FLAPS)	Flap deflection is indicated with a pointer along a slide bar

Engine Off *Engine Start* *Normal*

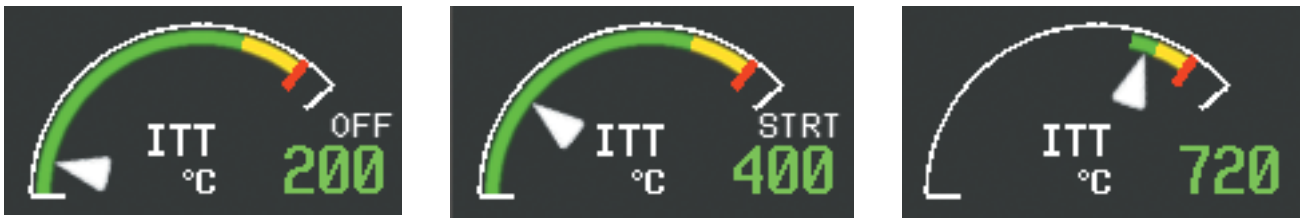
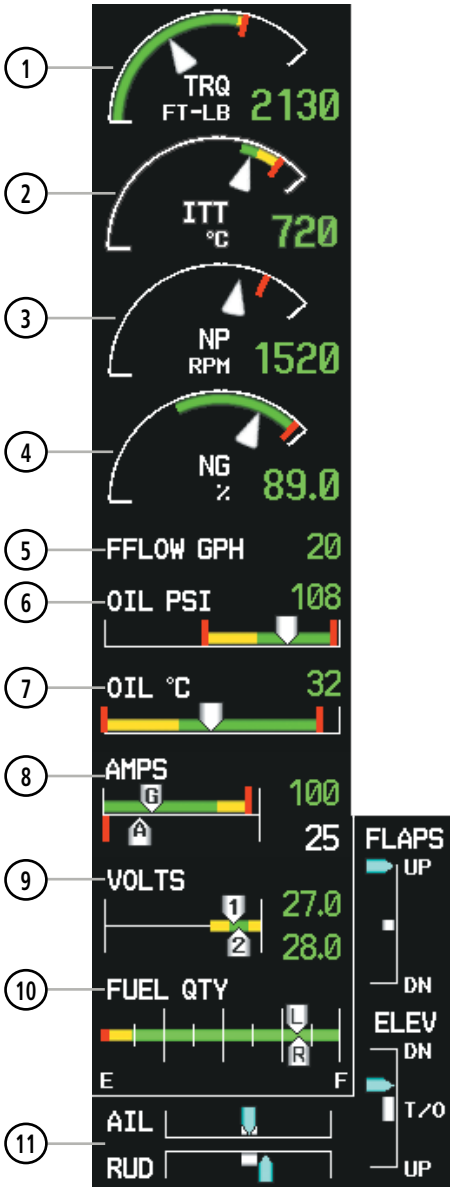


Figure 3-30 Interstage Turbine Temperature Gauge Status Annunciations



PT6-series

Figure 3-31 EIS Display (Evolution Shown)

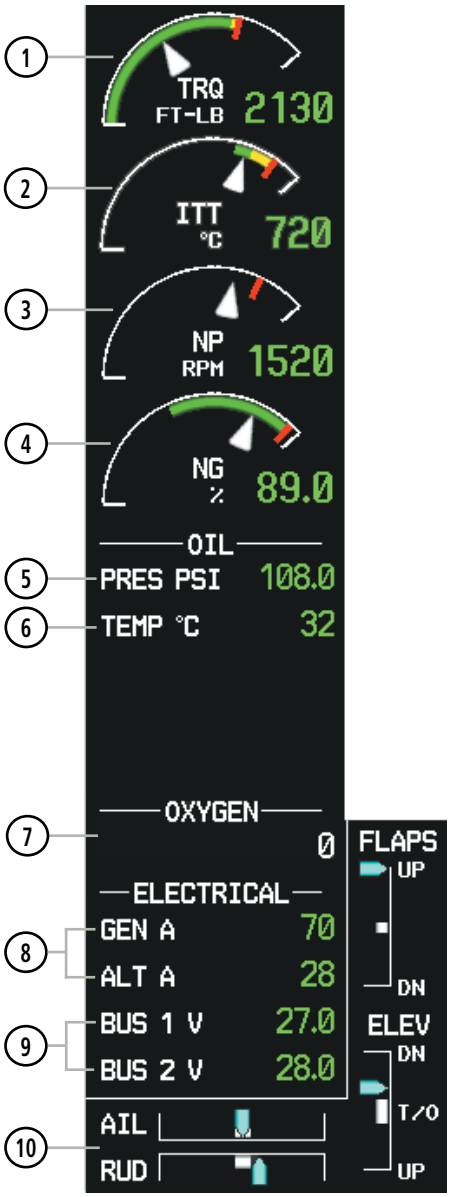
TURBOPROP SYSTEM DISPLAY

The System Display (Figure 3-32) is accessed by pressing the **SYSTEM** Softkey. The engine gauges and trim slide bars are displayed, along with readouts separated into two categories: Oil (pressure and temperature) and Electrical (currents and voltages).

Accessing the EIS System Display:

1) Press the **ENGINE** Softkey.
2) Press the **SYSTEM** Softkey.
3) To return to the default Engine Display, press the **ENGINE** or **BACK** Softkey.

(1) **Torque Gauge (TRQ FT-LB)**	Displays engine torque in foot-pounds (ft-lb)
(2) **Interstage Turbine Temperature Gauge (ITT °C)**	Displays Interstage Turbine Temperature (ITT) in degrees Celsius (°C)
(3) **Propeller Speed Gauge (NP RPM)**	Displays propeller speed in revolutions per minute (rpm)
(4) **Generator Speed Gauge (NG %)**	Displays gas generator speed as a percentage
(5) **Oil Pressure (PRES PSI)**	Displays engine oil pressure in pounds per square inch (psi)
(6) **Oil Temperature (TEMP °C)**	Displays engine oil temperature in °C
(6) **Oxygen Display**	Shows oxygen pressure in pounds per square inch (psi)
(7) **Ammeter (GEN A, ALT A)**	Displays DC current in amperes (amps) for the generator (G) and the alternator (A)
(8) **Voltmeter (BUS 1 V, BUS 2 V)**	Displays DC bus voltages
(9) **Aileron and Rudder Trim Bars (AIL, RUD)**	Aileron and rudder trim are indicated with pointers along slide bars; the white bars indicate takeoff trim positions
Elevator Trim Bar (ELEV)	Elevator trim is indicated with a pointer along a slide bar; takeoff trim position is indicated with a white bar and T/O label
Flap Position Indicator (FLAPS)	Flap deflection is indicated with a pointer along a slide bar



PT6-series

Figure 3-32 System Display (Evolution Shown)

TURBOPROP FUEL DISPLAY

NOTE: *Fuel calculations do not use the aircraft fuel quantity indicators and are calculated from the last time the fuel was reset.*

The Fuel Display (Figure 3-33) is accessed by pressing the **FUEL** Softkey. The engine gauges and trim slide bars are displayed, along with digital readouts separated into three categories: Oil (pressure and temperature), Fuel (flow, pressure, and quantities), and Fuel Calculations (fuel remaining and used, endurance, and range). The Fuel Display offers a means to reset the CO Guardian (optional) when a carbon monoxide alert is generated.

Accessing the EIS Fuel Display:

1) Press the **ENGINE** Softkey.
2) Press the **FUEL** Softkey.
3) To return to the default Engine Display, press the **ENGINE** or **BACK** Softkey.

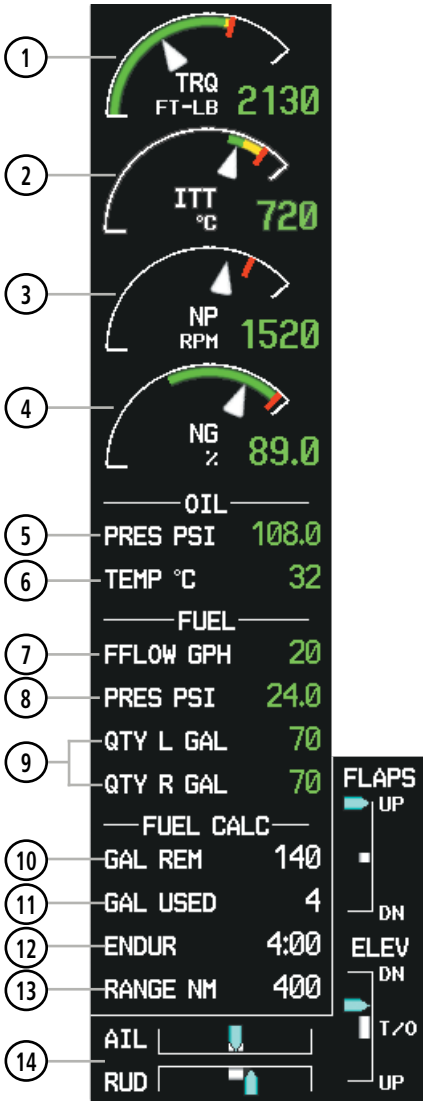
NOTE: *Fuel indications can be configured to display pounds or gallons.*

Fuel calculations are based on the fuel flow totalizer and the displayed fuel remaining (GAL REM), adjusted by the pilot using the following softkeys:

- **DEC FUEL** – Decreases totalizer-based fuel remaining in 10-gallon increments
- **INC FUEL** – Increases totalizer-based fuel remaining in 10-gallon increments
- **RST FUEL** – Resets totalizer-based fuel remaining to the aircraft's fuel capacity and the displayed fuel used (GAL USED) to zero

(1) **Torque Gauge (TRQ FT-LB)**	Displays engine torque in foot-pounds (ft-lb)
(2) **Interstage Turbine Temperature Gauge (ITT °C)**	Displays Interstage Turbine Temperature (ITT) in degrees Celsius (°C)
(3) **Propeller Speed Gauge (NP RPM)**	Displays propeller speed in revolutions per minute (rpm)
(4) **Generator Speed Gauge (NG %)**	Displays gas generator speed as a percentage
(5) **Oil Pressure (PRES PSI)**	Displays engine oil pressure in pounds per square inch (psi)
(6) **Oil Temperature (TEMP °C)**	Displays engine oil temperature in °C
(7) **Fuel Flow (FFLOW GPH)**	Displays current fuel flow in gallons per hour (gph)
(8) **Fuel Pressure (PRES PSI)**	Displays current fuel pressure in psi
(9) **Fuel Quantities (QTY L/R GAL)**	Displays quantities of fuel in gallons in the left (L) and right (R) tanks

(10) **Set Fuel Remaining (GAL REM)**	Displays current fuel remaining in gallons as set by the pilot and adjusted for fuel burn since last set
(11) **Calculated Fuel Used (GAL USED)**	Displays quantity of fuel used in gallons based on fuel flow since last reset
(12) **Calculated Endurance (ENDUR)**	Displays flight time remaining in hours:minutes (HH:MM) based on the calculated fuel remaining
(13) **Calculated Range (RANGE NM)**	Displays aircraft range in nautical miles (nm) based on the calculated fuel remaining, the aircraft's heading, and the wind direction and speed
(14) **Aileron and Rudder Trim Bars (AIL, RUD)**	Aileron and rudder trim are indicated with pointers along slide bars; the white bars indicate takeoff trim positions
Elevator Trim Bar (ELEV)	Elevator trim is indicated with a pointer along a slide bar; takeoff trim position is indicated with a white bar and T/O label
Flap Position Indicator (FLAPS)	Flap deflection is indicated with a pointer along a slide bar



PT6-series

Figure 3-33 Fuel Display (Evolution Shown)

CO ALERT RESET

If the optional CO Guardian carbon monoxide detector issues a warning for high carbon monoxide levels, the **CO RST** Softkey is available on MFD to reset the CO Guardian.

Resetting a CO Guardian alert:

1) On the MFD, press the **ENGINE** Softkey.
2) Press the **FUEL** Softkey.
3) Press the **CO RST** Softkey (available only when a CO alert is occurring) (Figure 3-34).

Refer to the CO Guardian documentation for further information.



Figure 3-34 Carbon Monoxide Alert Reset (Epic LT Shown)

TURBOPROP EIS DISPLAY (REVERSIONARY MODE)

In the event of a PFD1, PFD2 (if installed) or MFD display failure, the display(s) operating in Reversionary Mode are configured to present PFD symbology together with the EIS Display (refer to the System Overview for information about display reversionary mode). In reversionary mode, the EIS is separated into three displays: Engine, System, and Fuel.

In reversionary mode, the Engine, System, and Fuel displays are identical to the displays in normal mode.

EIS Display

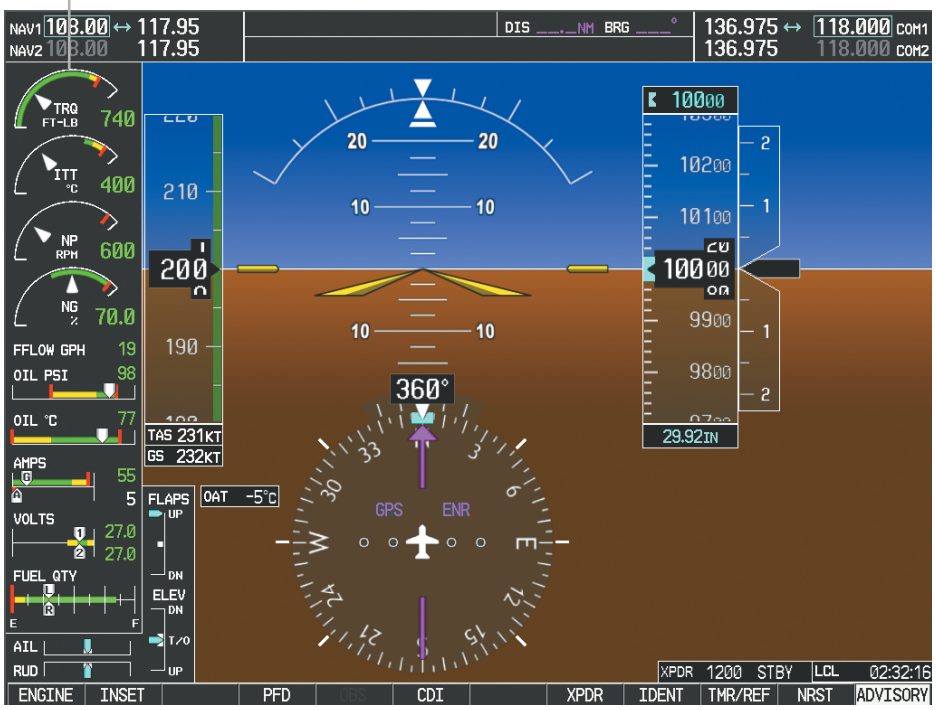


Figure 3-35 Reversionary Mode (Evolution Shown)

TURBOPROP EIS SOFTKEYS (NORMAL/REVERSIONARY MODE)

The Engine Display is shown by default. To return to the Engine Display from the System or Fuel Display, press the **ENGINE** or **BACK** Softkey.

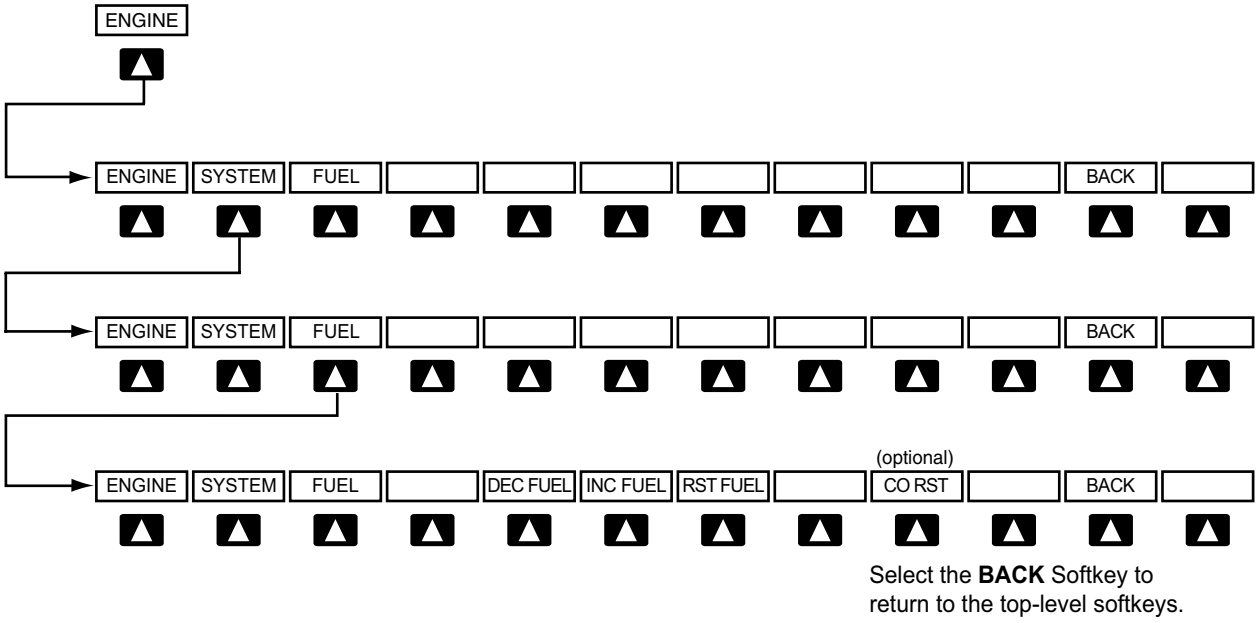


Figure 3-36 EIS Softkeys (Normal/Reversionary Mode – Turboprop Aircraft)

Level 1	Level 2	Level 3	Description
ENGINE			Displays second-level engine softkeys
	SYSTEM		Displays the EIS System Display
	FUEL		Displays the EIS Fuel Display
		DEC FUEL	Decreases displayed fuel remaining in 1-gal increments
		INC FUEL	Increases displayed fuel remaining in 1-gal increments
		RST FUEL	Resets displayed fuel remaining to maximum fuel capacity for aircraft and fuel used to zero
		CO RST	Resets CO Guardian; softkey enabled when carbon monoxide alert generated (*optional*)

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SECTION 4 AUDIO PANEL AND CNS

4.1 OVERVIEW

The Communication/Navigation/Surveillance (CNS) system includes the audio panel, communication radios, navigation radios, and Mode S transponder. The System Overview Section provides a block diagram description of the Audio Panel and CNS system interconnection.

CNS operation in the G900X is performed by the following Line Replaceable Units (LRUs):

- Primary Flight Display (PFD) (1 or 2)
- Multifunction Display (MFD)
- Integrated Avionics Unit (2)
- Audio Panel
- Mode S Transponder (1 or 2)
- Control Unit (optional)

The MFD/PFD controls are used to tune the communication transceivers and navigation radios.

The Audio Panel provides the traditional audio selector functions of microphone and receiver audio selection. The Audio Panel includes an intercom system (ICS) between the pilot, copilot, and passengers, a marker beacon system, and a COM clearance recorder. Ambient noise from the aircraft radios is reduced by a feature called Master Avionics Squelch (MASQ). When no audio is detected, MASQ processing further reduces the amount of background noise from the radios.

The single or dual Mode S Transponders are controlled with softkeys and the **FMS** Knob located on the Primary Flight Display (PFD). The Transponder Data Box is located to the left of the System Time Box. The data box displays the active four-digit code, mode, and a reply status (Figure 4-1).

PFD CONTROLS AND FREQUENCY DISPLAY



Figure 4-1 PFD Controls, NAV/COM Frequency Tuning Boxes, and NRST Window

1. **NAV VOL/ID Knob –** Controls NAV audio volume level. Press to turn the Morse code identifier audio on and off. Volume level is shown in the NAV frequency field as a percentage.
2. **NAV Frequency Transfer Key –** Transfers the standby and active NAV frequencies.
3. **NAV Knob –** Tunes the standby frequencies for the NAV receiver (large knob for MHz; small knob for kHz). Press to move the tuning box (light blue box) and Frequency Transfer Arrow between NAV1 and NAV2.
4. **NAV Frequency Box –** Displays NAV standby and active frequency fields, volume, and station ID. The frequency of the NAV radio selected for navigation is displayed in green.
5. **COM Frequency Box –** Displays COM standby and active frequency fields and volume. The selected COM transceiver frequency is displayed in green.
6. **COM Knob –** Tunes the standby frequencies for the COM transceiver (large knob for MHz; small knob for kHz). Press to move the tuning box (light blue box) and Frequency Transfer Arrow between COM1 and COM2.
7. **COM Frequency Transfer Key –** Transfers the standby and active COM frequencies. Press and hold this key for two seconds to tune the emergency frequency (121.500 MHz) automatically into the active frequency field.
8. **COM VOL/SQ Knob –** Controls COM audio volume level. Press to turn the COM automatic squelch on and off. Volume level is shown in the COM frequency field as a percentage.
9. **Nearest Airports Window –** Display by pressing the **NRST** Softkey.
10. **ENT Key –** Validates or confirms an Auto-tune selection.
11. **FMS Knob –** Flight Management System Knob, used to enter transponder codes and Auto-tune entries when NRST Window is present. Press the **FMS** Knob to turn the selection cursor on and off. The large knob moves the cursor in the window. The small knob selects individual characters for the highlighted cursor location.
12. **Transponder Data Box –** Indicates the selected transponder code, operating mode, reply, and ident status for the applicable transponder.

AUDIO PANEL CONTROLS
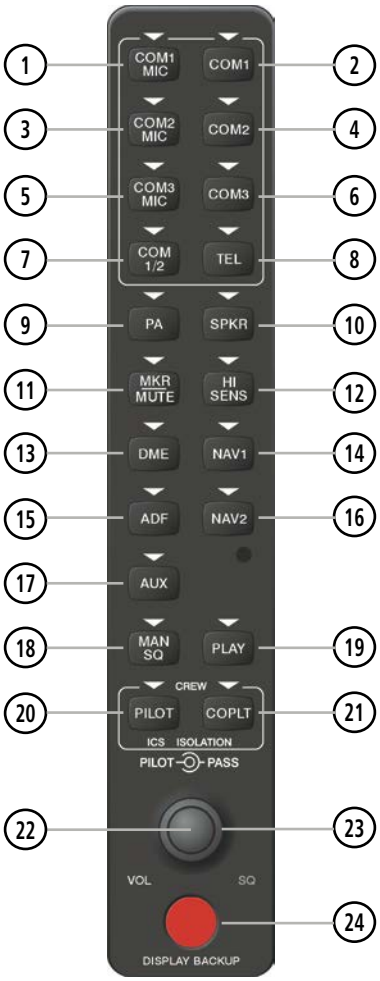


Figure 4-2 Audio Panel Controls

NOTE: *When a key is selected, a triangular annunciator above the key is illuminated.*

1. **COM1 MIC** – Selects the #1 transmitter for transmitting. COM1 receive is simultaneously selected when this key is pressed allowing received audio from the #1 COM receiver to be heard. COM2 receive can be added by pressing the **COM2** Key.
2. **COM1** – When selected, audio from the #1 COM receiver can be heard.
3. **COM2 MIC** – Selects the #2 transmitter for transmitting. COM2 receive is simultaneously selected when this key is pressed allowing received audio from the #2 COM receiver to be heard. COM1 receive can be added by pressing the **COM1** Key.
4. **COM2** – When selected, audio from the #2 COM receiver can be heard.
5. **COM3 MIC** – Not used in the G900X

6. **COM3** – Not used in the G900X
7. **COM 1/2** – Not used in the G900X.
8. **TEL** – Turns optional satellite receiver audio on or off.
9. **PA** – Selects the passenger address system. The selected COM transmitter is deselected when the **PA** Key is pressed.
10. **SPKR** – Selects and deselects the cabin speaker (if installed). COM and NAV receiver audio can be heard on the speaker.
11. **MKR/MUTE** – Selects marker beacon receiver audio. Mutes the currently received marker beacon receiver audio. Unmutes automatically when new marker beacon audio is received. Also, stops play of recorded COM audio.
12. **HI SENS** – Press to increase marker beacon receiver sensitivity. Press again to return to low sensitivity.
13. **DME** – Turns optional DME audio on or off.
14. **NAV1** – When selected, audio from the #1 NAV receiver can be heard.
15. **ADF** – Turns optional ADF receiver audio on or off.
16. **NAV2** – When selected, audio from the #2 NAV receiver can be heard.
17. **AUX** – Not used in the G900X.
18. **MAN SQ** – Enables manual squelch for the intercom. When the intercom is active, press the **PILOT** Knob to illuminate SQ. Turn the **PILOT/PASS** Knobs to adjust squelch.
19. **PLAY** – Press once to play the last recorded COM audio. Press again while audio is playing and the previous block of recorded audio will be played. Each subsequent press plays each previously recorded block. Pressing the **MKR/MUTE** Key during play of a memory block stops play.
20. **PILOT** – Selects and deselects the pilot intercom isolation.
21. **COPLT** – Selects and deselects the copilot intercom isolation.
22. **PILOT Knob** – Press to switch between volume and squelch control as indicated by illumination of VOL or SQ. Turn to adjust intercom volume or squelch. The **MAN SQ** Key must be selected to allow squelch adjustment.
23. **PASS Knob** – Turn to adjust Copilot/Passenger intercom volume or squelch. The **MAN SQ** Key must be selected to allow squelch adjustment.
24. **DISPLAY BACKUP Button** – Manually selects Reversionary Mode.

MFD/PFD CONTROL UNIT

The optional MFD/PFD Control Unit is a pedestal-mounted interface allowing MFD/PFD1 operation, data entry, COM and NAV tuning, and transponder control. The MFD/PFD Control Unit duplicates many PFD display bezel controls. PFD2 is not controlled by the MFD/PFD Control Unit. Annunciators above the **PFD**, **MFD**, **NAV**, and **COM** keys illuminate when their respective control modes are selected. The unit is in MFD control mode by default on system power-up.

Tune the COM and NAV radios in either MFD or PFD control mode. The appropriate frequency box on the selected display is outlined by a light blue selection box, which flashes for a few seconds to indicate control unit activity. Selection of a different display control or radio tuning mode results in cancellation of the previous radio tuning mode.



Figure 4-3 MFD/PFD Control Unit



Figure 4-4 Frequency Tuning with the MFD/PFD Control Unit

1. **MENU Key** – Displays a list of options for accessing additional features or making setting changes.
2. **Alphanumeric Keys** – Allows data entry (rather than using the **FMS** Knob to select characters/numbers).
3. **BKSP Key** – Moves cursor back one character space and removes last character entered.
4. **ENT Key** – Validates or confirms a menu selection or data entry.
5. **CLR Key** – Erases information, cancels entries, or removes menus.
6. **SEL Key** – Arrows move light blue Softkey Selection Box on selected display. Press the center to activate the selected softkey
7. **Decimal Key** – Enters a decimal point.
8. **NAV Key** – Selects NAV radio tuning mode on the MFD/PFD Control Unit. The NAV tuning box is outlined with a light blue selection line when the NAV frequency is active on the control unit.
9. **COM Key** – Selects COM radio tuning mode on the MFD/PFD Control Unit. The COM tuning box is outlined with a light blue selection line when the COM frequency is active on the control unit.
10. **Frequency Transfer Key (EMERG)** – Transfers the standby and active COM or NAV frequencies. Press and hold for two seconds to tune the emergency frequency (121.500 MHz) automatically into the COM active frequency field.
11. **PFD Key** – When selected, the MFD/PFD Control Unit is used to access PFD functions.
12. **MFD Key** – When selected, the MFD/PFD Control Unit is used to access MFD functions (default control mode).
13. **FMS/NAV-COM Knob** – NAV/COM Tuning Modes: Acts as the NAV or COM Knob. MFD/PFD Control Modes: Acts as the FMS Knob.

MFD CONTROL UNIT

The optional MFD Control Unit is a pedestal-mounted interface allowing MFD operation, data entry, COM and NAV tuning, and transponder control. The MFD Control Unit duplicates many PFD display bezel controls. Annunciators beside the **FMS**, **XPDR**, **COM**, and **NAV** keys illuminate when their respective control modes are selected. The unit is in FMS control mode by default on system power-up.

The appropriate frequency box on the selected display is outlined by a light blue selection box, which flashes for a few seconds to indicate control unit activity. Selection of a different display control or radio tuning mode results in cancelation of the previous radio tuning mode.



Figure 4-5 GCU 477 MFD Control Unit

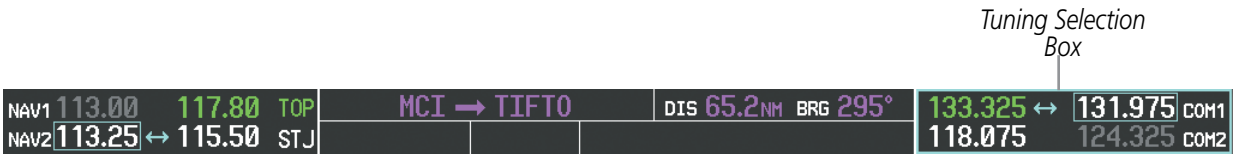


Figure 4-6 Frequency Tuning with the Control Unit

1. **CLR Key** – Erases information, cancels entries, or removes menus.
2. **MENU Key** – Displays a list of options for accessing additional features or making setting changes.
3. **ENT Key** – Validates or confirms a menu selection or data entry.
4. **FMS Knob** – Flight Management System Knob. This knob provides tuning capability for the COM and NAV radios when the appropriate **COM** or **NAV** key is presssed. When the **XPDR** Key is pressed, the transponder code may be entered using the **FMS** Knob. The large knob moves the cursor in the window. The small knob selects individual characters for the highlighted cursor location.
5. **FMS Key** – Sets the **FMS** Knob to control FMS functions on the MFD. When pressed, an annunciator next to the key illuminates indicating adjustment of the **FMS** Knob will now affect FMS functions.
6. **COM Key** – Sets the **FMS** Knob to control tuning of the COM radios. The first press will select COM1, as indicated by an illuminated "1" to the left of the key. Press again to select COM2. This is annunciated with a "2" to the right of the key. Each subsequent press of the **COM** Key will switch between COM1 and COM2. Use the **FMS** Knob to tune the selected COM The COM Tuning Selection Box is outlined with a light blue line when the COM frequency is active on the control unit (Figure 4-4).
7. **Frequency Transfer Key (EMERG)** – Transfers the standby and active COM or NAV frequencies. Press and hold for two seconds to tune the emergency frequency (121.500 MHz) automatically into the COM active frequency field.
8. **NAV Key** – Sets the **FMS** Knob to control tuning of the NAV radios. The first press will select NAV1, as indicated by an illuminated "1" to the left of the key. Press again to select NAV2. This is annunciated with a "2" to the right of the key. Each subsequent press of the **NAV** Key will switch between NAV1 and NAV2. Use the **FMS** Knob to tune the selected NAV. The NAV Tuning Selection Box is outlined with a light blue line when the NAV frequency is active on the control unit.
9. **XPDR Key** – Sets the **FMS** Knob to enter transponder codes. When pressed, an annunciator next to the key illuminates indicating the **FMS** Knob can now be used for transponder code entry. Transponder code entry can be performed with either the number keypad or **FMS** Knob.
10. **IDENT Key** – Press to activate the IDENT function of the transponder. When the **IDENT** Key is pressed, a green IDNT indication is displayed in the mode field of the Transponder Data Box for 18 seconds.
11. **SEL Key** – The center of this key activates the selected MFD softkey, while the right and left arrows move the softkey selection box to the right and left, respectively.
12. **Decimal Key** – Enters a decimal point.
13. **BKSP Key** – Moves cursor back one character space and removes last character entered.
14. **Alphanumeric Keys** – Allows data entry (rather than using the **FMS** Knob to select characters/numbers).

4.2 COM OPERATION

COM TRANSCEIVER SELECTION AND ACTIVATION

NOTE: *During PA Mode, the COM MIC Annunciator is extinguished and the COM active frequency color changes to white, indicating that neither COM transmitter is active.*

NOTE: *When turning on the G900X for use, the system remembers the last frequencies used and the active COM transceiver state prior to shutdown.*

The COM Frequency Box is composed of four fields; the two active frequencies are on the left side and the two standby frequencies are on the right. Select the COM transceiver for transmitting by pressing the **COM MIC** Keys on the Audio Panel. During reception of audio from the COM radio selected for transmission, audio from the other COM radio is muted.

An active COM frequency displayed in green indicates that the COM transceiver is selected on the Audio Panel (**COM1 MIC** or **COM2 MIC** Key). Both active COM frequencies appearing in white indicate that no COM radio is selected for transmitting (**PA** Key is selected on the Audio Panel).

Frequencies in the standby field are displayed in either white or gray. The standby frequency in the tuning box is white. The other standby frequency is gray.

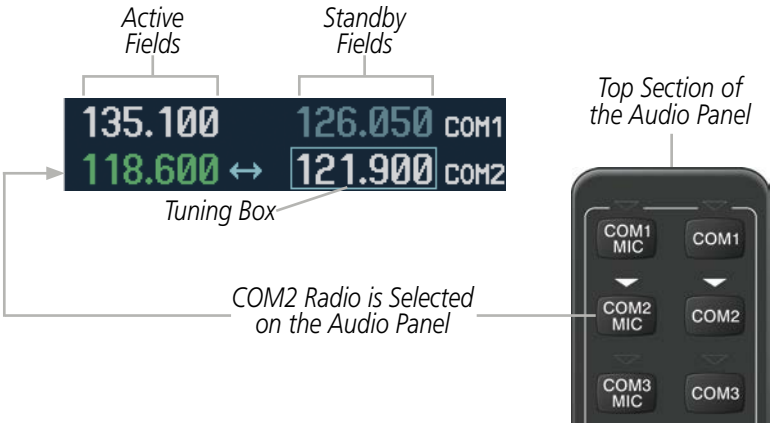


Figure 4-7 Selecting a COM Radio for Transmit

TRANSMIT/RECEIVE INDICATIONS

During COM transmission, a white TX appears by the active COM frequency replacing the Frequency Transfer Arrow. On the Audio Panel, when the active COM is transmitting, the active transceiver **COM MIC** Key Annunciator flashes approximately once per second.

During COM signal reception, a white RX appears by the active COM frequency replacing the Frequency Transfer Arrow.



Figure 4-8 COM Radio Transmit and Receive Indications

COM TRANSCEIVER MANUAL TUNING

The COM frequency controls and frequency boxes are on the right side of each PFD.

Manually tuning a COM frequency:

1) Turn the **COM** Knob to tune the desired frequency in the COM Tuning Box (large knob for MHz; small knob for kHz).
2) Press the **Frequency Transfer** Key to transfer the frequency to the active field.
3) Adjust the volume level with the COM **VOL/SQ** Knob.
4) Press the COM **VOL/SQ** Knob to turn automatic squelch on and off.



Figure 4-9 COM Frequency Tuning

Manual frequency tuning from the optional Control Unit

1) Press the **COM** Key to select the COM frequency box.
2) Turn the **FMS** or **NAV/COM** Knob to tune the desired frequency in the COM Tuning Box (large knob for MHz; small knob for kHz).
3) Press the **Frequency Transfer** Key to transfer the frequency to the active field.

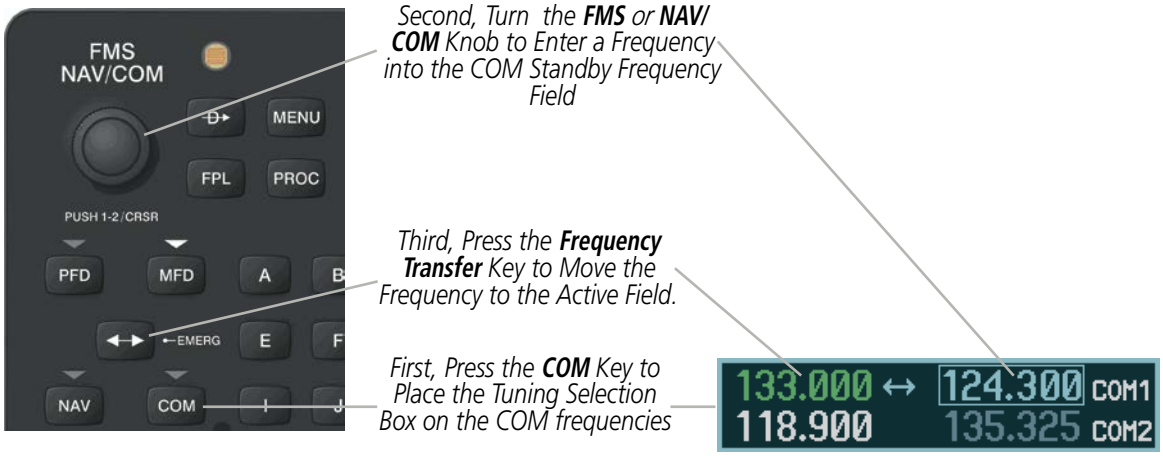


Figure 4-10 Frequency Tuning from the Control Unit

SELECTING THE RADIO TO BE TUNED

Press the small **COM** Knob to transfer the frequency tuning box and Frequency Transfer Arrow between the upper and lower radio frequency fields.

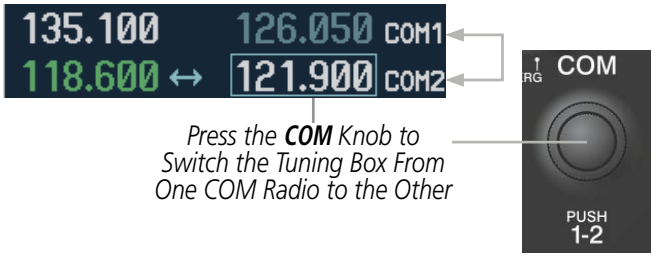


Figure 4-11 Switching COM Tuning Boxes

QUICK-TUNING AND ACTIVATING 121.500 MHZ

Pressing and holding the COM **Frequency Transfer** Key for two seconds automatically loads the emergency COM frequency (121.500 MHz) in the active field of the COM radio selected for tuning (the one with the transfer arrow). In the example shown, pressing the Audio Panel **COM2 MIC** Key activates the transceiver.

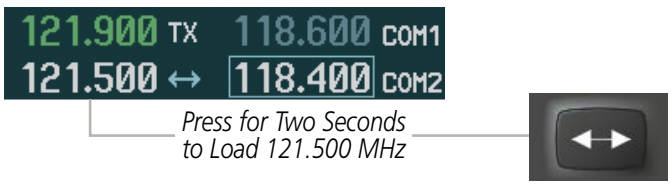


Figure 4-12 Quickly Tuning 121.500 MHz

AUTO-TUNING THE COM FREQUENCY

Tune COM frequencies from the following:

- Nearest Airports Window (PFD)
- WPT – Airport Information Page
- NRST – Nearest Airports Page
- NRST – Nearest Frequencies Page (ARTCC, FSS, WX)
- NRST – Nearest Airspaces Page

AUTO-TUNING FROM THE PFD

Tune COM frequencies for the nearest airports from the Nearest Airports Window on the PFD. When the desired frequency is entered, it becomes a standby frequency. Pressing the **Frequency Transfer** Key places this frequency into the COM Active Frequency Field.

Auto-tuning a COM frequency for a nearby airport from the PFD:

1) Press the **NRST** Softkey on the PFD to open the Nearest Airports Window. A list of 25 nearest airport identifiers and COM frequencies is displayed.
2) Turn the **FMS** Knob to scroll through the list and highlight the desired COM frequency.
3) Press the **ENT** Key to load the COM frequency into the COM Standby Tuning Box.
4) Press the **Frequency Transfer** Key to transfer the frequency to the COM Active Frequency Field.



*Select the **NRST** Softkey to Open the Nearest Airports Window*

Figure 4-13 Nearest Airports Window

AUTO-TUNING FROM THE MFD

Load frequencies into the COM Frequency Box from pages in the NRST or WPT page group by highlighting the frequency and pressing the **ENT** Key (Figures 4-15, 4-16, and 4-17).

Auto-tuning a COM frequency from the WPT and NRST Pages:

1) From any page that the COM frequency can be auto-tuned, activate the cursor by pressing the **FMS** Knob or pressing the appropriate softkey.
2) Turn the **FMS** Knob to place the cursor on the desired COM frequency (Figure 4-16).
3) Press the **ENT** Key to load the COM frequency into the standby field of the selected COM radio.
4) Press the **Frequency Transfer** Key to transfer the frequency to the COM Active Frequency Field.

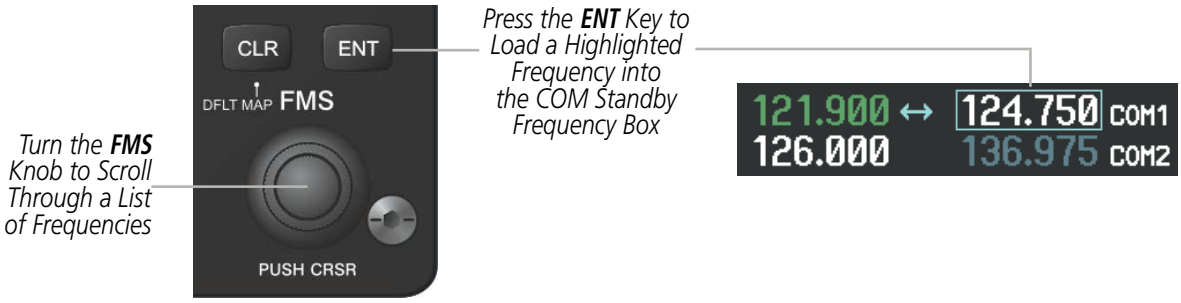
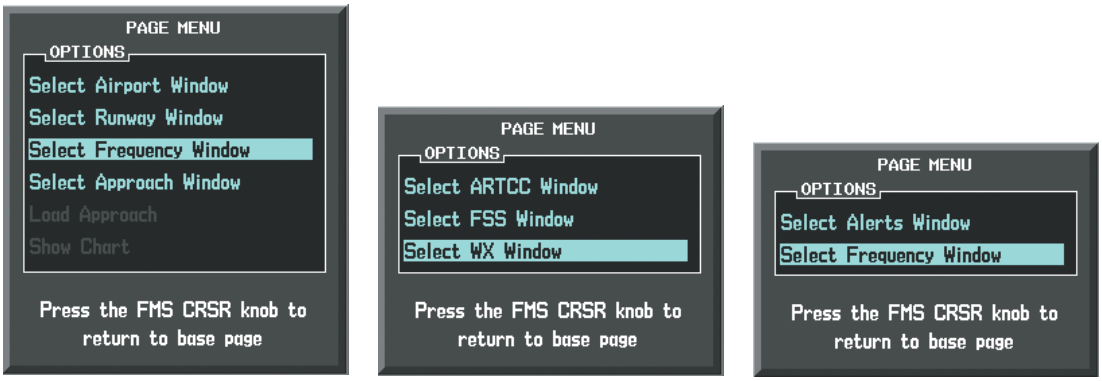


Figure 4-14 Frequency Auto-Tuning from the MFD

Or:

1) On the Nearest Airports, Frequencies, or Airspaces page, press the **MENU** Key to display the page menu.
2) Turn the large **FMS** Knob to scroll through the menu options.
3) Press the **ENT** Key to place the cursor on the desired selection.
4) Scroll through the frequency selections with the **FMS** Knob.
5) Press the **ENT** Key to load the COM frequency into the standby field of the selected COM radio.
6) Press the **Frequency Transfer** Key to transfer the frequency to the COM Active Frequency Field.



Nearest Airports Menu *Nearest Frequencies Menu* *Nearest Airspaces Menu*

Figure 4-15 Nearest Pages Menus

On the WPT - Airport Information Page, place the cursor on the frequency field by pressing the **FMS** Knob and scrolling through the list. Transfer the frequency to the COM Standby Field with the **ENT** Key.



Selected Airport Identifier and Information

Runway Information

*Press **ENT** Key to load frequency into PFD1 COM Standby Field. Cursor then advances to the next frequency.*

*Select **INFO-x** Softkey for AIRPORT, RUNWAYS, and FREQUENCIES Windows*

Figure 4-16 WPT – Airport Information Page

Tune COM frequencies from the NRST – Nearest Airspaces, NRST – Nearest Frequencies, and NRST – Nearest Airports Pages on the MFD in a similar manner using the appropriate softkeys or **MENU** Key, the **FMS** Knob, and the **ENT** Key.



Figure 4-17 NRST – Nearest Airspaces, NRST – Nearest Airports, and NRST – Nearest Frequencies Pages

FREQUENCY SPACING

The G900X COM radios can tune either 25-kHz spacing (118.000 to 136.975 MHz) or 8.33-kHz spacing (118.000 to 136.990 MHz) for 760-channel or 3040-channel configuration. When 8.33-kHz channel spacing is selected, all of the 25-kHz channel spacing frequencies are also available in the complete 3040-channel list.

COM channel spacing is set on the System Setup Page of the AUX Page Group.



8.33-kHz Channel Spacing

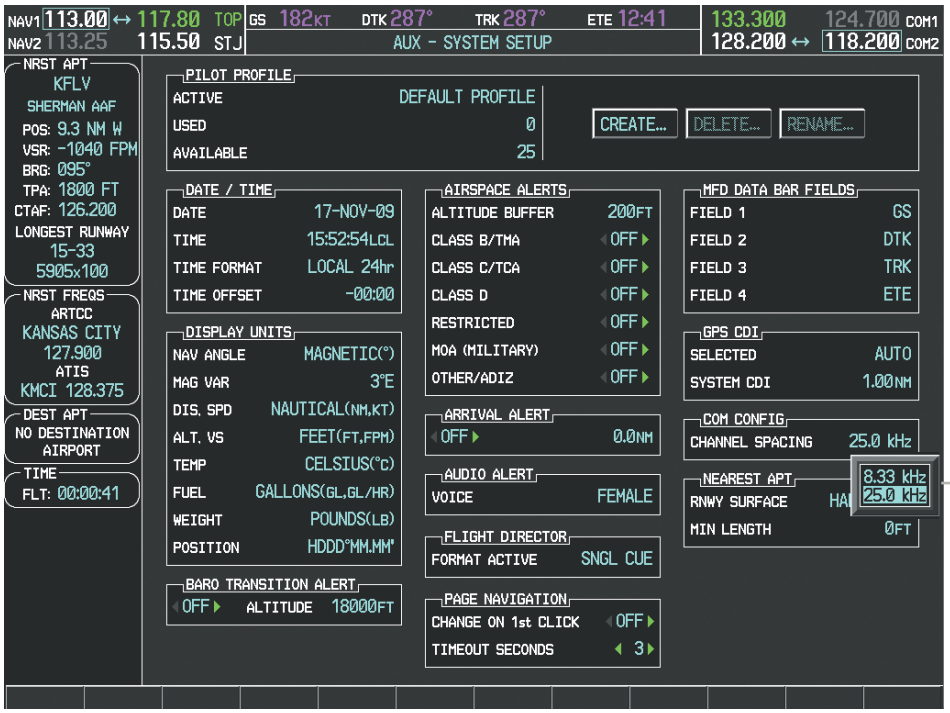
25-kHz Channel Spacing

Figure 4-18 COM Channel Spacing

Changing COM frequency channel spacing:

1) Select the AUX – System Setup Page.
2) Press the **FMS** Knob to activate the flashing cursor.
3) Turn the large **FMS** Knob to highlight the Channel Spacing Field in the COM Configuration Box.
4) Turn the small **FMS** Knob to select the desired channel spacing.
5) Press the **ENT** Key to complete the channel spacing selection.

While the COM CONFIG Window is selected, the G900X softkeys are blank.



Select 8.33-kHz or 25.0-kHz COM Frequency Channel Spacing

Figure 4-19 AUX – System Setup Page

AUTOMATIC SQUELCH

Automatic Squelch quiets unwanted static noise when no audio signal is received, while still providing good sensitivity to weak COM signals. To disable Automatic Squelch, press the **VOL/SQ** Knob. While Automatic Squelch is disabled, COM audio reception is continuous (static noise is heard over the headsets and speaker). Pressing the **VOL/SQ** Knob again enables Automatic Squelch.

When Automatic Squelch is disabled, a white SQ appears next to the COM frequency.



Figure 4-20 Overriding Automatic Squelch

VOLUME

Adjust COM radio volume level from 0 to 100% using the **VOL/SQ** Knob. Turning the knob clockwise increases volume, turning the knob counterclockwise decreases volume. When adjusting volume, the level is displayed in place of the standby frequencies. Volume level indication remains for two seconds after the change.

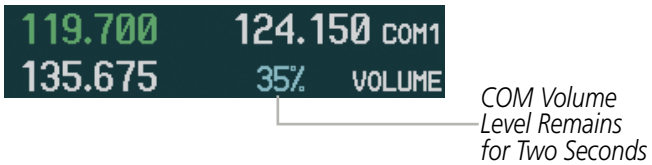


Figure 4-21 COM Volume Level

4.3 NAV OPERATION

NAV RADIO SELECTION AND ACTIVATION

The NAV Frequency Box is composed of four fields; two standby fields and two active fields. The active frequencies are on the right side and the standby frequencies are on the left.

Press the **CDI** Softkey on the PFD to select a NAV radio for navigation. The active NAV frequency selected for navigation is displayed in green. Pressing the **CDI** Softkey once selects NAV1 as the navigation radio. Pressing the **CDI** Softkey a second time selects NAV2 as the navigation radio. Pressing the **CDI** Softkey a third time activates GPS mode. Pressing the **CDI** Softkey again cycles back to NAV1.

While cycling through the **CDI** Softkey selections, the NAV Tuning Box and the Frequency Transfer Arrow are placed in the active NAV Frequency Field and the active NAV frequency color changes to green.

The three navigation modes that can be cycled through are:

- VOR1 (or LOC1) – If NAV1 is selected, a green single line arrow (not shown) labeled either VOR1 or LOC1 is displayed on the HSI and the active NAV1 frequency is displayed in green.
- VOR2 (or LOC2) – If NAV2 is selected, a green double line arrow (shown) labeled either VOR2 or LOC2 is displayed on the HSI and the active NAV2 frequency is displayed in green.
- GPS – If GPS Mode is selected, a magenta single line arrow (not shown) appears on the HSI and neither NAV radio is selected. Both active NAV frequencies are then displayed in white.

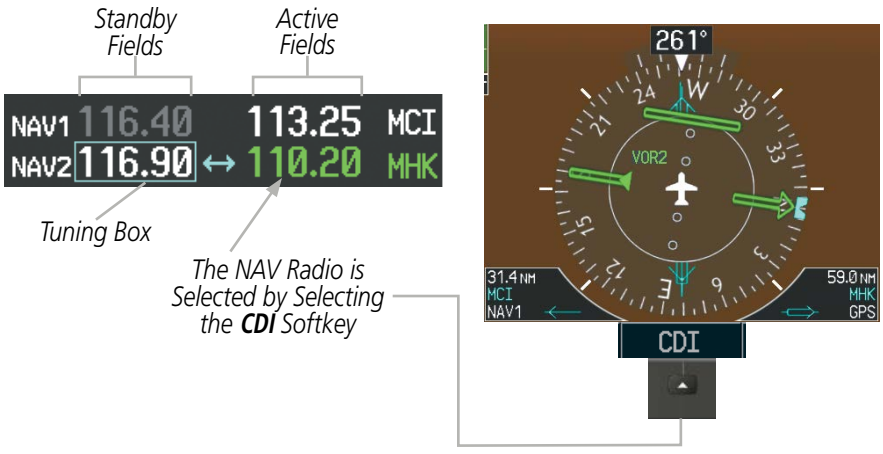


Figure 4-22 Selecting a NAV Radio for Navigation

See the Flight Instruments Section for selecting the DME and Bearing Information windows and using VOR as the source for the bearing pointer.

The NAV Frequency Box displays the decoded Morse Code station identifier that is received from the navigation source. Audio verification of the selected station identifier is still required, and can be accomplished by selecting the corresponding NAV radio on the audio panel and pressing the **NAV VOL/ID** Knob.

Select NAV radios for listening by pressing the corresponding keys on the Audio Panel. Pressing the **NAV1**, **NAV2**, or **DME** Key selects and deselects the navigation radio source. Selected audio can be heard over the headset and the speakers (if selected). All radios can be selected individually or simultaneously.



Figure 4-23 Selecting a NAV Radio Receiver

NAV RECEIVER MANUAL TUNING

The NAV frequency controls and frequency boxes are on the left side of the MFD and PFDs.

Manually tuning a NAV frequency:

1) Turn the **NAV** Knob to tune the desired frequency in the NAV Tuning Box.
2) Press the **Frequency Transfer** Key to transfer the frequency to the NAV Active Frequency Field.
3) Adjust the volume level with the NAV **VOL/ID** Knob.
4) Press the NAV **VOL/ID** Knob to turn the Morse code identifier audio on and off.

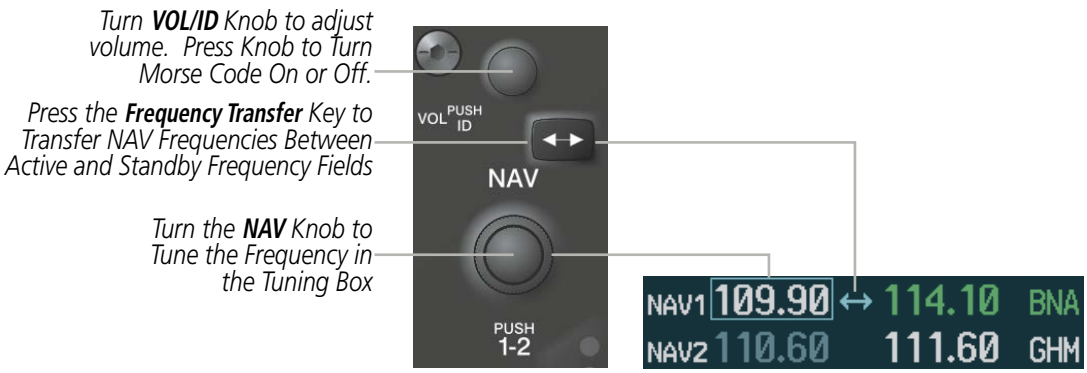


Figure 4-24 NAV Frequency Tuning

Manual NAV frequency tuning from the Control Unit

1) Press the **NAV** Key to enable the **FMS** Knob for NAV tuning. The NAV Tuning Selection Box is shown.
2) Press the **NAV** Key again, if needed, to select the desired NAV radio (1 or 2).
3) Turn the **FMS** Knob to tune the desired frequency in the NAV Tuning Box (large knob for MHz; small knob for kHz).

   Or:

   Press the numeric keys on the keypad to enter a Frequency.
4) Press the **Frequency Transfer** Key to transfer the frequency to the active field.

If an error is made during frequency entry with the numeric keypad, pressing the **BKSP** Key moves the cursor back one space. If an incorrect frequency is entered, reenter the correct one using the same procedure.

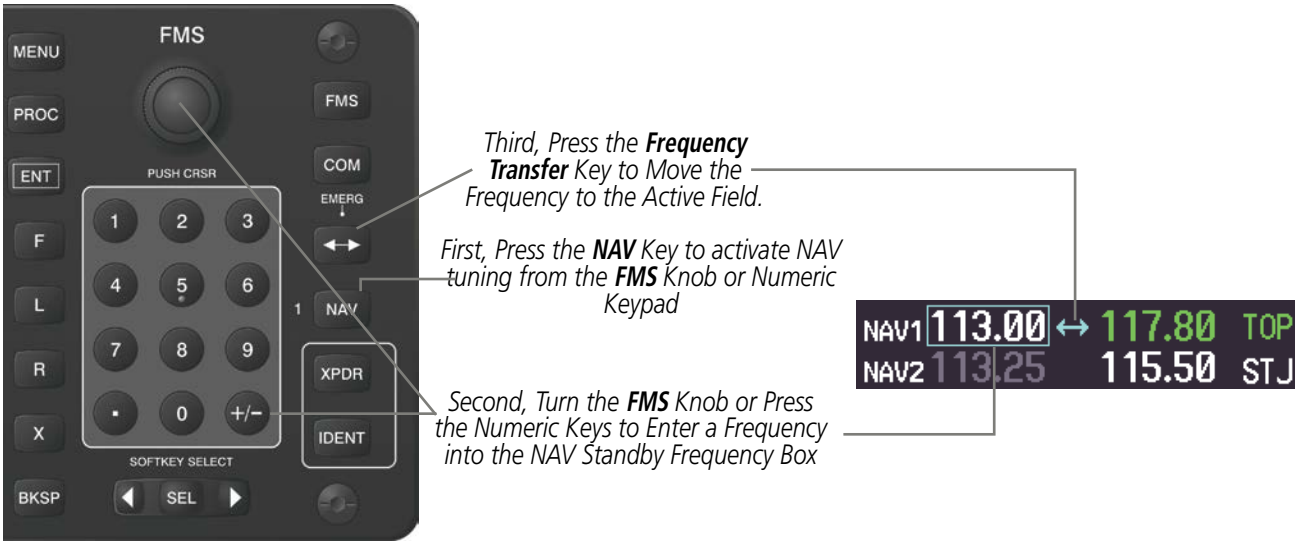


Figure 4-25 Frequency Tuning from the Control Unit

SELECTING THE RADIO TO BE TUNED

Press the small **NAV** Knob to transfer the frequency tuning box and Frequency Transfer Arrow between the upper and lower radio frequency fields.

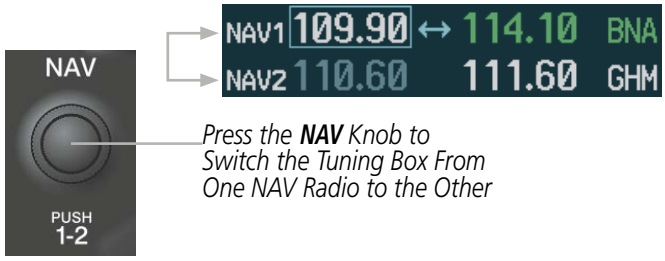


Figure 4-26 Switching NAV Tuning Boxes

VOR/LOC ID

When the Morse code Identifier audio is on for a NAV radio, a white ID appears to the left of the active NAV frequency.

In the example shown, in order to listen to either station identifier, press the **NAV1** or **NAV2** Key on the Audio Panel. Pressing the **VOL/ID** Knob turns off the Morse code audio only in the radio with the NAV Tuning Box. To turn off both NAV IDs, transfer the NAV Tuning Box between NAV1 and NAV2 by pressing the small **NAV** Knob and pressing the **VOL/ID** Knob again to turn the Morse code off in the other radio.



Figure 4-27 NAV Radio ID Indication

VOLUME

Adjust NAV Radio volume level from 0 to 100% using the **VOL/ID** Knob. Turning the knob clockwise increases volume, counterclockwise decreases volume.

When adjusting, the level is displayed in place of the standby frequencies. Volume level indication remains for two seconds after the change.



Figure 4-28 NAV Volume Levels

AUTO-TUNING A NAV FREQUENCY FROM THE MFD

Select and load NAV frequencies from the following MFD pages:

- WPT – Airport Information
- WPT – VOR Information
- NRST – Nearest Airports
- NRST – Nearest VOR
- NRST – Nearest Frequencies (FSS, WX)
- NRST – Nearest Airspaces

The MFD provides auto-tuning of NAV frequencies from waypoint and nearest pages. During enroute navigation, the NAV frequency is entered automatically into the NAV standby frequency field. During approach activation the NAV frequency is entered automatically into the NAV active frequency field.

Load frequencies into the NAV Frequency Box from pages in the NRST or WPT page group by highlighting the frequency and pressing the **ENT** Key (Figures 4-29, 4-30, and 4-31).

Auto-tuning a NAV frequency from the WPT and NRST Pages:

1) From any page that the NAV frequency can be auto-tuned, activate the cursor by pressing the **FMS** Knob or pressing the appropriate softkey.
2) Turn the **FMS** Knob to place the cursor on the desired NAV identifier or NAV frequency.
3) On the Nearest VOR, Nearest Airspaces, and Nearest Airports pages, press the **FREQ** Softkey to place the cursor on the NAV frequency (Figure 4-31).
4) Press the **ENT** Key to load the NAV frequency into the standby field of the selected NAV radio.
5) Press the **Frequency Transfer** Key to transfer the frequency to the NAV Active Frequency Field.

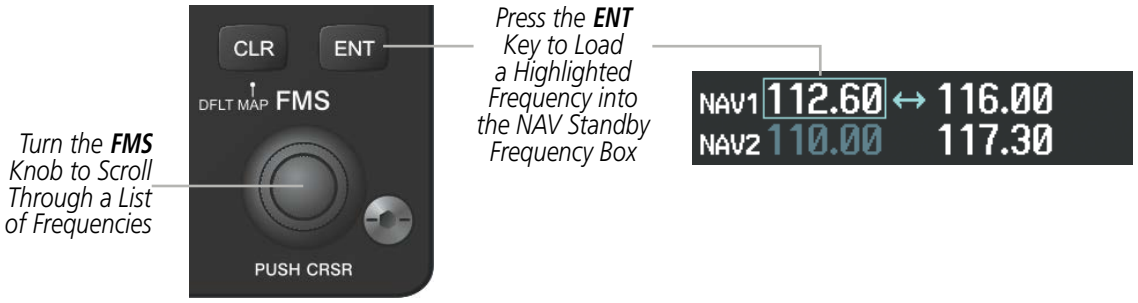
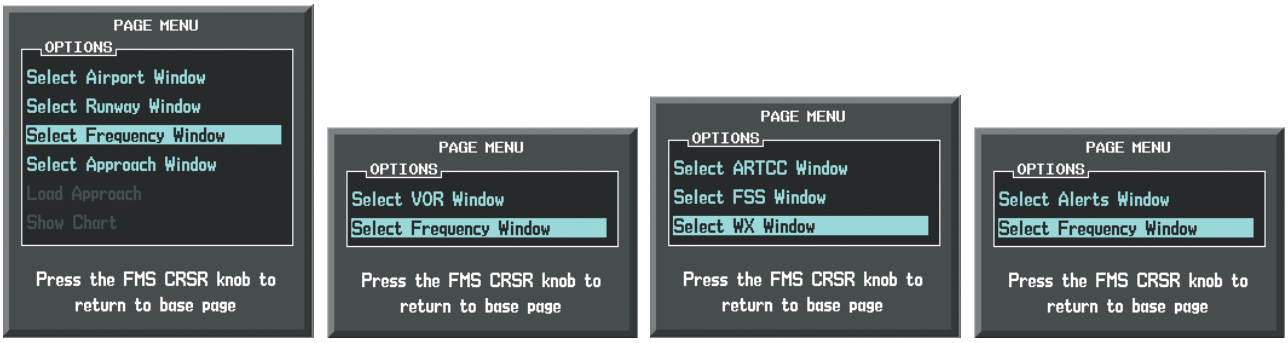


Figure 4-29 NAV Frequency Auto-Tuning from the MFD

Or:

1) When on the NRST pages, press the **MENU** Key to display the page menu.
2) Turn the large **FMS** Knob to scroll through the menu options.
3) Press the **ENT** Key to place the cursor in the desired window.
4) Scroll through the frequency selections with the **FMS** Knob.
5) Press the **ENT** Key to load the NAV frequency into the standby field of the selected NAV radio.
6) Press the **Frequency Transfer** Key to transfer the frequency to the NAV Active Frequency Field.



Nearest Airports Menu *Nearest VOR Menu* *Nearest Frequencies Menu* *Nearest Airspaces Menu*

Figure 4-30 Nearest Pages Menus

In the example shown, the VOR list is selected with the **VOR** Softkey or from the page menu. Use the **FMS** Knob or **ENT** Key to scroll through the list. Place the cursor on the frequency with the **FREQ** Softkey and load it into the NAV Tuning Box with the **ENT** Key.



Figure 4-31 Loading the NAV Frequency from the NRST – Nearest VOR Page

While enroute, tune NAV frequencies from the NRST – Nearest Airports, WPT – Airport Information, WPT – VOR Information, and NRST – Nearest Frequencies Pages on the MFD in a similar manner using the appropriate softkeys or **MENU** Key, the **FMS** Knob, and the **ENT** Key.



Figure 4-32 NRST – Nearest Frequencies, WPT – VOR Information, WPT – Airport Information, and NRST – Nearest Airports Pages

AUTO-TUNING NAV FREQUENCIES ON APPROACH ACTIVATION

NOTE: *The primary NAV frequency is auto-tuned upon loading a VOR or ILS/Localizer approach.*

NOTE: *When an ILS/LOC approach has been activated in GPS Mode, the system switches to NAV Mode as the final approach course is intercepted (within 15 nm of the FAF). See the Flight Management Section for details.*

NAV frequencies are automatically loaded into the NAV Frequency Box on approach activation.

When loading or activating a VOR or ILS/LOC approach, the approach frequency is automatically transferred to a NAV frequency field as follows:

- If the current CDI navigation source is GPS, the approach frequency is transferred to the NAV1 or NAV2 active frequency fields. The frequency that was previously in the NAV1 or NAV2 active frequency fields are transferred to standby.
- If the current CDI navigation source is GPS, and if the approach frequency is already loaded into the NAV1 or NAV2 standby frequency field, the standby frequency is transferred to active.
- If the current CDI navigation source is NAV1 or NAV2, the approach frequency is transferred to the standby frequency fields of the selected CDI NAV radio.

MARKER BEACON RECEIVER

NOTE: *The marker beacon indicators operate independently of marker beacon audio and cannot be disabled.*

The marker beacon receiver is used as part of the ILS. The marker beacon receiver is always on and detects any marker beacon signals within the reception range of the aircraft.

The receiver detects the three marker tones – outer, middle, and inner – and provides the marker beacon annunciations located to the left of the Altimeter on the PFD.

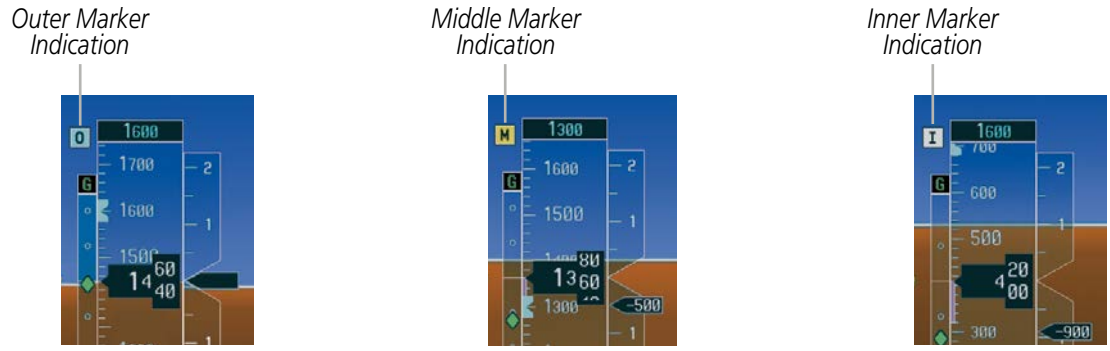


Figure 4-33 Marker Beacon Annunciations on the PFD



Figure 4-34 Marker Beacon Keys

The Audio Panel provides three different states of marker beacon operation; On, Muted, and Deselected. Pressing the **MKR/MUTE** Key selects and deselects marker beacon audio. The key annunciator indicates when marker beacon audio is selected.

During marker beacon audio reception, pressing the **MKR/MUTE** Key mutes the audio but does not affect the marker annunciations (Figure 4-32). The marker tone is silenced, then waits for the next marker tone. The **MKR/MUTE** Key Annunciator is illuminated, indicating audio muting. The audio returns when the next marker beacon signal is received. If the **MKR/MUTE** Key is pressed during signal reception (O, M, I indication) while marker beacon audio is muted, the audio is deselected and the **MKR/MUTE** Key Annunciator is extinguished.

Pressing the **HI SENS** Key switches between high and low marker beacon receiver sensitivity. The HI SENS function (annunciator illuminated) is used to provide an earlier indication when nearing a marker during an approach. The LO SENS function (annunciator extinguished) results in a narrower marker dwell while over a station.

DME TUNING

NOTE: *When another auxiliary window is turned on, the DME Tuning Window is replaced on the PFD.*

NOTE: *When turning on the G900X for use, the system remembers the last frequency used for DME tuning and the NAV1, NAV2, or HOLD state prior to shutdown.*

The G900X System tunes the optional DME transceiver. Tune the UHF DME frequency by pairing with a VHF NAV frequency. DME frequency pairing is automatic and only the VHF NAV frequency is shown.

The DME Tuning Window is located to the right of the HSI in the lower right corner of the PFD. Select NAV1, NAV2, or HOLD in the DME Tuning Window to tune the DME transceiver. Pressing the **DME** Softkey shows or hides the DME Tuning Window.

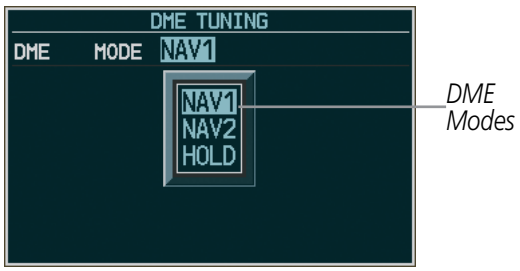


Figure 4-35 DME Tuning Window

The following DME transceiver pairings can be selected:

- NAV1 – Pairs the DME frequency from the selected NAV1 frequency.
- NAV2 – Pairs the DME frequency from the selected NAV2 frequency.
- HOLD – When in the HOLD position, the DME frequency remains paired with the last selected NAV frequency.

Selecting DME transceiver pairing:

1) Press the **DME** Softkey to display the DME Tuning Window.
2) Turn the small **FMS** Knob to select the DME tuning mode.
3) Press the **ENT** Key to complete the selection.

Pressing the **CLR** Key or **FMS** Knob while in the process of DME pairing cancels the tuning entry and reverts back to the previously selected DME tuning state. Pressing the **FMS** Knob activates/deactivates the cursor in the DME Tuning Window.

See the Flight Instruments Section for displaying the DME information window.

4.4 MODE S TRANSPONDER(S)

The single or dual GTX 33 or GTX 33 with Extended Squitter Mode S Transponder(s) provide Mode A, Mode C, and Mode S interrogation and reply capabilities. Selective addressing or Mode Select (Mode S) capability includes the following features:

- Level-2 reply data link capability to exchange information between aircraft and Air Traffic Control (ATC) facilities
- Surveillance identifier capability
- Flight ID (Flight Identification) reporting – The Mode S Transponder reports aircraft identification as either the aircraft registration or a unique Flight ID.
- Altitude reporting
- Airborne status determination
- Transponder capability reporting
- Mode S Enhanced Surveillance (EHS) requirements
- Mode S Elementary Surveillance (ELS) requirements
- Acquisition squitter – Acquisition squitter, or short squitter, is the transponder 24-bit identification address. The transmission is sent periodically, regardless of the presence of interrogations. The purpose of acquisition squitter is to enable Mode S ground stations and aircraft equipped with a Traffic Avoidance System (TAS) to recognize the presence of Mode S-equipped aircraft for selective interrogation.
- Extended squitter (Optional) – The extended squitter is transmitted periodically and contains information such as altitude (barometric and GPS), GPS position, and aircraft identification. The purpose of extended squitter is to provide aircraft position and identification to ADS-B Ground-Based Transceivers (GBTs) and other aircraft.

The Hazard Avoidance Section provides more details on traffic avoidance systems.

TRANSPONDER CONTROLS

Transponder function is displayed on three levels of softkeys on the PFD: Top-level, Mode Selection, and Code Selection. When the top-level **XPDR** Softkey is selected, the Mode Selection softkeys appear: **XPDR1**, **XPDR2** (optional), **STBY**, **ON**, **ALT**, **VFR**, **CODE**, **IDENT**, **ADS-B TX** (optional), **BACK**.

When the **CODE** Softkey is pressed, the number softkeys appear: **0**, **1**, **2**, **3**, **4**, **5**, **6**, **7**, **IDENT**, **BKSP**, **BACK**. The digits 8 and 9 are not used for code entry. Pressing the numbered softkeys in sequence enters the transponder code. If an error is made, pressing the **BKSP** Softkey moves the code selection cursor to the previous digit. Pressing the **BKSP** Softkey again moves the cursor to the next previous digit.

Pressing the **BACK** Softkey during code selection reverts to the Mode Selection Softkeys. Pressing the **BACK** Softkey during mode selection reverts to the top-level softkeys.

The code can also be entered with the **FMS** Knob on either PFD. Code entry must be completed with either the softkeys or the **FMS** Knob, but not a combination of both.

Pressing the **IDENT** Softkey while in Mode or Code Selection initiates the ident function and reverts to the top-level softkeys.

After 45 seconds of transponder control inactivity, the system reverts back to the top-level softkeys.

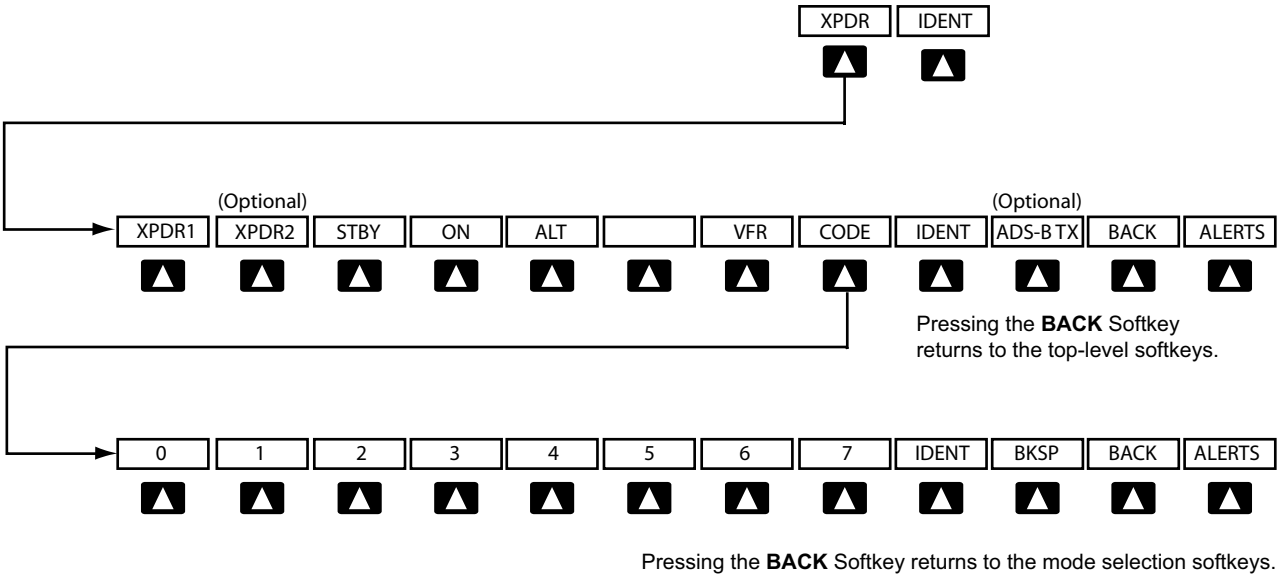


Figure 4-36 Transponder Softkeys (PFD) (Dual Transponders Shown)

Selecting and activating Transponder 1 or Transponder 2:

1) Press the **XPDR** Softkey to display the Transponder Mode Selection Softkeys.
2) Press the **XPDR1** or **XPDR2** Softkey to select and activate the other transponder.

When powering on the G900X, the system activates Transponder 1 as the default unit, regardless of which transponder was active prior to shutdown. When switching between Transponder 1 and Transponder 2, the code and mode remain the same. If a new code is entered in the active transponder, switching transponders does not bring back the previous code.

TRANSPONDER MODE SELECTION

Mode selection can be automatic (Altitude Modes) or manual (Standby, On, and Altitude Modes). The **STBY**, **ON**, and **ALT** Softkeys can be accessed by selecting the **XPDR** Softkey.

Selecting a transponder mode:

1) Press the **XPDR** Softkey to display the Transponder Mode Selection Softkeys.
2) Select the desired softkey to activate the transponder mode.

STANDBY MODE (MANUAL)

NOTE: *In Standby Mode, the IDENT function is inhibited.*

Standby Mode can be selected at any time by pressing the **STBY** Softkey. In Standby, the transponder is powered and new codes can be entered, but no replies or squitters are transmitted.. When Standby is selected, a white STBY indication and transponder code appear in the mode field of the Transponder Data Box.



Figure 4-37 Standby Mode

ON MODE (MANUAL)

ON Mode can be selected at any time by pressing the **ON** Softkey. ON Mode generates Mode A and Mode S replies as well as transmission of acquisition and extended squitters, including ADS-B out (if equipped). Mode S replies will not include altitude information. Mode C altitude reporting is inhibited. In ON Mode, a green ON indication and transponder code appear in the mode field of the Transponder Data Box.

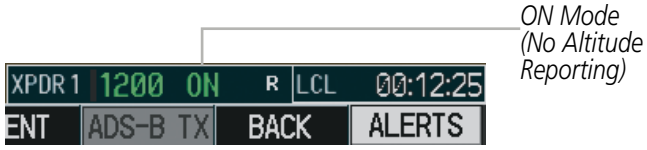


Figure 4-38 ON Mode

ALTITUDE MODE (AUTOMATIC OR MANUAL)

The white Altitude Reporting Mode is normally selected automatically when the aircraft is on the ground. White Altitude Mode may also be selected manually by pressing the **ALT** Softkey while on the ground. White Altitude Mode generates Mode S replies to discrete interrogations as well as transmission of acquisition and extended squitters, including ADS-B out (if equipped). Mode A, Mode C, and Mode S all-call replies are inhibited.

If Altitude Mode is selected while on the ground, a white ALT indication and transponder code appear in the mode field of the Transponder Data Box.



Figure 4-39 Altitude Mode

The green Altitude Mode is automatically selected when the aircraft becomes airborne. Green Altitude Mode may also be selected manually by pressing the **ALT** Softkey while airborne. Green Altitude Mode generates Mode A, Mode C, and Mode S replies as well as transmissions of acquisition and extended squitters including ADS-B out (if equipped).

If Altitude Mode is selected while airborne, a green ALT indication and transponder code appear in the mode field of the Transponder Data Box, and all transponder replies requesting altitude information are provided with pressure altitude information.



Figure 4-40 Altitude Mode

REPLY STATUS

When the transponder sends replies to interrogations, a white R indication appears momentarily in the reply status field of the Transponder Data Box.



Figure 4-41 Reply Indication

ENTERING A TRANSPONDER CODE

Entering a transponder code with softkeys:

1) Press the **XPDR** Softkey to display the Transponder Mode Selection Softkeys.
2) Press the **CODE** Softkey to display the Transponder Code Selection Softkeys, for digit entry.
3) Press the digit softkeys to enter the code in the code field. When entering the code, the next softkey in sequence must be selected within 10 seconds, or the entry is cancelled and restored to the previous code. Press the **BKSP** Softkey to move the code selection cursor to the previous digit. Five seconds after the fourth digit has been entered, the transponder code becomes active.



Figure 4-42 Entering a Code

Entering a transponder code with the PFD FMS Knob:

1) Press the **XPDR** and the **CODE** Softkeys as in the previous procedure to enable code entry.
2) Turn the small **FMS** Knob to enter the first two code digits.
3) Turn the large **FMS** Knob to move the cursor to the next code field.
4) Enter the last two code digits with the small **FMS** Knob.
5) Press the **ENT** Key to complete code digit entry.

Pressing the **CLR** Key or small **FMS** Knob before code entry is complete cancels code entry and restores the previous code. Waiting for 10 seconds after code entry is finished activates the code automatically.



Figure 4-43 Entering a Code with the FMS Knob

Manual code entry from the Control Unit

1) Press the **XPDR** Key to select the transponder code field.
2) Turn the small **FMS** Knob on the PFD to enter the first two code digits, turn the large **FMS** Knob to select the last two digits, and turn the small **FMS** Knob to enter the last two code digits.

   Or:

   Press the numeric keys on the keypad to enter a code.

If an error is made during code entry with the numeric keypad, press the **BKSP** Key to move the cursor back one space. If an incorrect code is entered, reenter the correct one using the same procedure.

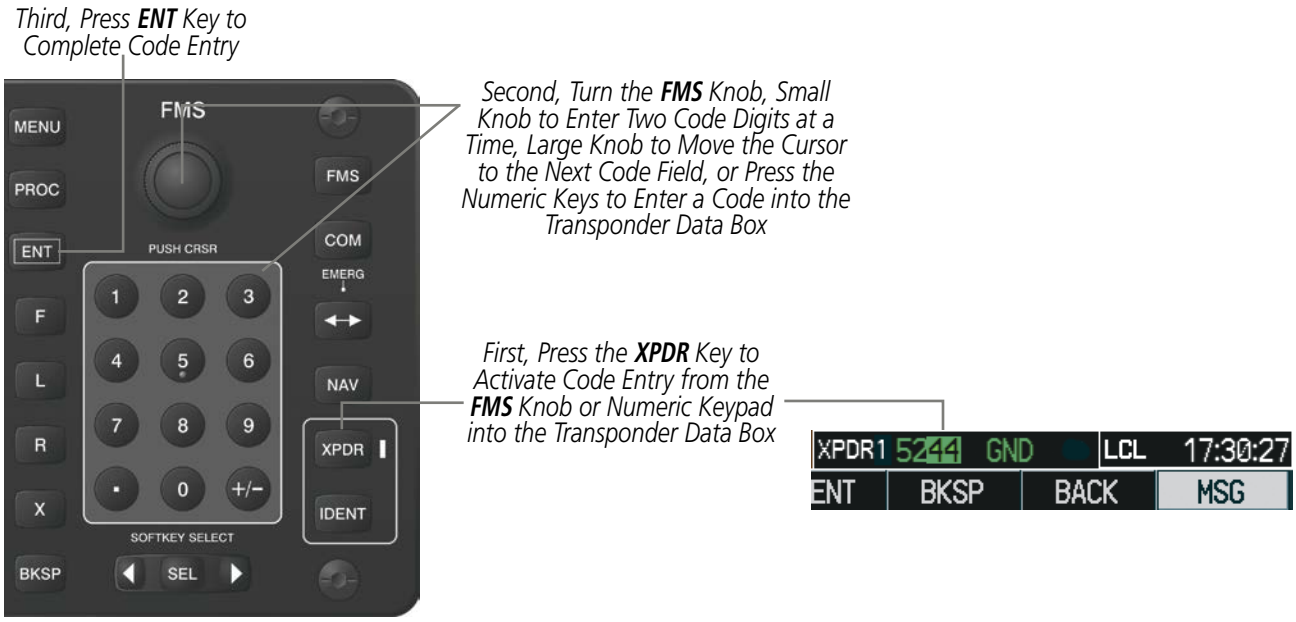


Figure 4-44 Transponder Code Entry from the Control Unit

VFR CODE

The VFR code can be entered either manually or by pressing the **XPDR** Softkey, then the **VFR** Softkey. When the **VFR** Softkey is pressed, the pre-programmed VFR code is automatically displayed in the code field of the Transponder Data Box. Pressing the **VFR** Softkey again restores the previous identification code.

The pre-programmed VFR Code is set at the factory to 1200. If a VFR code change is required, contact a Garmin-authorized service center for configuration.



Figure 4-45 VFR Code

IDENT FUNCTION

NOTE: *In Standby Mode, the **IDENT** Softkey is inoperative.*

Press the **IDENT** Softkey to send a distinct identity indication to Air Traffic Control (ATC). The indication distinguishes the identing transponder from all the others on the air traffic controller's screen. The **IDENT** Softkey appears on all levels of transponder softkeys. When the **IDENT** Softkey is pressed, a green IDNT indication is displayed in the mode field of the Transponder Data Box for a duration of 18 seconds.

After the **IDENT** Softkey is pressed while in Mode or Code Selection, the system reverts to the top-level softkeys.



Figure 4-46 IDENT Softkey and Indication

ADS-B TX

If equipped with an optional GTX 33 ES Transponder, transmission of extended squitters containing ADS-B out information is enabled/disabled by pressing the **ADS-B TX** Softkey. ADS-B transimssion defaults to enabled at each power cycle. Do not disable ADS-B transmission unless requested by ATC.

Even with the ADS-B TX enabled, transmission of extended squitters containing ADS-B out information will vary based on the current mode of the transponder



Figure 4-47 Altitude Mode

FLIGHT ID REPORTING

NOTE: *If the Flight ID is required but the system is not configured for it, contact a Garmin-authorized service center for configuration.*

Flight ID Reporting is an optional feature for the G900X.

When the Flight ID must be entered before flight operation, the identifier is placed in the Timer/References Window on the PFD. The Flight ID is not to exceed seven characters. No space is needed when entering Flight ID. When a Flight ID contains a space, the system automatically removes it upon completion of Flight ID entry. If configuration is set to "SAME AS TAIL" the aircraft tail number will always be displayed.

Entering a Flight ID:

1) Press the **TMR/REF** Softkey to display the Timer/References Window.
2) Press the **FMS** Knob to activate the selection cursor, if not already activated.
3) Turn the large **FMS** Knob to scroll down to the Flight ID.
4) Turn the small **FMS** Knob to enter the desired Flight ID.
5) Press the **ENT** Key to complete Flight ID entry. The word "updating" appears until the new entry is completed.

If an error is made during Flight ID entry, pressing the **CLR** Key returns to the original Flight ID entry. While entering a Flight ID, turning the **FMS** Knob counterclockwise moves the cursor back one space for each detent of rotation. If an incorrect Flight ID is discovered after the unit begins operation, reenter the correct Flight ID using the same procedure.

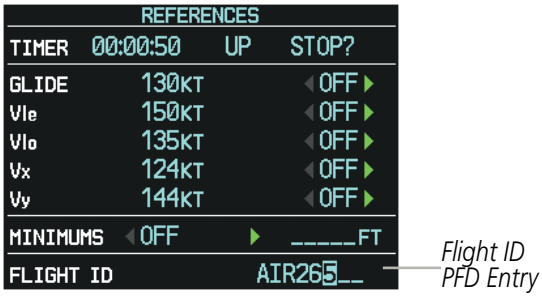


Figure 4-48 Timer/References Window, Entering Flight ID

4.5 ADDITIONAL AUDIO PANEL FUNCTIONS

POWER-UP

The Audio Panel performs a self-test during power-up. During the self-test all Audio Panel annunciator lights illuminate for approximately two seconds. Once the self-test is completed, most of the settings are restored to those in use before the unit was last turned off.

MONO/STEREO HEADSETS

Stereo headsets are recommended for use with the G900X.

Using a monaural headset in a stereo jack shorts the right headset channel output to ground. While this does not damage the Audio Panel, a person listening on a monaural headset hears only the left channel in both ears. If a monaural headset is used at one of the passenger positions, any other passenger using a stereo headset hears audio in the left ear only.

SPEAKER

All of the radios can be heard over the cabin speaker (if installed). Press the **SPKR** Key to select and deselect the cabin speaker. Speaker audio is muted when the PTT is pressed. Certain aural alerts and warnings (autopilot, traffic, altitude) are always heard on the speaker, even when the speaker is not selected.

The speaker volume is adjustable within a nominal range. Volume can be adjusted though configuration.



Figure 4-49 Speaker Key

INTERCOM

The Audio Panel includes a six-position intercom system (ICS) and a stereo music input for the pilot, copilot and up to four passengers. The intercom provides Pilot and Copilot isolation from the passengers and aircraft radios.



Figure 4-50 Intercom Controls

PILOT KEY Annunciator	COPLT KEY Annunciator	Pilot Hears	Copilot Hears	Passenger Hears
OFF	OFF	Selected radios, aural alerts, pilot, copilot, passengers, music	Selected radios, aural alerts, pilot, copilot, passengers, music	Selected radios, aural alerts, pilot, copilot, passengers, music
ON	OFF	Selected radios, aural alerts, pilot	Copilot, passengers, music	Copilot, passengers, music
OFF	ON	Selected radios, aural alerts, pilot; passengers, music	Copilot	Selected radios, aural alerts, pilot, passengers, music
ON	ON	Selected radios, aural alerts, pilot, copilot	Selected radios, aural alerts, pilot, copilot	Passengers; music

Table 4-1 ICS Isolation Modes

Pilot isolation is selected when the PILOT Annunciator is illuminated. During Pilot isolation, the pilot can hear the selected radios and aural alerts and warnings. The copilot and passengers can communicate with each other. The copilot is isolated from aural alerts and warnings.

Copilot isolation is selected when the COPLT Annunciator is illuminated. The copilot is isolated from the selected radios, aural alerts and warnings, and everyone else. The pilot and passengers can hear the selected radios, aural alerts, and communicate with each other.

When both the PILOT and COPLT Annunciators are illuminated, the pilot and copilot can hear the selected radios, aural alerts, and communicate with each other. The passengers are isolated from the pilot and copilot but can communicate with each other.

When both the PILOT and COPLT Annunciators are extinguished, everyone hears the selected radios, aural alerts, and is able to communicate with everyone else.

INTERCOM VOLUME AND SQUELCH

The **PILOT/PASS** Knob controls volume or manual squelch adjustment for the pilot and copilot/passenger. The small knob controls the pilot volume and squelch. The large knob controls the copilot/passenger volume and squelch. The VOL and SQ annunciations at the bottom of the unit indicate which function the knob is controlling. Press the **PILOT/PASS** Knob to switch between volume and squelch control as indicated by the VOL or SQ annunciation being illuminated.

The **MAN SQ** Key allows either automatic or manual control of the squelch setting.

- When the MAN SQ Annunciator is extinguished (Automatic Squelch is on), the **PILOT/PASS** Knob controls only the volume (pressing the **PILOT/PASS** Knob has no effect on the VOL/SQ selection).
- When the MAN SQ Annunciator is illuminated (Manual Squelch), the **PILOT/PASS** Knob controls either volume or squelch (selected by pressing the **PILOT/PASS** Knob and indicated by the VOL or SQ annunciation).

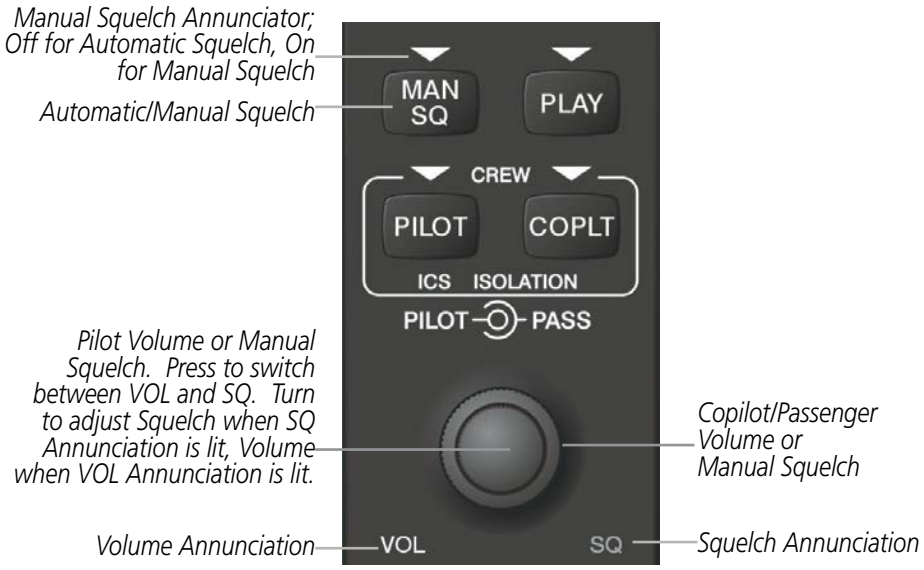


Figure 4-51 Volume/Squelch Control

PASSENGER ADDRESS (PA) SYSTEM

A passenger address system is available for delivering voice messages over the cabin speaker. When the **PA** Key is pressed on the Audio Panel, the COM MIC Annunciator is extinguished, and the active COM frequency changes to white, indicating that there is no COM selected. A Push-to-Talk (PTT) must be pressed to deliver PA announcements. The PA Annunciator flashes about once per second while the PTT is depressed.

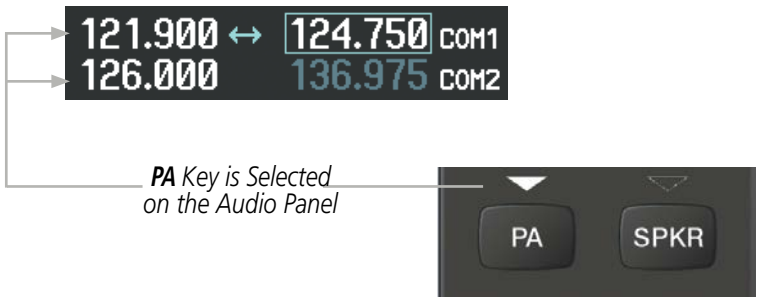


Figure 4-52 PA Key Selected for Cabin Announcements

CLEARANCE RECORDER AND PLAYER

The Audio Panel contains a digital clearance recorder that records up to 2.5 minutes of the selected COM radio signal. Recorded COM audio is stored in separate memory blocks. Once 2.5 minutes of recording time have been reached, the recorder begins recording over the stored memory blocks, starting from the oldest block.

The **PLAY** Key controls the play function. Press the **PLAY** Key once to play the latest recorded memory block. The PLAY Annunciator flashes to indicate when play is in progress. The PLAY Annunciator turns off after the present memory block has finished playing.

Press the **MKR/MUTE** Key during play of a memory block to stop play. If a COM input signal is detected during play of a recorded memory block, play is halted.

Press the **PLAY** Key while audio is playing to play the previously recorded memory block. Each subsequent press of the **PLAY** Key selects the previously recorded memory block.

Powering off the unit automatically clears all recorded blocks.



Figure 4-53 Play Key

ENTERTAINMENT INPUTS

NOTE: *Audio level for an external music input can be adjusted through configuration.*

The Audio Panel provides a stereo auxiliary entertainment input. The input is compatible with popular portable entertainment devices such as MP3 and CD players. A 3.5-mm stereo phone jack can optionally be installed in a convenient location. The headphone outputs of the entertainment devices are plugged into the jack.

The current ICS state of isolation affects the distribution of the entertainment input (see Table 4-1).

Music can be heard by the pilot and copilot when both the PILOT and the COPLT Annunciators are extinguished. Music can also be heard by the pilot when the COPLT Annunciator is illuminated and by the copilot when the PILOT Annunciator is illuminated.

Music muting occurs when aircraft radio or marker beacon activity is heard. Music is always soft muted when an interruption occurs from an aircraft radio. Soft muting is the gradual return of music to its original volume level. The time required for music volume to return to normal is between one-half and four seconds.

Press and hold the **MKR/MUTE** Key for three seconds to switch music muting on and off. When switching, either one or two beeps are heard; one beep indicates that music muting is enabled, two beeps indicate music muting is disabled. Music muting is reset (enabled) during power up.

XM RADIO ENTERTAINMENT

XM Radio audio from the Data Link Receiver may be heard by the pilot and passengers simultaneously (optional: requires subscription to XM Radio Service). Refer to the Additional Features Section for more details on the Data Link Receiver.

XM Radio audio will not be available when a device is connected to the optional 3.5-mm music jack.

4.6 AUDIO PANEL PREFLIGHT PROCEDURE

NOTE: *If the pilot and/or copilot are using headsets that have a high/low switch or volume control knob, verify that the switch is in the high position and the volume control on the headsets are at maximum volume setting. On single-pilot flights, verify that all other headsets are not connected to avoid excess noise in the audio system.*

NOTE: *When the **MAN SQ** Key is pressed, the ICS squelch can be set manually by the pilot and copilot. If manual squelch is set to full open (SQ annunciated and the knobs turned counterclockwise) background noise is heard in the ICS system as well as during COM transmissions.*

After powering up the G900X System, the following steps will aid in maximizing the use of the Audio Panel as well as prevent pilot and copilot induced issues. These preflight procedures should be performed each time a pilot boards the aircraft to ensure awareness of all audio levels in the Audio Panel and radios.

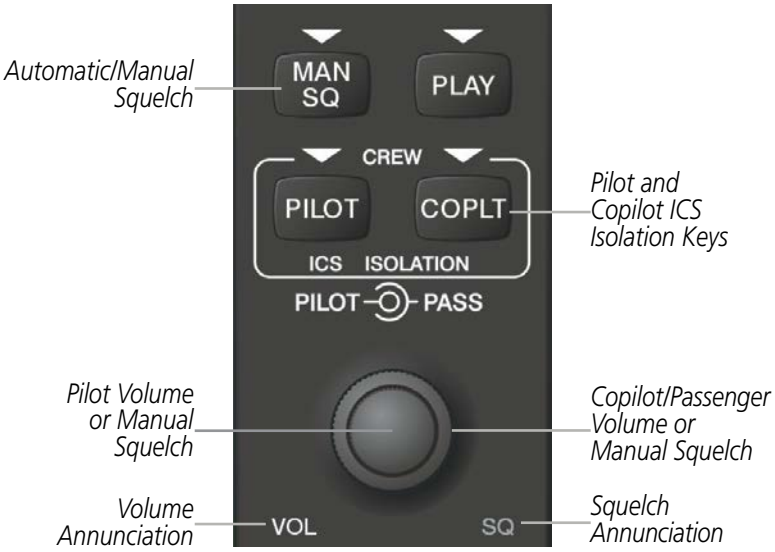


Figure 4-54 Audio Panel Controls

Setting the Audio Panel during preflight:

1) Verify that the PILOT and COPLT Annunciators are extinguished.
2) Verify that manual squelch is set to full open.
3) Turn the **PILOT/PASS** Knobs clockwise two full turns. This sets the headset intercom audio level to max volume (least amount of attenuation).
4) Adjust radio volume levels (COM, NAV, etc.) to a suitable level.
5) Adjust the **PILOT/PASS** Knob volume to the desired intercom level.
6) Reset squelch to automatic, or adjust to the appropriate level manually.

Once this procedure has been completed, the pilot and copilot can change settings, keeping in mind the notes above.

4.7 ABNORMAL OPERATION

Abnormal operation of the G900X includes equipment failures of the G900X components and failure of associated equipment, including switches and external devices.

STUCK MICROPHONE

If the push-to-talk (PTT) Key becomes stuck, the COM transmitter stops transmitting after 35 seconds of continuous operation. An alert appears on the PFD to advise the crew of a stuck microphone.

The **COM1 MIC** or **COM2 MIC** Key Annunciator on the Audio Panel flashes as long as the PTT Key remains stuck.



Figure 4-55 Stuck Microphone Alert

COM TUNING FAILURE

In case of a COM system tuning failure, the emergency frequency (121.500 MHz) is automatically tuned in the radio in which the tuning failure occurred. Depending on the failure mode, a red X may appear on the frequency display.



Figure 4-56 COM Tuning Failure

AUDIO PANEL FAIL-SAFE OPERATION

If there is a failure of the Audio Panel, a fail-safe circuit connects the pilot's headset and microphone directly to the COM1 transceiver. Audio will not be available on the speaker.

PFD FAILURE, DUAL SYSTEM

If PFD1 fails, COM1 and NAV1 display a red X on both remaining displays. NAV1 will be unavailable. COM1 automatically tunes 121.500 MHz, but the frequency is not shown. The COM1 emergency frequency is available to both the copilot and pilot.



Figure 4-57 Frequency Section of MFD Display after PFD1 Failure

If PFD2 fails, COM2 and NAV2 display a red X on the remaining PFD display. NAV2 will be unavailable. COM2 tunes 121.500 MHz, but the frequency is not shown. The COM2 emergency frequency is available to both the copilot and pilot.



Figure 4-58 PFD1 Display after PFD2 Failure

PFD FAILURE, SINGLE SYSTEM (REVERSIONARY MODE)

The red **DISPLAY BACKUP** Button selects the Reversionary Mode. See the System Overview Section for more information on Reversionary Mode.



Figure 4-59 Reversionary Mode Button

SECTION 5 FLIGHT MANAGEMENT

5.1 INTRODUCTION

The G900X is an integrated flight, engine, communication, navigation and surveillance system. This section of the Pilot's Guide explains flight management using the G900X.

The most prominent part of the G900X are the full color displays: one or two Primary Flight Displays (PFD) and a Multi Function Display (MFD). The information to successfully navigate the aircraft using the GPS sensors is displayed on the PFD and the MFD. See examples in the Figure 5-1 and Figure 5-2. Detailed descriptions of flight management functions are discussed later in this section.

A brief description of the flight management data on the PFD and MFD follows.

Navigation mode indicates which sensor is providing the course data (e.g., GPS, VOR) and the flight plan phase (e.g., Departure (DPRT), Terminal (TERM), Enroute (ENR), Oceanic (OCN), RNAV Approach (LNAV, LNAV+V, L/VNAV, LP, LP+V, or LPV), or Missed Approach (MAPR)).

The Inset Map is a small version of the MFD Navigation Map and can be displayed in the lower left corner of the PFD. When the system is in reversionary mode, the Inset Map is displayed in the lower right corner. The Inset Map is displayed by pressing the **INSET** Softkey. Pressing the **INSET** Softkey again, then pressing the **OFF** Softkey removes the Inset Map.

The Navigation Map displays aviation data (e.g., airports, VORs, airways, airspaces), geographic data (e.g., cities, lakes, highways, borders), topographic data (map shading indicating elevation), and hazard data (e.g., traffic, terrain, weather). The amount of displayed data can be reduced by pressing the **DCLTR** Softkey. The Navigation Map can be oriented four different ways: North Up (NORTH UP), Track Up (TRK UP), Desired Track Up (DTK UP), or Heading Up (HDG UP).

An aircraft icon is placed on the Navigation Map at the location corresponding to the calculated present position. The aircraft position and the flight plan legs are accurately based on GPS calculations. The basemap upon which these are placed are from a source with less resolution, therefore the relative position of the aircraft to map features is not exact. The leg of the active flight plan currently being flown is shown as a magenta line on the navigation map. The other legs are shown in white.

There are 28 different map ranges available, from 500 feet to 2000 nm. The current range is indicated in the lower right corner of the map and represents the top-to-bottom distance covered by the map. To change the map range on any map, turn the **Joystick** counter-clockwise to zoom in (-, decreasing), or clockwise to zoom out (+, increasing).

The Direct-to Window, the Flight Plan Window, the Procedures Window, and the Nearest Airports Window can be displayed in the lower right corner of the PFD. Details of these windows are discussed in detail later in the section.



Figure 5-1 GPS Navigation Information on the PFD

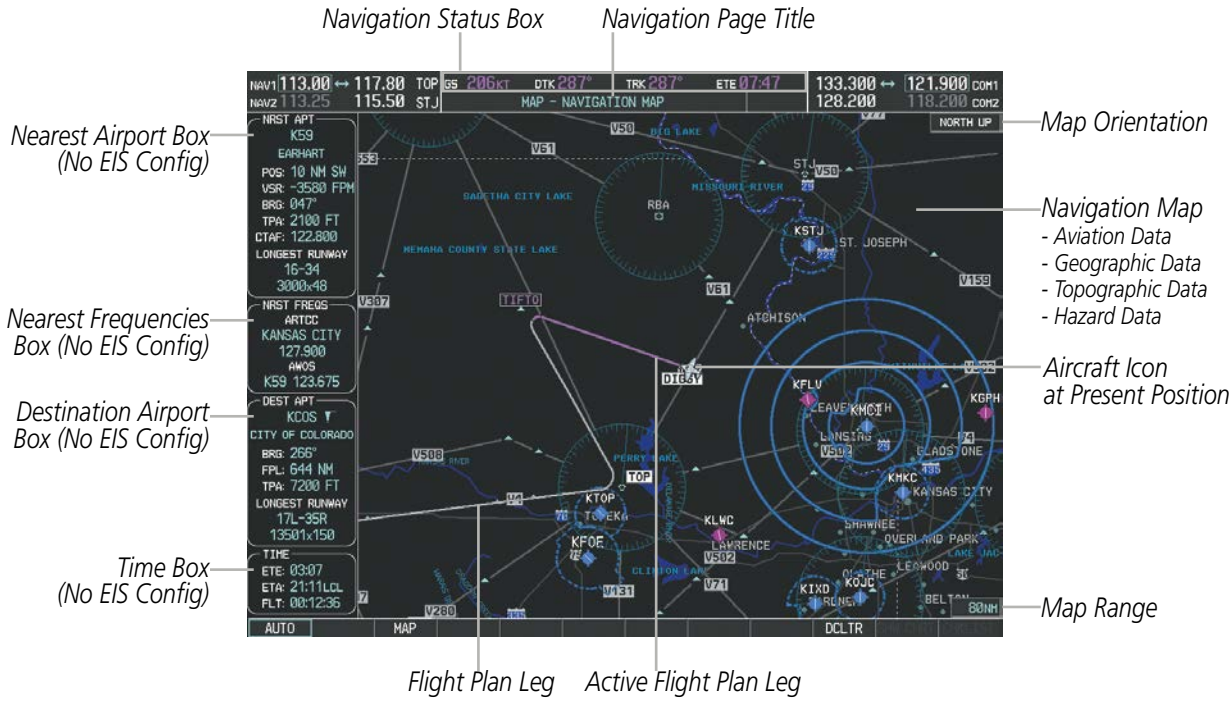


Figure 5-2 GPS Navigation Information on the MFD Navigation Page

NAVIGATION STATUS BOX

The Navigation Status Box located at the top of the PFD contains two fields displaying the following information:



PFD Navigation Status Box

- Active flight plan leg (e.g., 'D-> KICT' or 'KIXD -> KCOS') **or** flight plan annunciations (e.g., 'Turn right to 021° in 8 seconds')
- Distance (DIS) and Bearing (BRG) to the next waypoint **or** flight plan annunciations (e.g., 'TOD within 1 minute')

The symbols used in the PFD status bar are:

Symbol	Description	Symbol	Description
	Active Leg		Left Holding Pattern
	Direct-to		Vector to Final
	Right Procedure Turn		Right DME Arc
	Left Procedure Turn		Left DME Arc
	Right Holding Pattern		

The Navigation Status Box located at the top of the MFD contains four data fields, each displaying one of the following items:

BRG	Bearing
DIS	Distance
DTK	Desired Track
END	Endurance
ENR	ETE to Final Destination
ESA	Enroute Safe Altitude
ETA	Estimated Time of Arrival
ETE	Estimated Time Enroute
FOB	Fuel on Board

FOD	Fuel over Destination
GS	Ground Speed
ISA	ISA Relative Temperature
LDG	ETA at Final Destination
MSA	Minimum Safe Altitude
TAS	True Air Speed
TKE	Track Angle Error
TRK	Track



MFD Navigation Status Box

The navigation information displayed in the four data fields can be selected on the MFD Data Bar Fields Box on the AUX - System Setup Page. The default selections (in order left to right) are GS, DTK, TRK, and ETE.

WARNING: *The displayed minimum safe altitude (MSA) and enroute safe altitude (ESA) are different values than shown on an instrument approach plate. See the glossary entries for MSA and ESA for details on the meaning of the displayed values.*

Changing a field in the MFD Navigation Status Box:

1) Select the System Setup Page.
2) Press the **FMS** Knob momentarily to activate the flashing cursor.
3) Turn the large **FMS** Knob to highlight the desired field number in the MFD Data Bar Fields Box.
4) Turn the small **FMS** Knob to display and scroll through the data options list.
5) Select the desired data.
6) Press the **ENT** Key. Pressing the **DFLTS** Softkey returns all fields to the default setting.

5.2 USING MAP DISPLAYS

Map displays are used extensively in the G900X to provide situational awareness in flight. Most G900X maps can display the following information:

- Airports, NAVAIDs, airspaces, airways, land data (highways, cities, lakes, rivers, borders, etc.) with names
- Map range
- Wind direction and speed
- Map orientation
- Icons for enabled map features
- Aircraft icon (representing present position)
- Nav range ring
- Fuel range ring
- Map Pointer information (distance and bearing to pointer, location of pointer, name, and other pertinent information)
- Flight plan legs
- User waypoints
- Track vector
- Topography scale
- Topography data
- Obstacle data

The information in this section applies to the following maps unless otherwise noted:

- All Map Group Pages (MAP)
- All Waypoint Group Pages (WPT)
- AUX - Trip Planning
- All Nearest Group Pages (NRST)
- Flight Plan Pages (FPL)
- Direct-to Window
- PFD Inset Map
- Procedure Loading Pages

MAP ORIENTATION

Maps are shown in one of four different orientation options, allowing flexibility in determining aircraft position relative to other items on the map (north up) or for determining where map items are relative to where the aircraft is going (track up, desired track up, or heading up). The map orientation is shown in the upper right corner of the map.



Figure 5-3 Map Orientation

- North up (NORTH UP) aligns the top of the map display to north (default setting).
- Track up (TRK UP) aligns the top of the map display to the current ground track.
- Desired track up (DTK UP) aligns the top of the map display to the desired course.
- Heading up (HDG UP) aligns the top of the map display to the current aircraft heading.

NOTE: *When panning or reviewing active flight plan legs in a non-North Up orientation, the map does not show the map orientation nor the wind direction and speed.*

NOTE: *Map orientation can only be changed on the Navigation Map Page. Any other displays that show navigation data reflect the orientation selected for the Navigation Map Page:*

Changing the Navigation Map orientation:

1) With the Navigation Map Page displayed, press the **MENU** Key. The cursor flashes on the 'Map Setup' option.

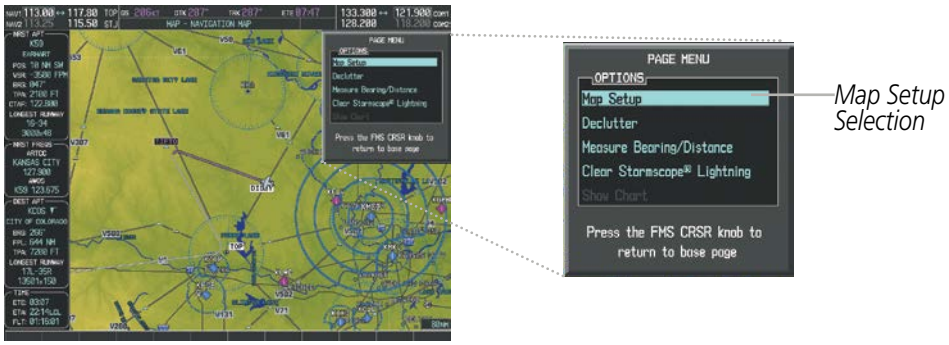


Figure 5-4 Navigation Map Page Menu Window

2) Press the **ENT** Key to display the Map Setup Window.

3) Turn the large **FMS** Knob, or press the **ENT** Key once, to select the 'ORIENTATION' field.



Figure 5-5 Map Setup Menu Window - Map Group

4) Turn the small **FMS** Knob to select the desired orientation.

5) Press the **ENT** Key to select the new orientation.

6) Press the **FMS** Knob to return to the base page.

The map can be configured to switch automatically to a north up orientation when the map range reaches a minimum range.

Enabling/disabling Auto North Up and selecting the minimum switching range:

1) Press the **MENU** Key with the Navigation Map Page displayed. The cursor flashes on the 'Map Setup' option.
2) Press the **ENT** Key. The Map Setup Menu is displayed.
3) Select the 'Map' group.
4) Press the **ENT** Key.
5) Highlight the 'AUTO NORTH UP' field.
6) Select 'On' or 'Off' using the small **FMS** Knob.
7) Press the **ENT** Key to accept the selected option. The flashing cursor highlights the range field.
8) Use the small **FMS** Knob to select the desired range.
9) Press the **ENT** Key to accept the selected option.
10) Press the **FMS** Knob to return to the Navigation Map Page.

MAP RANGE

There are 28 different map ranges available, from 500 feet to 2000 nm. The current range is indicated in the lower right corner of the map and represents the top-to-bottom distance covered by the map. When the map range is decreased to a point that exceeds the capability of the G900X to accurately represent the map, a magnifying glass icon is shown to the left of the map range. To change the map range turn the **Joystick** counter-clockwise to decrease the range, or clockwise to increase the range.



Range Overzoom

Figure 5-6 Map Range

AUTO ZOOM

Auto zoom allows the G900X to change the map display range to the smallest range clearly showing the active waypoint. Auto zoom can be overridden by adjusting the range with the Joystick, and remains until the active waypoint changes, a terrain or traffic alert occurs, the aircraft takes off, or the manual override times out (timer set on Map Setup Window).

If a terrain caution or warning occurs, all navigation maps automatically adjust to the smallest map range clearly showing the potential impact points If a new traffic advisory alert occurs, any map page capable of displaying traffic advisory alerts automatically adjusts to the smallest map range clearly showing the traffic advisory. When terrain or traffic alerts clear, the map returns to the previous auto zoom range based on the active waypoint.

The auto zoom function can be turned on or off independently for the PFD(s) and MFD. Control of the ranges at which the auto zoom occurs is done by setting the minimum and maximum 'look forward' times (set on the Map Setup Window for the Map Group). These settings determine the minimum and maximum distance to display based upon the aircraft's ground speed.

- Waypoints that are long distances apart cause the map range to increase to a point where many details on the map are decluttered. If this is not acceptable, lower the maximum look ahead time to a value that limits the auto zoom to an acceptable range.
- Waypoints that are very short distances apart cause the map range to decrease to a point where situational awareness may not be what is desired. Increase the minimum look ahead time to a value that limits the auto zoom to a minimum range that provides acceptable situational awareness.
- Flight plans that have a combination of long and short legs cause the range to increase and decrease as waypoints sequence. To avoid this, auto zoom can be disabled or the maximum/minimum times can be adjusted.
- The 'time out' time (configurable on the Map Setup Page for the Map Group) determines how long auto zoom is overridden by a manual adjustment of the range knob. At the expiration of this time, the auto zoom range is restored. Setting the 'time out' value to zero causes the manual override to never time out.
- When the maximum 'look forward' time is set to zero, the upper limit becomes the maximum range available (2000 nm).
- When the minimum 'look forward' time is set to zero, the lower limit becomes 1.5 nm.

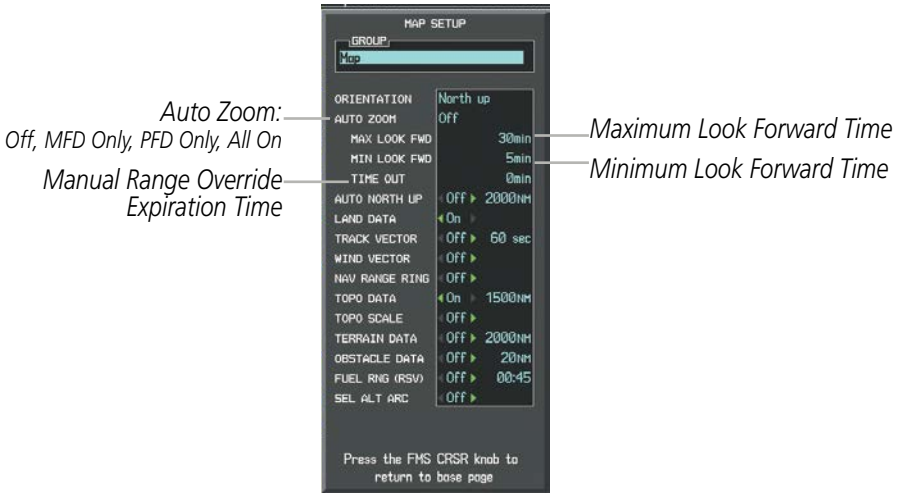


Figure 5-7 Map Setup Menu Window - Map Group, Auto Zoom

Configuring automatic zoom:

1) Press the **MENU** Key with the Navigation Map Page displayed. The cursor flashes on the 'Map Setup' option.
2) Press the **ENT** Key. The Map Setup Menu is displayed.
3) Select the 'Map' group.
4) Press the **ENT** Key.
5) Highlight the 'AUTO ZOOM' field.
6) Select 'Off', 'MFD Only', 'PFD Only', or 'ALL On'.
7) Press the **ENT** Key to accept the selected option. The flashing cursor highlights the 'MAX LOOK FWD' field. Times are from zero to 999 minutes.
8) Use the **FMS** Knobs to set the time. Press the **ENT** Key.
9) Repeat step 8 for 'MIN LOOK FWD' (zero to 99 minutes) and 'TIME OUT' (zero to 99 minutes).
10) Press the **FMS** Knob to return to the Navigation Map Page.

MAP PANNING

Map panning allows the pilot to:

- View parts of the map outside the displayed range without adjusting the map range
- Highlight and select locations on the map
- Review information for a selected airport, NAVAID or user waypoint
- Designate locations for use in flight planning
- View airspace and airway information

When the panning function is selected by pressing the **Joystick**, the Map Pointer flashes on the map display. A window also appears at the top of the map display showing the latitude/longitude position of the pointer, the bearing and distance to the pointer from the aircraft's present position, and the elevation of the land at the position of the pointer.

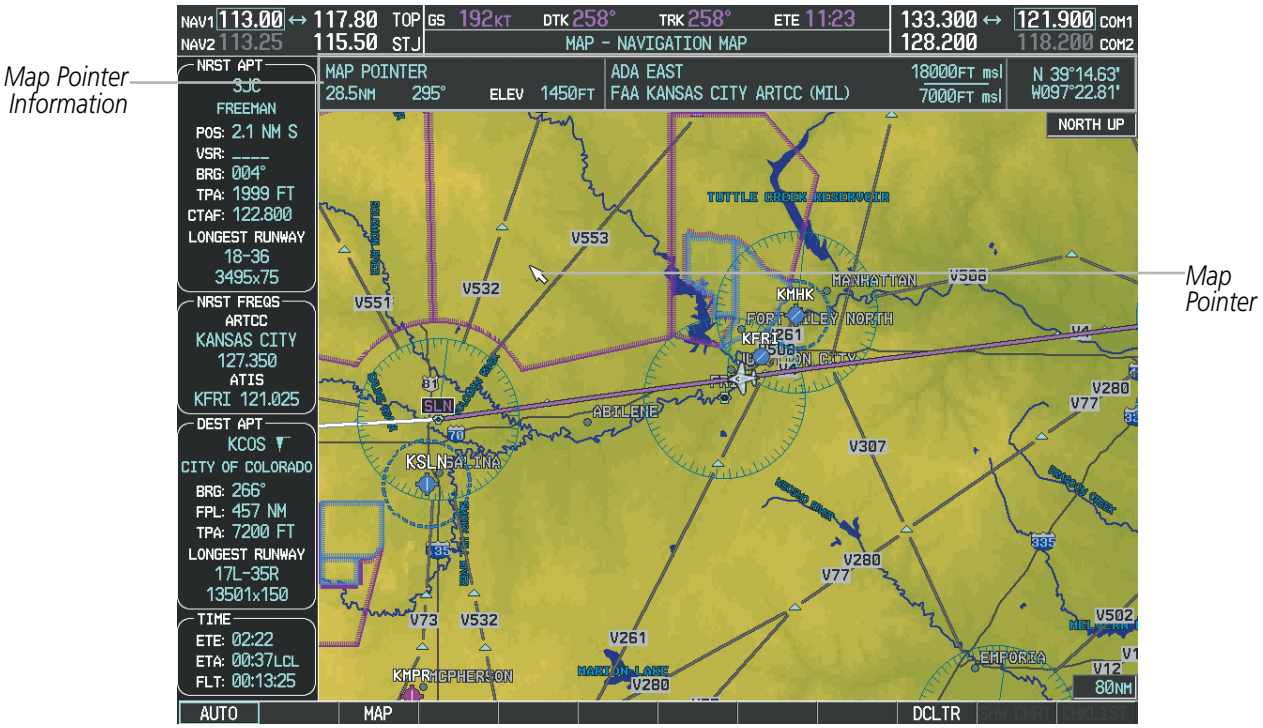


Figure 5-8 Navigation Map - Map Pointer Activated

NOTE: *The map is normally centered on the aircraft's position. If the map has been panned and there has been no pointer movement for about 60 seconds, the map reverts back to centered on the aircraft position and the flashing pointer is removed.*

When the Map Pointer is placed on an object, the name of the object is highlighted (even if the name was not originally displayed on the map). When any map feature or object is selected on the map display, pertinent information is displayed.

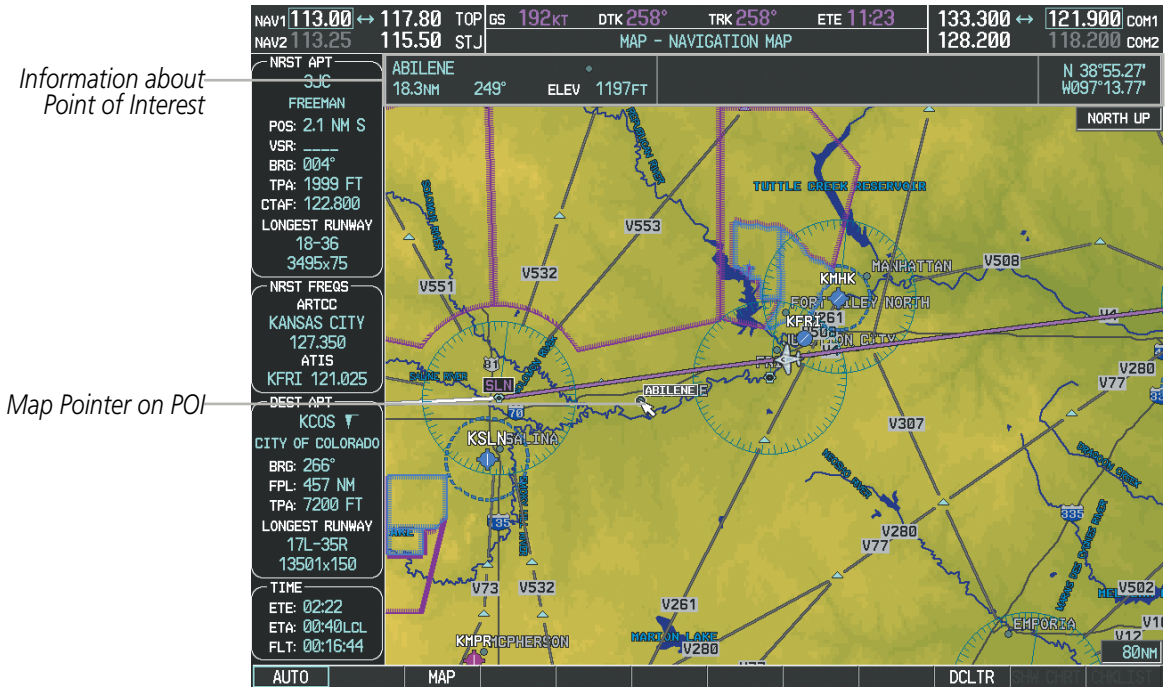


Figure 5-9 Navigation Map - Map Pointer on Point of Interest

When the Map Pointer crosses an airspace boundary, the boundary is highlighted and airspace information is shown at the top of the display. The information includes the name and class of airspace, the ceiling in feet above Mean Sea Level (MSL), and the floor in feet MSL.

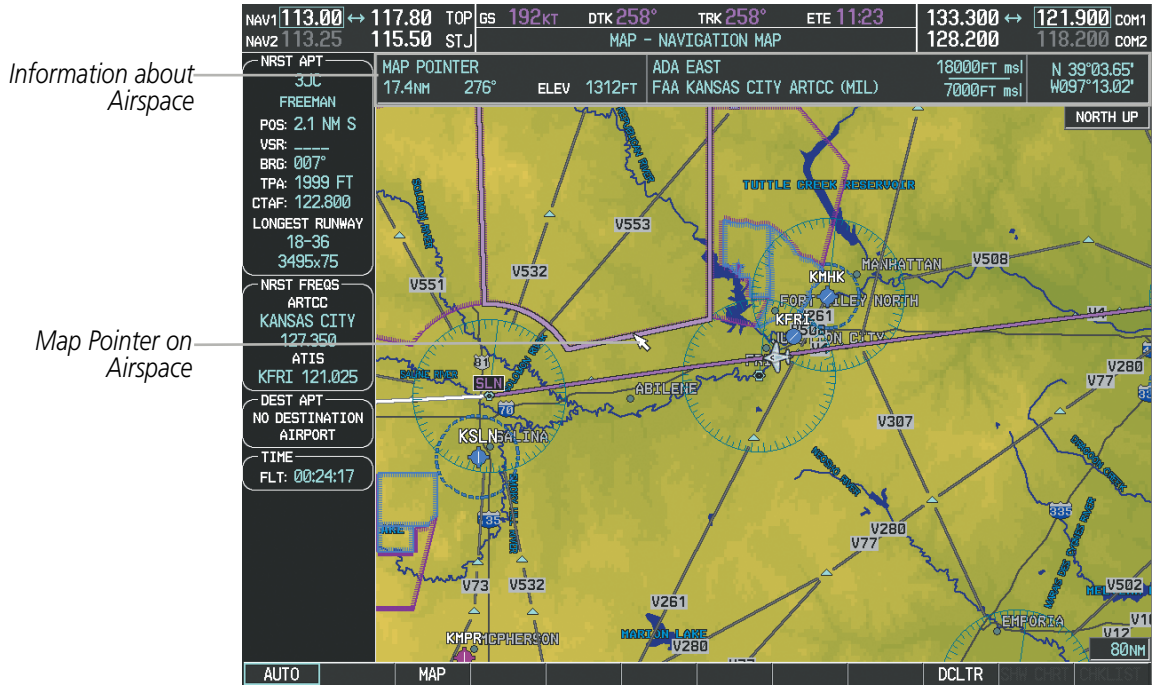


Figure 5-10 Navigation Map - Map Pointer on Airspace

Panning the map:

1) Press the **Joystick** to display the Map Pointer.
2) Move the **Joystick** to move the Map Pointer around the map.
3) Press the **Joystick** to remove the Map Pointer and recenter the map on the aircraft's current position.

Reviewing information for an airport, NAVAID, or user waypoint:

1) Place the Map Pointer on a waypoint.
2) Press the **ENT** Key to display the Waypoint Information Page for the selected waypoint.
3) Press the **GO BACK** Softkey, the **CLR** Key, or the **ENT** Key to exit the Waypoint Information Page and return to the Navigation Map showing the selected waypoint.

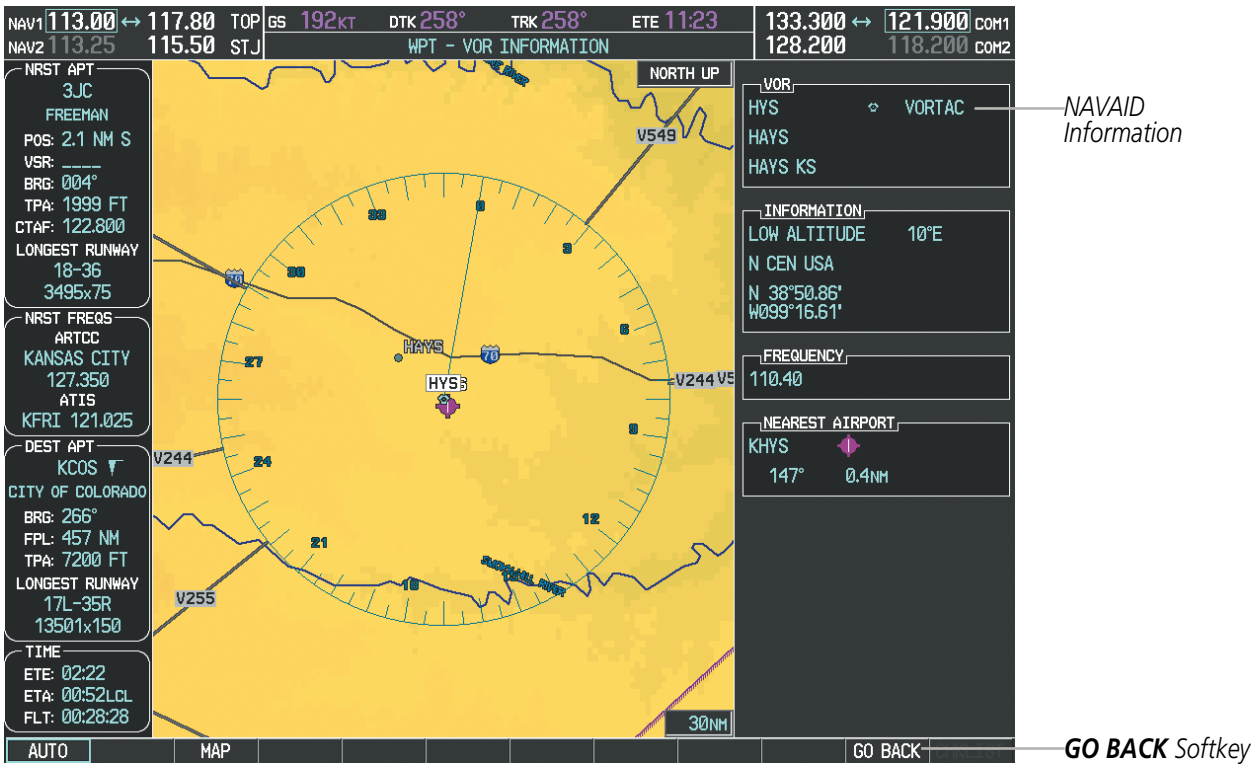


Figure 5-11 Navigation Map - Information Window - NAVAID

Viewing airspace information for a special-use or controlled airspace:

1) Place the Map Pointer on an open area within the boundaries of an airspace.
2) Press the **ENT** Key to display an options menu.
3) 'Review Airspaces' should already be highlighted, if not select it. Press the **ENT** Key to display the Airspace Information Page for the selected airspace.
4) Press the **CLR** or **ENT** Key to exit the Airspace Information Page.

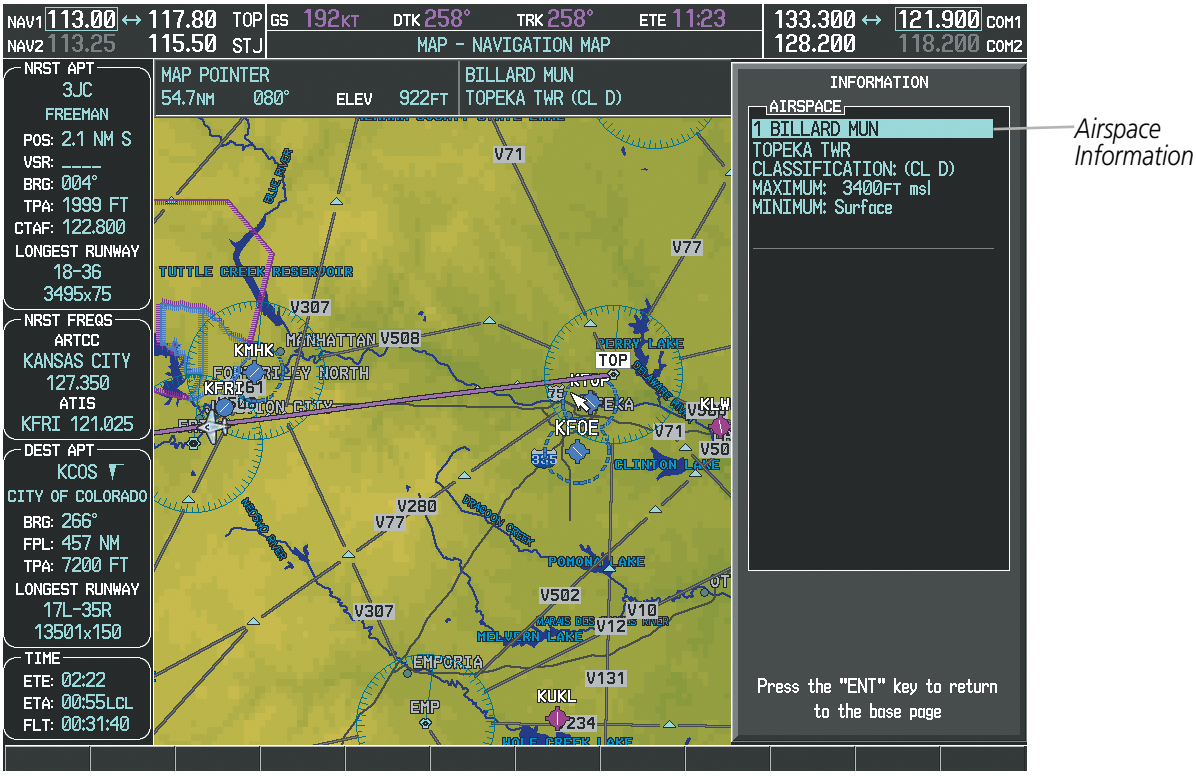


Figure 5-12 Navigation Map - Information Window - Airspace

MEASURING BEARING AND DISTANCE

Distance and bearing from the aircraft's present position to any point on the viewable navigation map may be calculated using the 'Measure Bearing and Distance' selection from Navigation Map page menu. The bearing and distance tool displays a dashed Measurement Line and a Measure Pointer to aid in graphically identifying points with which to measure. Lat/Long, distance and elevation data for the Measure Pointer is provided in a window at the top of the navigation map.

Measuring bearing and distance between any two points:

1) Press the **MENU** Key (with the Navigation Map Page displayed).
2) Highlight the 'Measure Bearing/Distance' field.
3) Press the **ENT** Key. A Measure Pointer is displayed on the map at the aircraft's present position.
4) Move the **Joystick** to place the reference pointer at the desired location. The bearing and distance are displayed at the top of the map. Elevation at the current pointer position is also displayed. Pressing the **ENT** Key changes the starting point for measuring.
5) To exit the Measure Bearing/Distance option, press the **Joystick**; or select 'Stop Measuring' from the Page Menu and press the **ENT** Key.

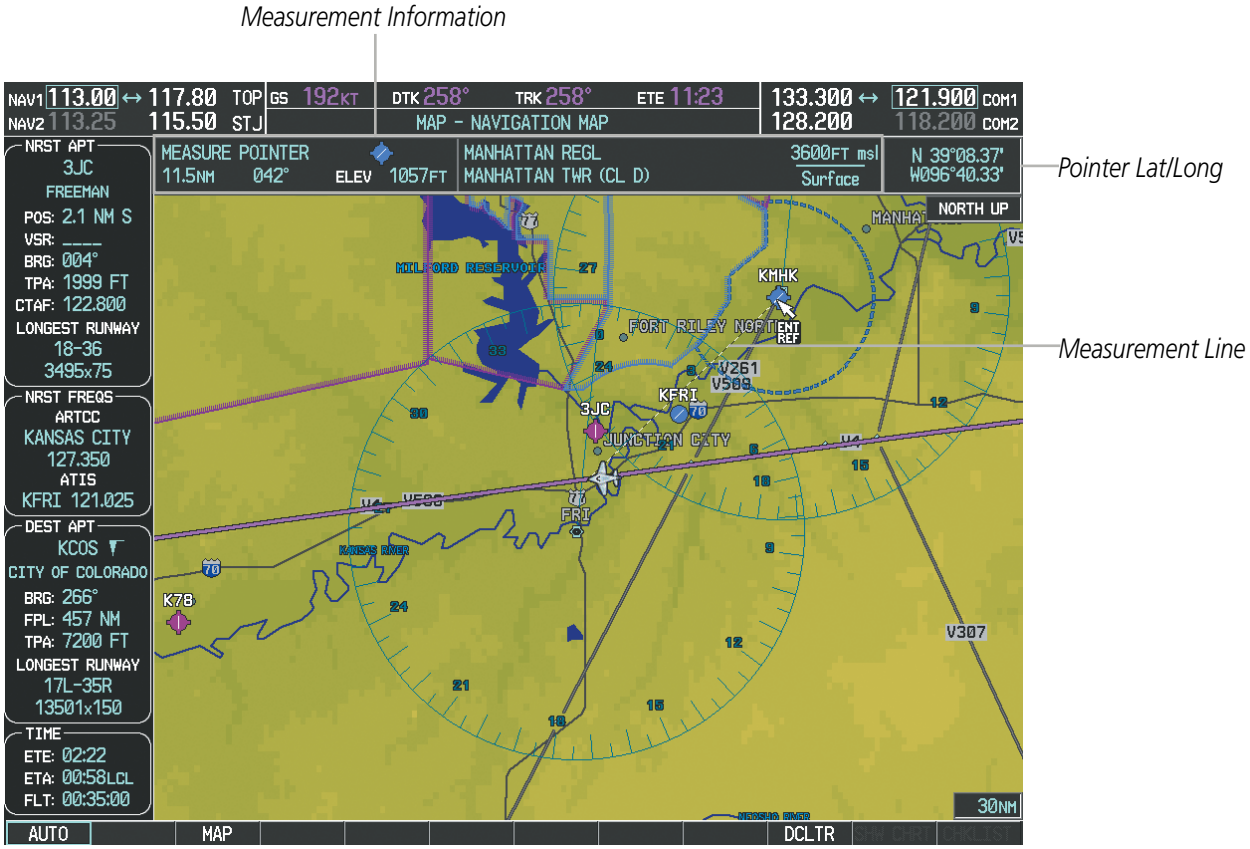


Figure 5-13 Navigation Map - Measuring Bearing and Distance

TOPOGRAPHY

All navigation maps can display various shades of topography colors representing land elevation, similar to aviation sectional charts. Topographic data can be displayed or removed as described in the following procedures. Topographic data can also be displayed on the selectable profile map at the bottom of the navigation map.

Displaying/removing Profile View

1) From the Navigation Map Page, press the **MAP** Softkey.
2) Press the **PROFILE** Softkey to enable or disable Profile View.

Or:

1) Press the **MENU** Key.
2) Select 'Show Profile View' or 'Hide Profile View' and press the **ENT** Key.

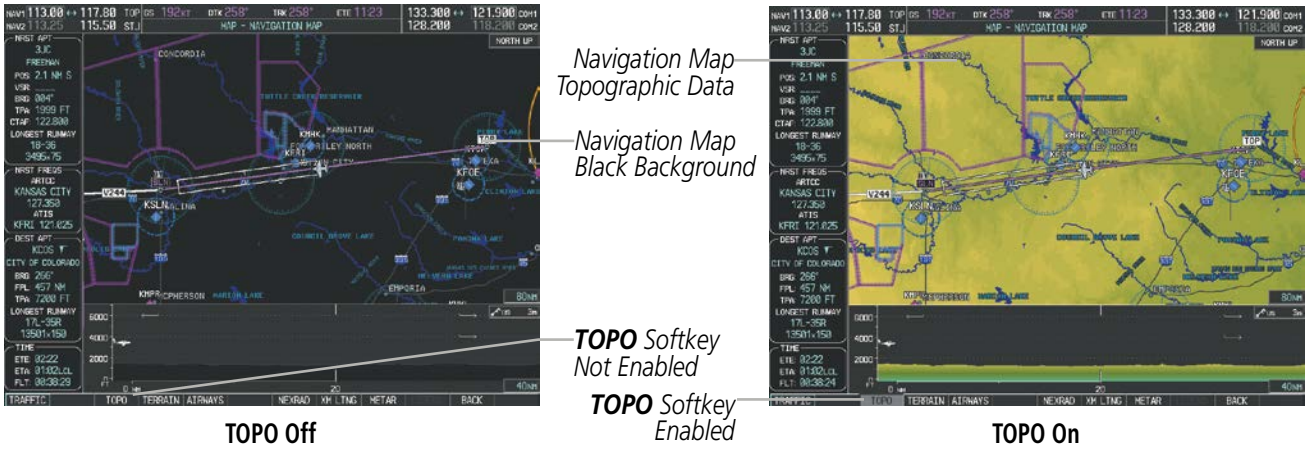


Figure 5-14 Navigation Map - Topographic Data

Displaying/removing topographic data on all pages displaying navigation maps:

1) Press the **MAP** Softkey (the **INSET** Softkey for the PFD Inset Map).
2) Press the **TOPO** Softkey.
3) Press the **TOPO** Softkey again to remove topographic data from the Navigation Map. When topographic data is removed from the page, all navigation data is presented on a black background.

Displaying/removing topographic data (TOPO DATA) using the Navigation Map Page Menu:

1) Press the **MENU** Key with the Navigation Map Page displayed. The cursor flashes on the 'Map Setup' option.
2) Press the **ENT** Key. The Map Setup Menu is displayed.
3) Select the 'Map' group.
4) Press the **ENT** Key.

5) Highlight the 'TOPO DATA' field.
6) Select 'On' or 'Off'.
7) Press the **FMS** Knob to return to the Navigation Map Page.

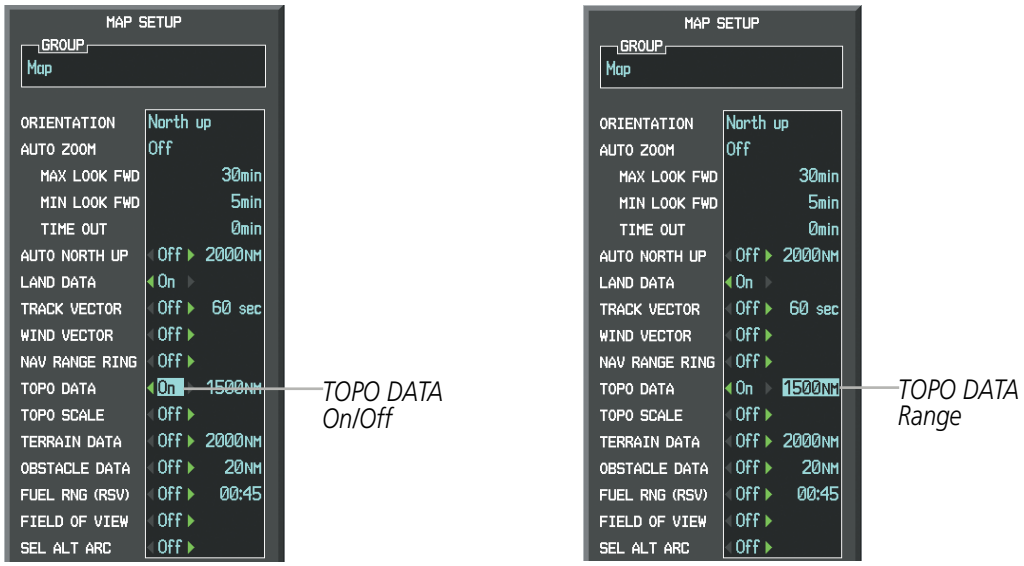


Figure 5-15 Navigation Map Setup Menu - TOPO DATA Setup

The topographic data range is the maximum map range on which topographic data is displayed.

NOTE: *Since the PFD Inset Map is much smaller than the MFD navigation maps, items are removed on the PFD Inset Map two range levels smaller than the range selected in the Map Setup pages (e.g., a setting of 100 nm removes the item at ranges above 100 nm on MFD navigation maps, while the PFD Inset Map removes the same item at 50 nm).*

Selecting a topographical data range (TOPO DATA):

1) Press the **MENU** Key with the Navigation Map Page displayed. The cursor flashes on the 'Map Setup' option.
2) Press the **ENT** Key. The Map Setup Menu is displayed.
3) Select the 'Map' group.
4) Press the **ENT** Key.
5) Highlight the 'TOPO DATA' range field. TOPO ranges are from 500 ft to 2000 nm.
6) To change the TOPO range setting, turn the small **FMS** Knob to display the range list.
7) Select the desired range using the small **FMS** Knob.
8) Press the **ENT** Key.
9) Press the **FMS** Knob to return to the Navigation Map Page.

In addition, the Navigation Map can display a topographic scale (located in the lower right hand side of the map) showing a scale of the terrain elevation and current elevation values.

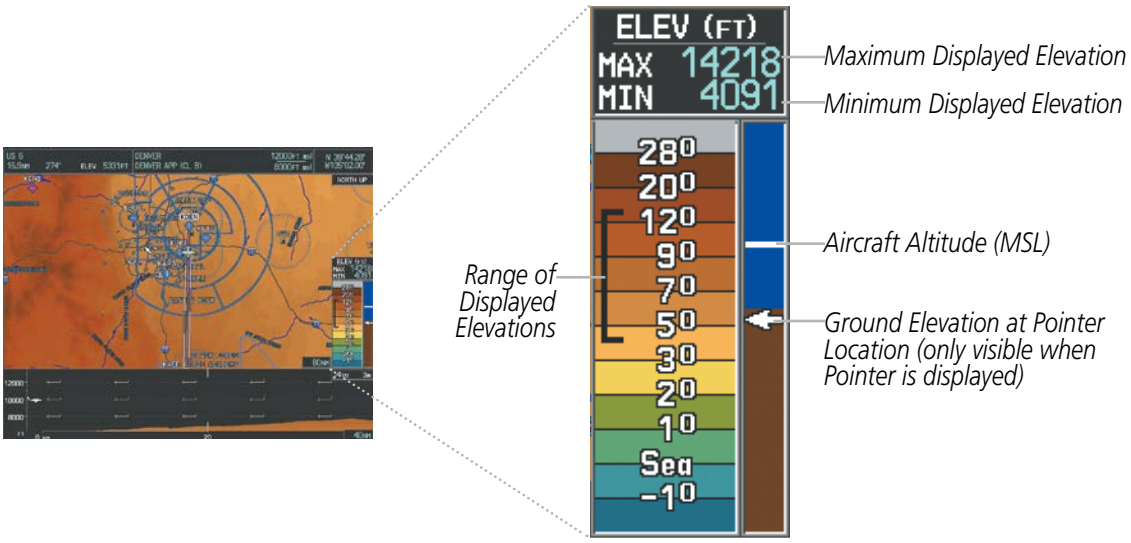


Figure 5-16 Navigation Map - TOPO SCALE

Displaying/removing the topographic scale (TOPO SCALE):

1) Press the **MENU** Key with the Navigation Map Page displayed. The cursor flashes on the 'Map Setup' option.
2) Press the **ENT** Key. The Map Setup Menu is displayed.
3) Select the 'Map' group and press the **ENT** Key.
4) Highlight the 'TOPO SCALE' field.
5) Select 'On' or 'Off'.
6) Press the **FMS** Knob to return to the Navigation Map Page.

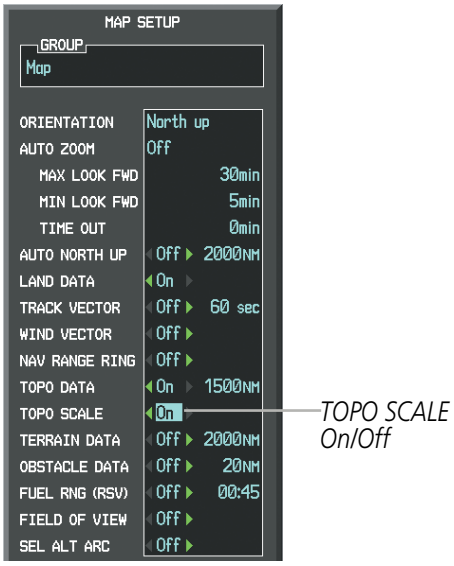


Figure 5-17 Navigation Map Setup Menu - TOPO SCALE Setup

MAP SYMBOLS

This section discusses the types of land and aviation symbols that can be displayed. Each listed type of symbol can be turned on or off, and the maximum range to display each symbol can be set. The decluttering of the symbols from the map using the **DCLTR** Softkey is also discussed.

LAND SYMBOLS

The following items are configured on the land menu:

Land Symbols *(Text label size can be None, Small, Medium (Med), or Large (Lrg))*	**Symbol**	**Default Range (nm)**	**Maximum Range (nm)**
Latitude/Longitude (LAT/LON)		Off	2000
Highways and Roads			
Interstate Highway (FREEWAY)		300	800
International Highway (FREEWAY)		300	800
US Highway (NATIONAL HWY)		30	80
State Highway (LOCAL HWY)		15	30
Local Road (LOCAL ROAD)	N/A	8	15
Railroads (RAILROAD)		15	30
LARGE CITY (> 200,000)		800	1500
MEDIUM CITY (> 50,000)		100	200
SMALL CITY (> 5,000)		20	50
States and Provinces (STATE/PROV)		800	1500
Rivers and Lakes (RIVER/LAKE)		200	500
USER WAYPOINT		150	300

Table 5-1 Land Symbol Information

AVIATION SYMBOLS

The following items are configured on the aviation menu:

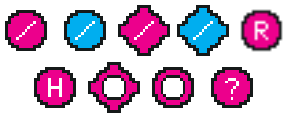
Aviation Symbols *(Text label size can be None, Small, Medium (Med), or Large (Lrg))*	**Symbol**	**Default Range (nm)**	**Maximum Range (nm)**
Active Flight Plan Leg (ACTIVE FPL)		2000	2000
Non-active Flight Plan Leg (ACTIVE FPL)		2000	2000
Active Flight Plan Waypoint (ACTIVE FPL WPT)	See Airports, NAVAIDs	2000	2000
Large Airports (LARGE APT) (Longest Runway ≥ 8100 ft)		250	500
Medium Airports (MEDIUM APT) (8100 ft > Longest Runway ≥ 5000 ft)		150	300
Small Airports (SMALL APT) (Longest Runway < 5000 ft) (Medium Airport if it has a tower frequency)		50	100
Taxiways (SAFETAXI)	See Additional Features	3	20
Runway Extension (RWY EXTENSION)	N/A	Off	100
Intersection (INT WAYPOINT)		15	30
Non-directional Beacon (NDB WAYPOINT)		15	30
VOR (VOR WAYPOINT)		150	300
VRP (VRP WAYPOINT)		15	30
Class B Airspace/TMA (CLASS B/TMA)		200	500
Class C Airspace/TCA (CLASS C/TCA)		200	500
Class D Airspace (CLASS D)		150	300
Restricted Area (RESTRICTED)		200	500
Military Operations Area [MOA(MILITARY)]		200	500
Other/Air Defense Interdiction Zone (OTHER/ADIZ)		200	500
Temporary Flight Restriction (TFR)		500	2000

Table 5-2 Aviation Symbol Information

SYMBOL SETUP

All pages with maps can display land symbols (roads, lakes, borders, etc). Land symbols can be removed totally (turned off).

Displaying/removing all land symbols:

1) Press the **MENU** Key with the Navigation Map Page displayed. The Page Menu is displayed and the cursor flashes on the 'Map Setup' option.
2) Press the **ENT** Key. The Map Setup Group Menu is displayed and the cursor flashes on the 'Map' option.
3) Highlight the 'LAND DATA' field.
4) Select 'On' or 'Off'.
5) Press the **FMS** Knob to return to the Navigation Map Page.

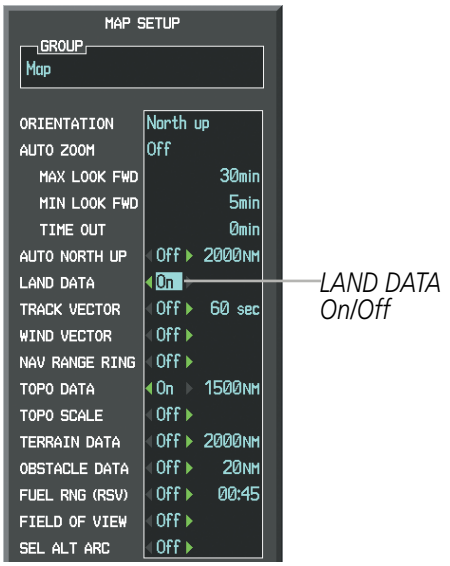


Figure 5-18 Navigation Map Setup Menu - LAND DATA Setup

The label size (TEXT) sets the size at which labels appear on the display (none, small, medium, and large). The range (RNG) sets the maximum range at which items appear on the display.

Selecting a 'Land' or 'Aviation' group item text size and range:

1) Press the **MENU** Key with the Navigation Map Page displayed. The cursor flashes on the 'Map Setup' option.
2) Press the **ENT** Key. The Map Setup Menu is displayed.
3) Select the 'Land' or 'Aviation' group.
4) Press the **ENT** Key. The cursor flashes on the first field.
5) Select the desired land option.
6) Select the desired text size.
7) Press the **ENT** Key to accept the selected size.
8) Select the desired range.

9) Press the **ENT** Key to accept the selected range.

10) Press the **FMS** Knob to return to the Navigation Map Page.

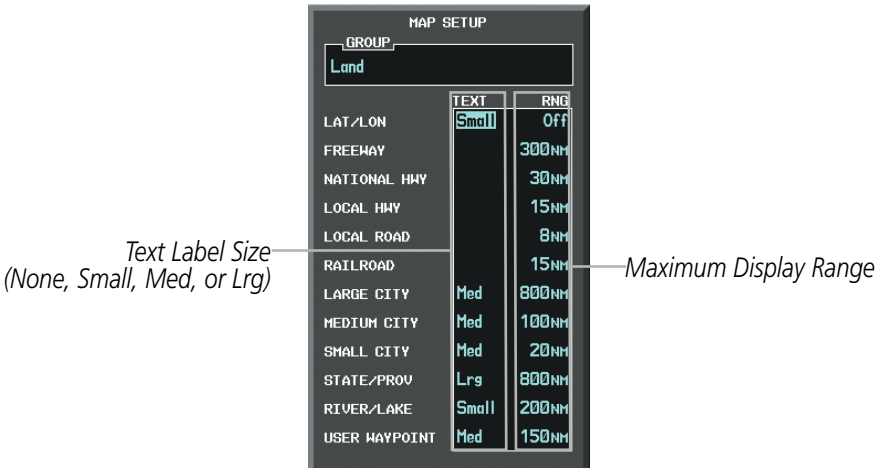


Figure 5-19 Navigation Map Setup Menu - LAND GROUP Setup

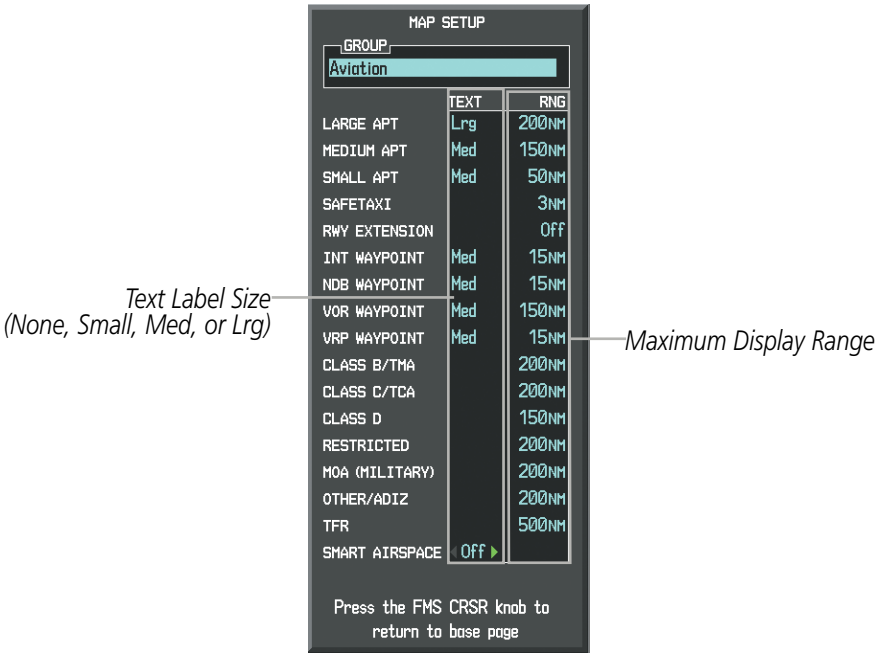
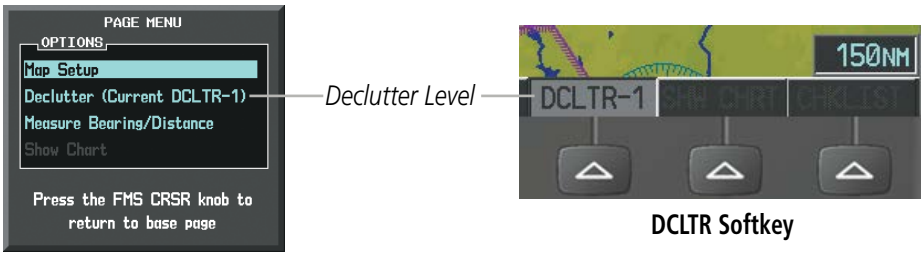


Figure 5-20 Navigation Map Setup Menu - AVIATION GROUP Setup

NOTE: *Since the PFD Inset Map is much smaller than the MFD navigation maps, items are removed on the PFD Inset Map two range levels smaller than the range selected in the Map Setup pages (e.g., a setting of 100 nm removes the item at ranges above 100 nm on MFD navigation maps, while the PFD Inset Map removes the same item at 50 nm).*

MAP DECLUTTER

The declutter feature allows the pilot to progressively step through four levels of removing map information. The declutter level is displayed in the **DCLTR** Softkey and next to the Declutter Menu Option.



Navigation Map Page Menu

DCLTR Softkey

Figure 5-21 Navigation Map - Declutter Level Indications

Decluttering the map:

Press the **DCLTR** Softkey with the Navigation Map Page displayed. The current declutter level is shown. With each softkey selection, another level of map information is removed.

Or:

1) Press the **MENU** Key with the Navigation Map Page displayed.
2) Select 'Declutter'. The current declutter level is shown.
3) Press the **ENT** Key.

Decluttering the PFD Inset Map:

1) Press the **INSET** Softkey.
2) Press the **DCLTR** Softkey. The current declutter level is shown. With each selection, another level of map information is removed.

Table 5-3 lists the items that are decluttered at each map detail level. The 'X' represents map items decluttered for each level of detail.

Item	Declutter-1	Declutter-2	Declutter-3
Data Link Radar Precipitation			X
Data Link Lightning			X
Graphical METARs			X
Airports			X
Safe Taxi			X
Runway Labels			X
TFRs			X
Restricted			X
MOA (Military)			X
User Waypoints		X	X
Latitude/Longitude Grid		X	X
NAVAIDs (does not declutter if used to define airway)		X	X
Intersections (does not declutter if used to define airway)		X	X
Class B Airspaces/TMA		X	X
Class C Airspaces/TCA		X	X
Class D Airspaces		X	X
Other Airspaces/ADIZ		X	X
Obstacles		X	X
Cities	X	X	X
Roads	X	X	X
Railroads	X	X	X
State/Province Boundaries	X	X	X

Table 5-3 Navigation Map Items Decluttered for each Detail Level

AIRWAYS

This airways discussion is based upon the North American airway structure. The airway structure in places other than North America vary by location, etc. and are not discussed in this book. Low Altitude Airways (Victor Airways or T-Routes) start 1,200 feet above ground level (AGL) and extend up to 18,000 feet mean sea level (MSL). Low Altitude Airways are designated with a "V" or a "T" before the airway number.

High Altitude Airways (Jet Routes or Q-Routes) start at 18,000 feet MSL and extend upward to 45,000 feet MSL. High Altitude Airways are designated with a "J" or a "Q" before the airway number.

Low Altitude Airways are drawn in gray (the same shade used for roads). High Altitude Airways are drawn in green. When both types of airways are displayed, High Altitude Airways are drawn on top of Low Altitude Airways.

When airways are selected for display on the map, the airway waypoints (VORs, NDBs and Intersections) are also displayed.

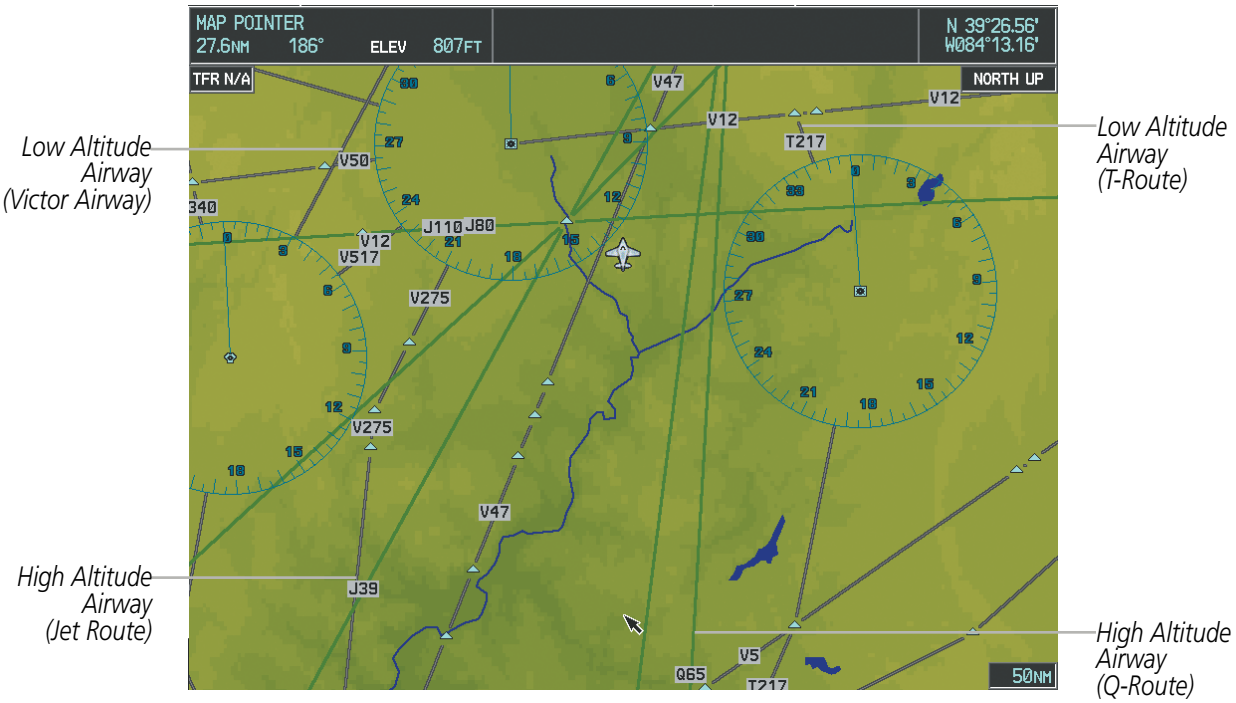


Figure 5-22 Airways on MFD Navigation Map

Airways may be displayed on the map at the pilot's discretion using either a combination of **AIRWAY** Softkey presses, or menu selections using the **MENU** Key from the Navigation Map Page. The Airway range can also be programmed to only display Airways on the MFD when the map range is at or below a specific number.

Displaying/removing airways:

1) Press the **MAP** Softkey.
2) Press the **AIRWAYS** Softkey. Both High and Low Altitude Airways are displayed.
3) Press the **s**oftkey again to display Low Altitude Airways only.

4) Press the **s**oftkey again to display High Altitude Airways only.
5) Press the **s**oftkey again to remove High Altitude Airways. No airways are displayed.

Or:

1) Press the **MENU** Key with the Navigation Map Page displayed. The cursor flashes on the 'Map Setup' option.
2) Press the **ENT** Key. The Map Setup Menu is displayed.
3) Turn the small **FMS** Knob to select the 'Airways' group, and press the **ENT** Key.
4) Turn the large **FMS** Knob to highlight the 'AIRWAYS' field.
5) Turn the **FMS** Knob to select 'Off', 'All', 'LO Only', or 'HI Only', and press the **ENT** Key.
6) Press the **FMS** Knob to return to the Navigation Map Page.

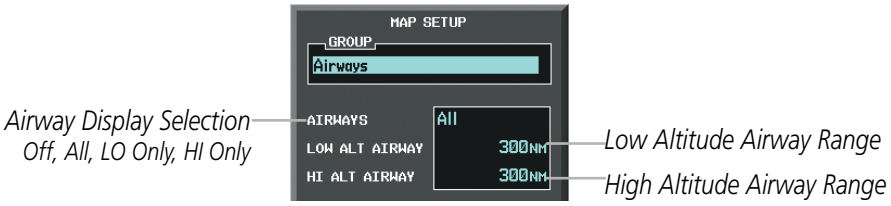


Figure 5-23 Navigation Map Setup Menu - AIRWAYS Setup

The airway range is the maximum map range on which airways are displayed.

Selecting an airway range (LOW ALT AIRWAY or HI ALT AIRWAY):

1) Press the **MENU** Key with the Navigation Map Page displayed. The cursor flashes on the 'Map Setup' option.
2) Press the **ENT** Key. The Map Setup Menu is displayed.
3) Turn the small **FMS** Knob to select the 'Airways' group, and press the **ENT** Key.
4) Highlight the 'LOW ALT AIRWAY' or 'HI ALT AIRWAY' range field.
5) To change the range setting, turn the small **FMS** Knob to display the range list.
6) Select the desired range using the small **FMS** Knob.
7) Press the **ENT** Key.
8) Press the **FMS** Knob to return to the Navigation Map Page.

The following range items are configurable on the airways menu:

Airway Type	Symbol	Default Range (nm)	Maximum Range (nm)
Low Altitude Airway (LOW ALT AIRWAY)		200	500
High Altitude Airway (HI ALT AIRWAY)		300	500

Table 5-4 Airway Range Information

TRACK VECTOR

The Navigation Map can display a track vector that is useful in minimizing track angle error. The track vector is a solid cyan line segment extended to a predicted location. The track vector look-ahead time is selectable (30 sec, 60 sec (default), 2 min, 5 min, 10 min, 20 min) and determines the length of the track vector. The track vector shows up to 90 degrees of a turn for the 30 and 60 second time settings.

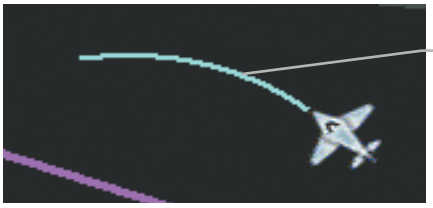


Figure 5-24 Navigation Map -Track Vector

Displaying/removing the track vector:

1) Press the **MENU** Key with the Navigation Map Page displayed. The cursor flashes on the 'Map Setup' option.
2) Press the **ENT** Key. The Map Setup Menu is displayed.
3) Select the 'Map' group.
4) Press the **ENT** Key.
5) Highlight the 'TRACK VECTOR' field.
6) Select 'On' or 'Off'. Press the **ENT** Key to accept the selected option. The flashing cursor highlights the look ahead time field. Use the **FMS** Knob to select the desired time. Press the **ENT** Key.
7) Press the **FMS** Knob to return to the Navigation Map Page.

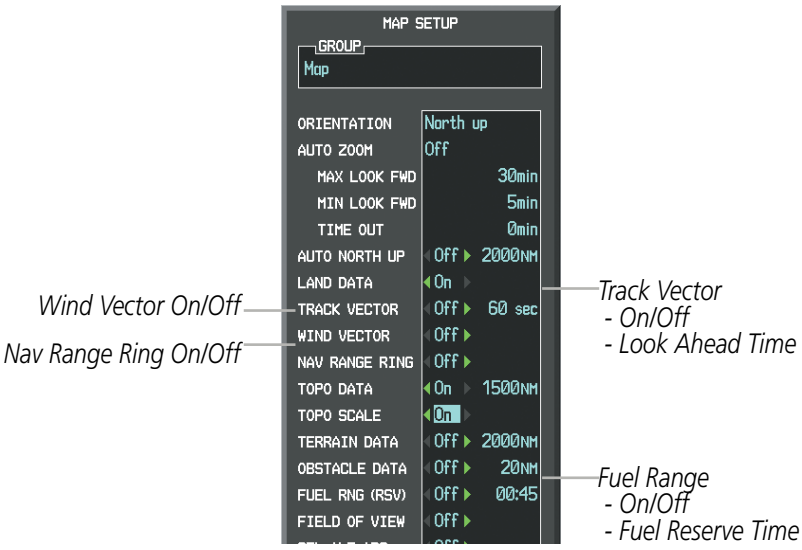


Figure 5-25 Navigation Map Setup Menu -TRACK VECTOR, WIND VECTOR, NAV RANGE RING, FUEL RANGE RING Setup

WIND VECTOR

The map displays a wind vector arrow in the upper right-hand portion of the screen. Wind vector information is displayed as a white arrow pointing in the direction in which the wind is moving for wind speeds greater than or equal to 1 kt.



Figure 5-26 Navigation Map - Wind Vector

NOTE: *The wind vector is not displayed until the aircraft is moving. It is not displayed on the Waypoint Information pages.*

Displaying/removing the wind vector:

1) Press the **MENU** Key with the Navigation Map Page displayed. The cursor flashes on the 'Map Setup' option.
2) Press the **ENT** Key. The Map Setup Menu is displayed.
3) Select the 'Map' group.
4) Press the **ENT** Key.
5) Highlight the 'WIND VECTOR' field.
6) Select 'On' or 'Off'.
7) Press the **FMS** Knob to return to the Navigation Map Page.

NAV RANGE RING

The Nav Range Ring shows the direction of travel (ground track) on a rotating compass card. The range is determined by the map range. The range is 1/4 of the map range (e.g., 37.5 nm on a 150 nm map).

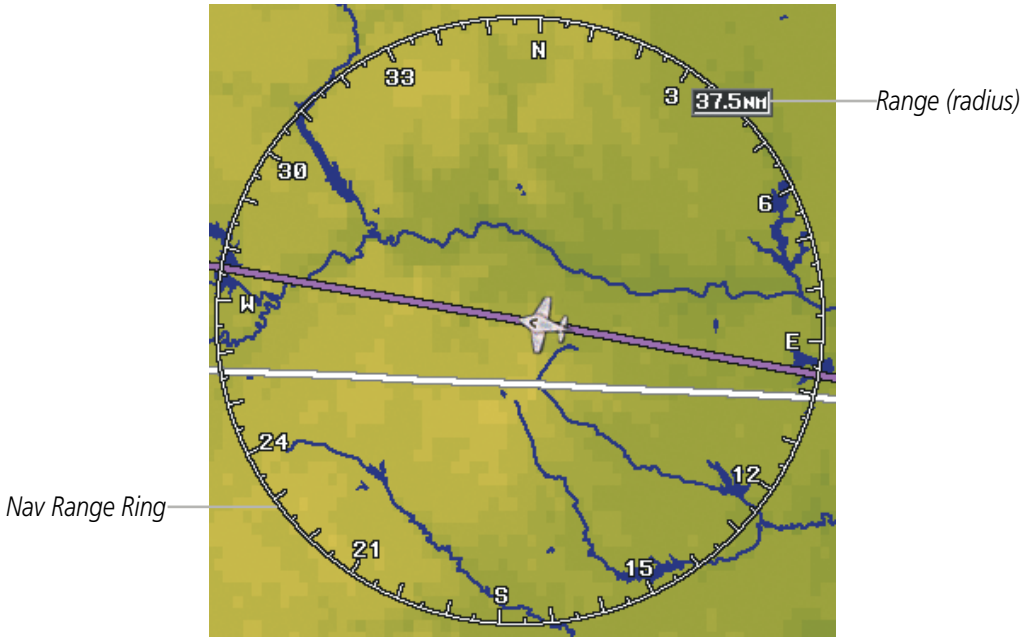


Figure 5-27 Navigation Map - Nav Range Ring

NOTE: *The Nav Range Ring is not displayed on the Waypoint Information pages, Nearest pages, or Direct-to Window map.*

Displaying/removing the Nav Range Ring:

1) Press the **MENU** Key with the Navigation Map Page displayed. The cursor flashes on the 'Map Setup' option.
2) Press the **ENT** Key. The Map Setup Menu is displayed.
3) Select the 'Map' group.
4) Press the **ENT** Key.
5) Highlight the 'NAV RANGE RING' field.
6) Select 'On' or 'Off'.
7) Press the **FMS** Knob to return to the Navigation Map Page.

NOTE: *The Nav Range Ring is referenced to either magnetic or true north, based on the selection on the AUX - System Setup Page.*

FUEL RANGE RING

The map can display a fuel range ring which shows the remaining flight distance. A dashed green circle indicates the selected range to reserve fuel. A solid green circle indicates the total endurance range. If only reserve fuel remains, the range is indicated by a solid amber circle.

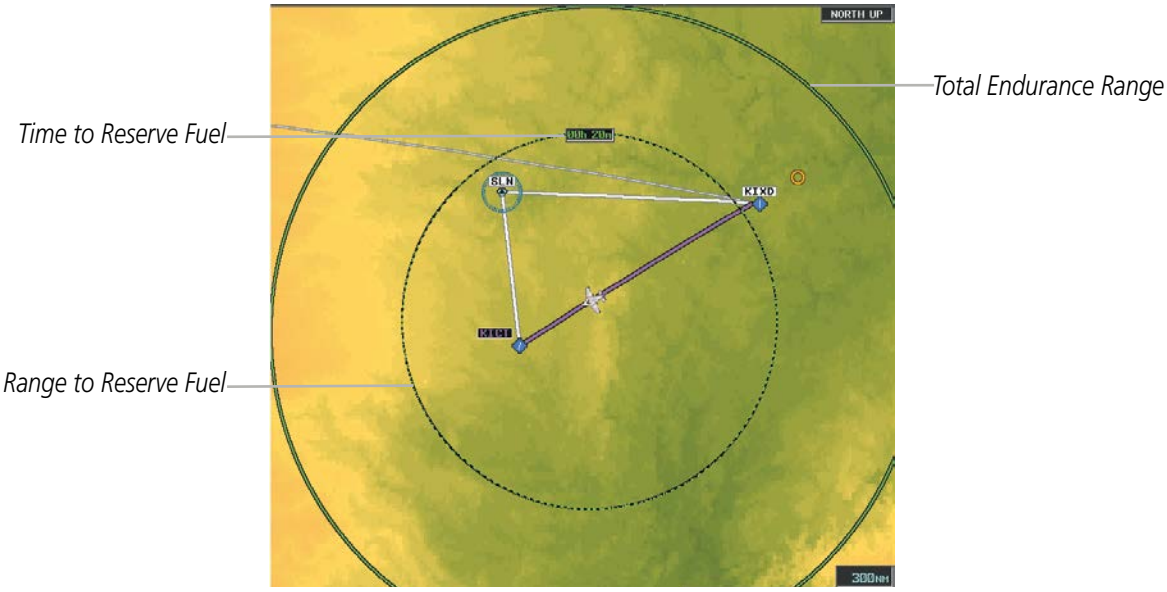


Figure 5-28 Navigation Map - Fuel Range Ring

Displaying/removing the fuel range ring and selecting a fuel range time:

1) Press the **MENU** Key with the Navigation Map Page displayed. The cursor flashes on the 'Map Setup' option.
2) Press the **ENT** Key. The Map Setup Menu is displayed.
3) Select the 'Map' group.
4) Press the **ENT** Key.
5) Highlight the 'FUEL RNG (RSV)' field.
6) Select 'On' or 'Off'.
7) Highlight the fuel reserve time field. This time should be set to the amount of flight time equal to the amount of fuel reserve desired.
8) To change the reserve fuel time, enter a time (00:00 to 23:59; hours:minutes). The default setting is 00:45 minutes.
9) Press the **ENT** Key.
10) Press the **FMS** Knob to return to the Navigation Map Page.

FIELD OF VIEW (SVT)

The map can display the boundaries of the PFD Synthetic Vision Technology (SVT) lateral field of view. The field of view is shown as two dashed lines forming a V shape in front of the aircraft symbol on the map. This is only available if SVT is installed on the aircraft.

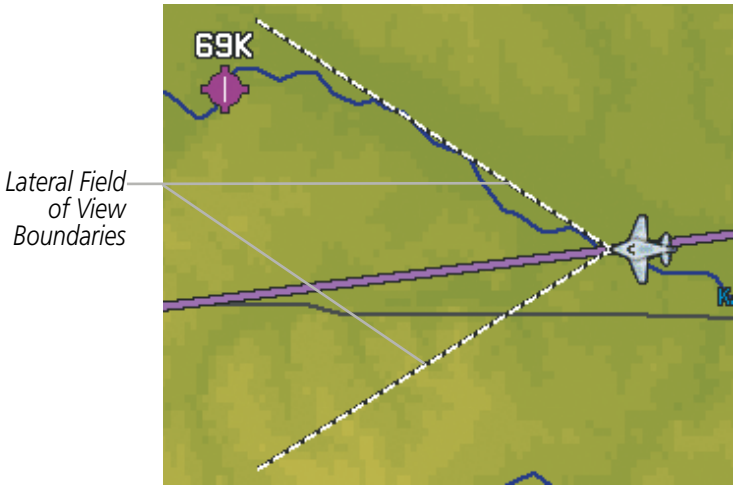


Figure 5-29 Navigation Map - Field of View

Displaying/removing the field of view:

1) Press the **MENU** Key with the Navigation Map Page displayed. The cursor flashes on the 'Map Setup' option.
2) Press the **ENT** Key. The Map Setup Menu is displayed.
3) Select the 'Map' group.
4) Press the **ENT** Key.
5) Highlight the 'FIELD OF VIEW' field.
6) Select 'On' or 'Off'.
7) Press the **FMS** Knob to return to the Navigation Map Page.

SELECTED ALTITUDE INTERCEPT ARC

The map can display the location along the current track where the aircraft will intercept the selected altitude. The location will be shown as a cyan arc when the aircraft is actually climbing or descending.

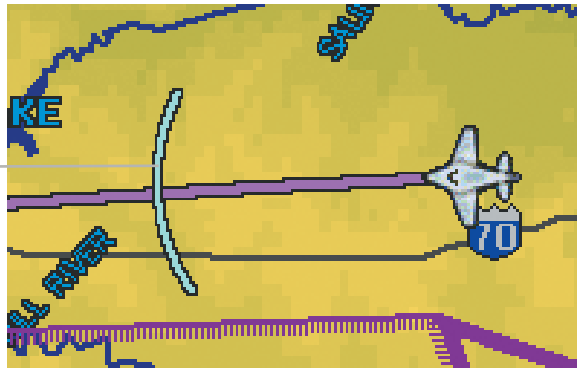


Figure 5-30 Navigation Map - Range to Altitude Arc

Displaying/removing the selected altitude intercept arc:

1) Press the **MENU** Key with the Navigation Map Page displayed. The cursor flashes on the 'Map Setup' option.
2) Press the **ENT** Key. The Map Setup Menu is displayed.
3) Select the 'Map' group.
4) Press the **ENT** Key.
5) Highlight the 'SEL ALT ARC' field.
6) Select 'On' or 'Off'.
7) Press the **FMS** Knob to return to the Navigation Map Page.

NO-EIS OPTION

If the G900X is configured with the "no-EIS" option, the EIS display is removed from the Navigation Map and is replaced with the Navigation Information Display shown in Figure 5-30.

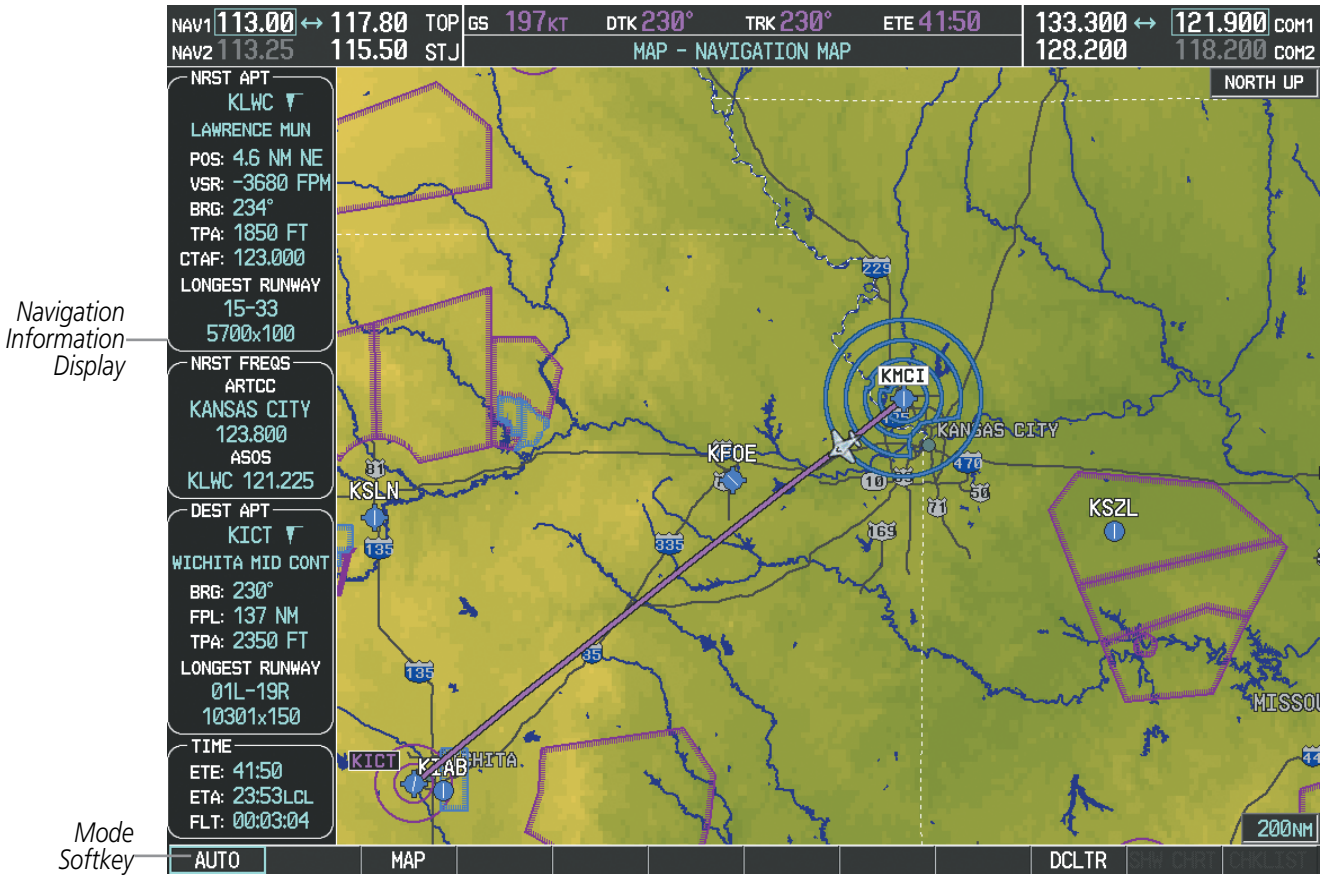
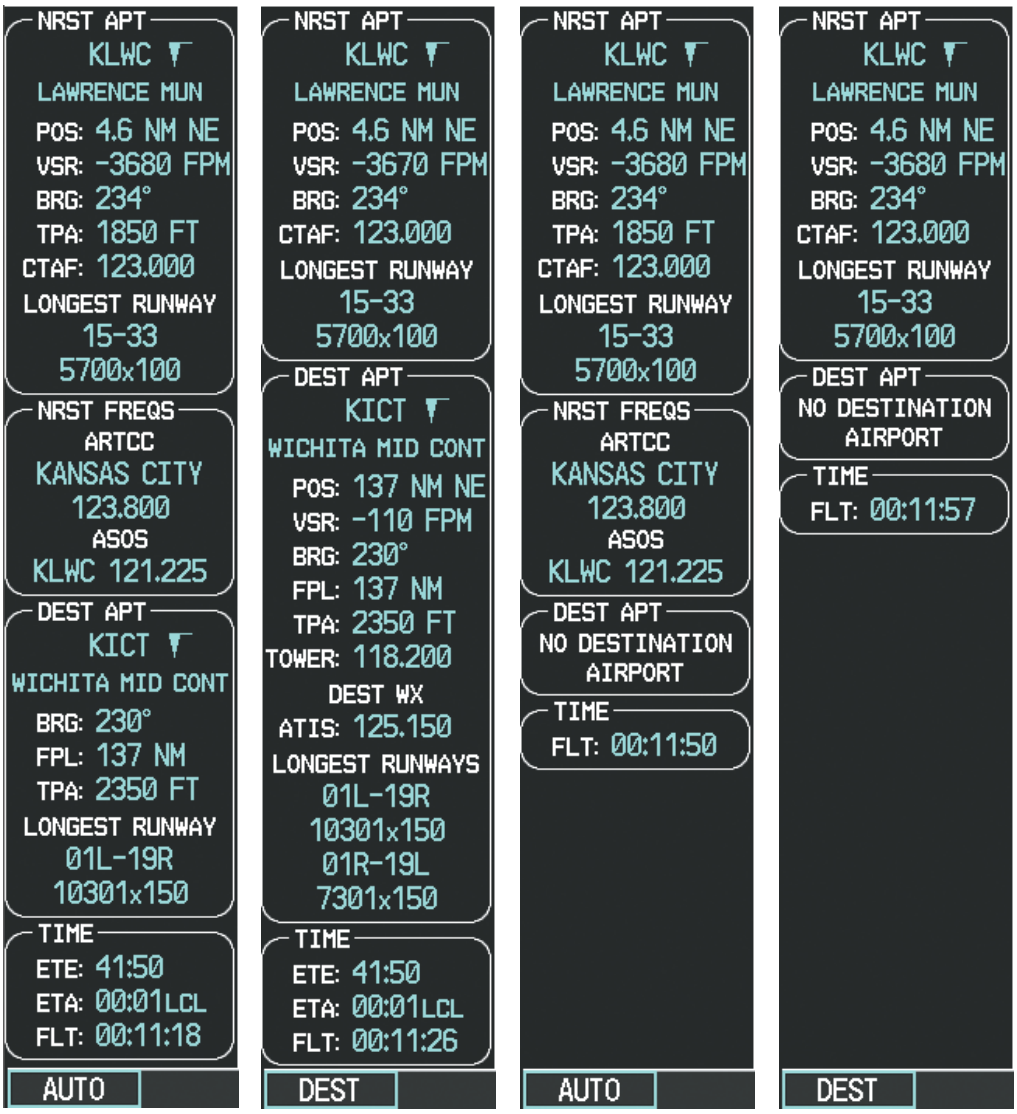


Figure 5-31 Optional No-EIS Navigation Information Display

The Navigation Information Display operates in two modes, automatic mode and destination mode. The mode is toggled by pressing the **AUTO** or **DEST** Softkey. The display defaults in automatic mode (softkey label displays 'AUTO'). In destination mode, the softkey label displays 'DEST'. Figure 5-32 shows the various modes of operation for the display.



Auto Mode, KMCI to KICT Flight Plan Loaded

Destination Mode, KMCI to KICT Flight Plan Loaded

Auto Mode, No Flight Plan Loaded

Destination Mode, No Flight Plan Loaded

Figure 5-32 Navigation Information Display Modes of Operation

The next sections describe the four Data Boxes within the Navigation Information Display.

NEAREST AIRPORT BOX

The Nearest Airport Box is displayed in automatic and destination mode. When no airports are within 200 NM of the aircraft position, the Nearest Airport Box displays "NONE WITHIN 200 NM". When the aircraft position is within 200 NM of an airport, the fields shown in Figure 5-33 are displayed in the Nearest Airport Box.

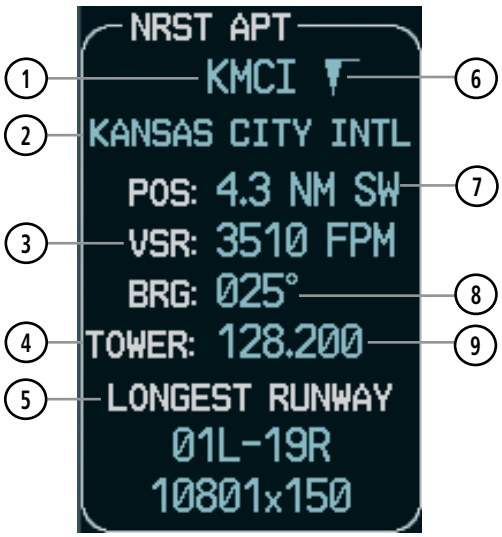


Figure 5-33 Nearest Airport Box

1. Identifier
2. Airport Name (Always Visible)
3. Vertical Speed Required (Vertical Speed Necessary at Current Ground Speed to perform a straight descent to airport, with a range of ± 5000 fps, beyond which it becomes dashed
4. COM Type
5. Longest Runway (Displayed when Airport is not the Destination Airport)
6. METAR Flag (When METAR information available)
7. Position From (Distance and Direction from Nearest Airport)
8. Bearing to Nearest Airport
9. COM Frequency (Displayed when Airport is not the Destination Airport)

NEAREST FREQUENCY BOX

The Nearest Frequency Box is displayed in the automatic mode and not displayed in the destination mode. When no nearest frequencies are detected, the Nearest Frequency Box displays "NONE WITHIN 200 NM".



Figure 5-34 Nearest Frequency Box

1. Air Route Traffic Control Center Frequency (Frequencies) of ARTCC nearest to present position; visible when nearest frequency detected
2. Frequency of Weather Station nearest to present position; visible when nearest weather station is detected

DESTINATION AIRPORT BOX

The Destination Airport Box is displayed in automatic and destination mode.

The destination airport for which the information is displayed is determined as follows.

- The destination airport is the last airport in the active flight plan if:
  - No arrival or approach is loaded, or
  - An arrival waypoint is part of the active leg and no approach is loaded, or
  - The active leg is past the MAP
- The destination airport is the airport prior to the procedure(s) in the active flight plan if:
  - An arrival and/or approach is loaded and neither are active
- The destination airport is the airport associated with the approach if:
  - An arrival waypoint is part of the active leg and an approach is loaded, or
  - The approach is active
- The destination airport is the Direct-to waypoint if:
  - The Direct-to waypoint is not in the active flight plan and is an airport

If none of these conditions are met, then the destination airport is undefined, and a single label is displayed in the box, reading "NO DESTINATION AIRPORT". When a destination airport has been determined, the fields shown in Figure 5-35 are displayed in the Destination Airport Box.

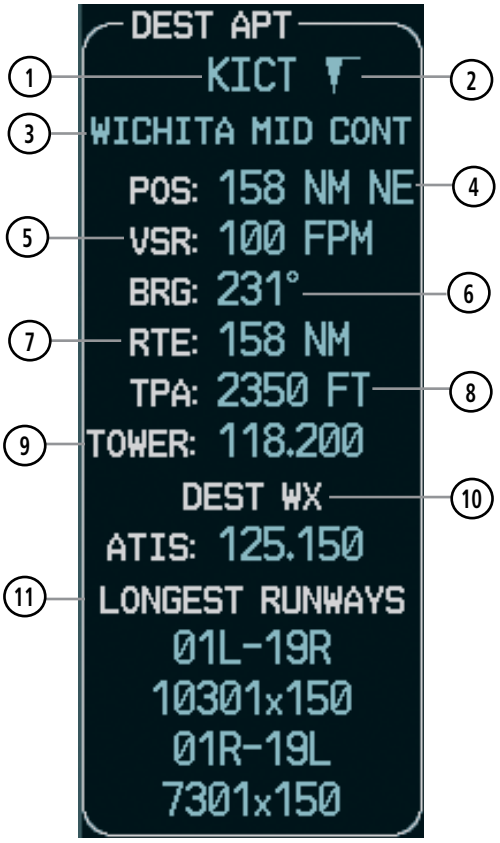


Figure 5-35 Destination Airport Box

1. Airport Identifier; always visible
2. METAR Flag, colored flag indicating METAR condition at airport, visisble when METAR information available
3. Airport Name; always Visible
4. Position From; distance and Bearing from Destination Airport (visible when the destination mode is active, or when the Nearest Airport is same as the destination airport, or when no ARTCC frequencies are detecetd
5. Vertical Speed Required. Vertical speed necessary at current ground speed to perform a straight descent to airport, with a maximum of 5000, beyond which it becomes dashed: "----". Visible when destination mode active, or when nearest airport is same as destination airport, or when no ARTCC frequencies are detected
6. Bearing To, directional bearing to destination airport, always visible
7. Route Distance; total distance from present position to final destination through all waypoints, always visible
8. Traffic Pattern Altitude; Traffic Pattern Altitude of destination airport. Visible when destination mode active, or when nearest airport is same as destination airport, or when one or fewer ARTCC frequencies are detected
9. COM Frequency, frequency of airport primary communication channel. Visible when destination mode active, or nearest airport is same as destination airport.
10. Nearest Weather Station; frequency of weather station nearest to destination airport. Visible when destination mode active, or nearest airport is same as destination airport
11. Longest Runways, identifier and size of the longest or the two longest runways. Identifier and size of the longest or the two longest runways. One: Always visible; Two: visible when destination mode active, or nearest airport is same as destination airport

TIME BOX

The Time Box is always visible.



Figure 5-36 Time Box

1. Estimated Time Enroute; visible when destination is set
2. Estimated Time of Arrival; sum of the present time and ETE, visible when destination is set
3. Flight Time (total time since takeoff) 'FLT' if in-air timer is selected on AUX Utility Page, otherwise 'PWR'. Always visible.

5.3 WAYPOINTS

Waypoints are predetermined geographical positions (internal database) or pilot-entered positions, and are used for all phases of flight planning and navigation.

Communication and navigation frequencies can be tuned "automatically" from various Waypoint Information (WPT) pages, Nearest (NRST) pages, and the Nearest Airports Window (on PFD). This auto-tuning feature simplifies frequency entry over manual tuning. Refer to the Audio Panel and CNS section for details on auto-tuning.

Waypoints can be selected by entering the ICAO identifier, entering the name of the facility, or by entering the city name. See the System Overview section for detailed instructions on entering data in the G900X. As a waypoint identifier, facility name, or location is entered, the G900X's Spell'N'Find™ feature scrolls through the database, displaying those waypoints matching the characters which have been entered to that point. A direct-to navigation leg to the selected waypoint can be initiated by pressing the **Direct-to** Key on any of the waypoint pages.



Figure 5-37 Waypoint Information Window

If duplicate entries exist for the entered facility name or location, additional entries may be viewed by continuing to turn the small **FMS** Knob during the selection process. If duplicate entries exist for an identifier, a Duplicate Waypoints Window is displayed when the **ENT** Key is pressed.



Figure 5-38 Waypoint Information Window - Duplicate Identifier

AIRPORTS

NOTE: *'North Up' orientation on the Airport Information Page cannot be changed; the pilot needs to be aware of proper orientation if the Navigation Map orientation is different from the Airport Information Page Map.*

The Airport Information Page is the first page in WPT group and allows the pilot to view airport information, load frequencies (COM, NAV, and lighting), review runways, and review instrument procedures that may be involved in the flight plan. See the Audio Panel and CNS Section for more information on loading frequencies (auto-tuning). After engine startup, the Airport Information Page defaults to the airport where the aircraft is located. After a flight plan has been loaded, it defaults to the destination airport. On a flight plan with multiple airports, it defaults to the airport which is the current active waypoint.

In addition to displaying a map of the currently selected airport and surrounding area, the Airport Information Page displays airport information in three boxes labeled 'AIRPORT', 'RUNWAYS', and 'FREQUENCIES'. For airports with multiple runways, information for each runway is available. This information is viewed on the Airport Information Page by pressing the INFO softkey until **INFO-1** is displayed.

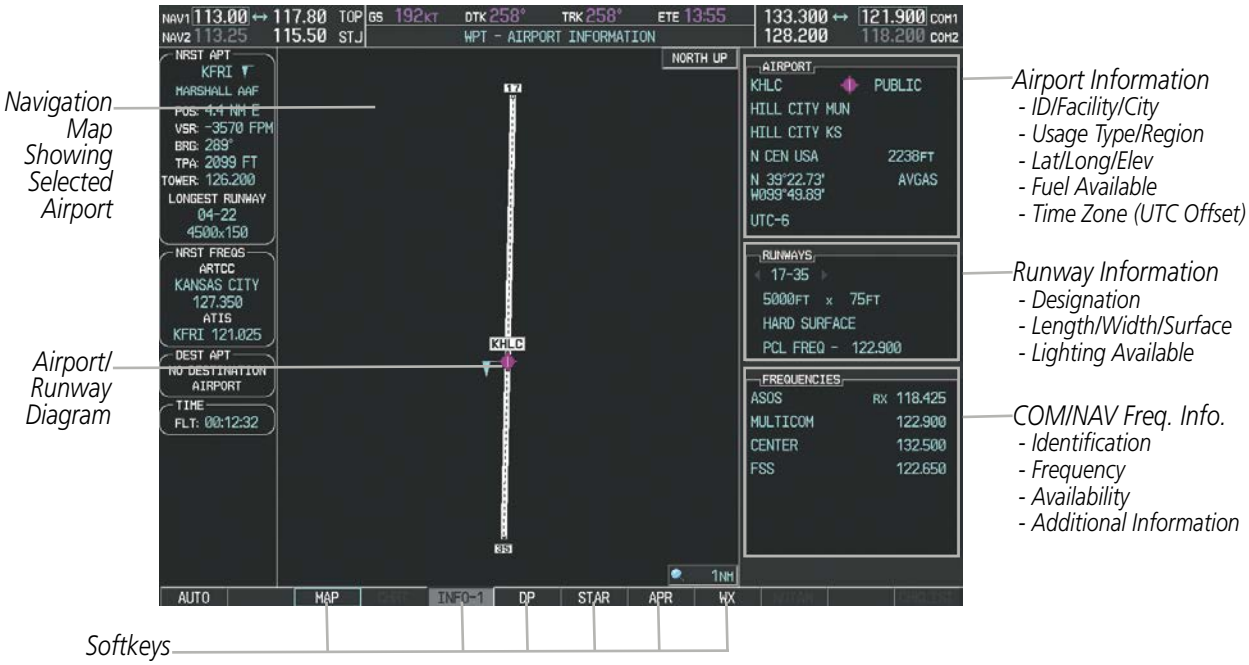


Figure 5-39 Airport Information Page

The following descriptions and abbreviations are used on the Airport Information Page:

- Usage type: Public, Military, Private, or Heliport
- Runway surface type: Hard, Turf, Sealed, Gravel, Dirt, Soft, Unknown, or Water
- Runway lighting type: No Lights, Part Time, Full Time, Unknown, or PCL Freq (for pilot-controlled lighting)
- COM Availability: TX (transmit only), RX (receive only), PT (part time), i (additional information available)

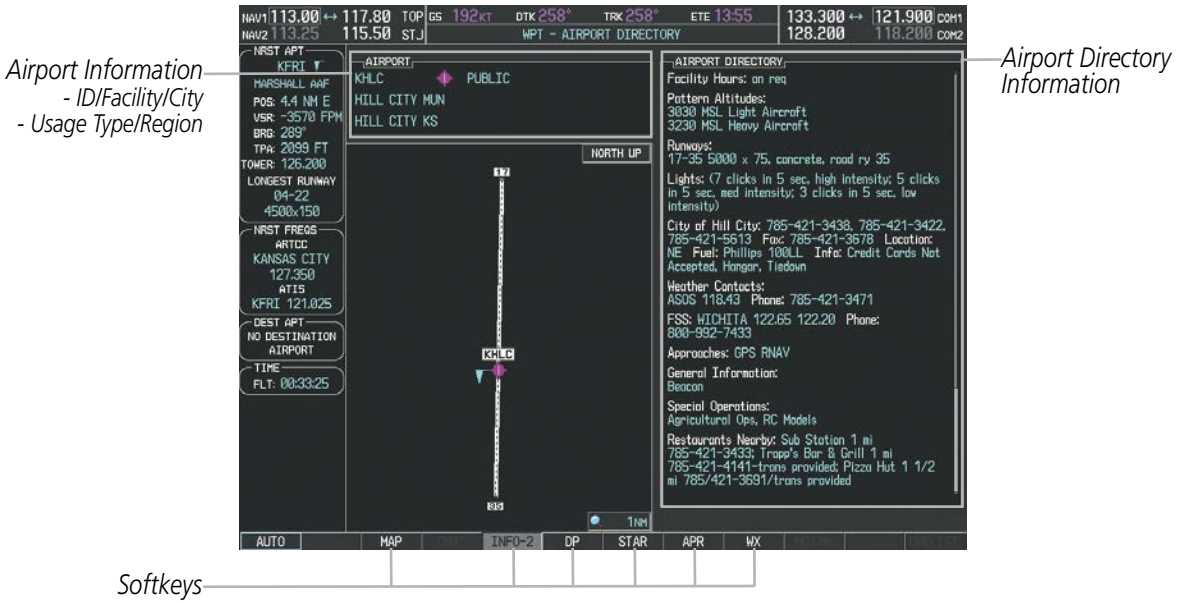


Figure 5-40 Airport Directory Page Example

The airport directory information is viewed on the Airport Directory Page by pressing the INFO softkey until **INFO-2** is displayed. The following are types of airport directory information shown (if available) on the Airport Directory Page:

- **Airport**: Identifier, Site Number, Name, City, State
- **Phones**: Phone/Fax Numbers
- **Hours**: Facility Hours, Light Hours, Tower Hours, Beacon Hours
- **Location**: Sectional, Magnetic Variation
- **Frequencies**: Type/Frequency
- **Transportation**: Ground Transportation Type Available
- **Approach**: Approach Facility Name, Frequency, Frequency Parameter
- **Traffic Pattern Altitudes (TPA)**: Aircraft Class/Altitude
- **Weather**: Service Type, Frequency, Phone Number
- **Flight Service Station (FSS)**: FSS Name, Phone Numbers
- **Instrument Approaches**: Published Approach, Frequency
- **NAVAIDS**: Type, Identifier, Frequency, Radial, Distance
- **Noise**: Noise Abatement Procedures
- **Charts**: Low Altitude Chart Number
- **Runway**: Headings, Length, Width, Obstructions, Surface
- **Obstructions**: General Airport Obstructions
- **Special Operations at Airport**
- **Services Available**: Category, Specific Service
- **Notes**: Airport Notes
- **Pilot Controlled Lighting**: High/Med/Low Clicks/Second
- **FBO**: Type, Frequencies, Services, Fees, Fuel, Credit Cards, Phone/Fax Numbers

Selecting an airport for review by identifier, facility name, or location:

1) From the Airport Information Page, press the **FMS** Knob.
2) Use the **FMS** Knobs and enter an identifier, facility name, or location.
3) Press the **ENT** Key.
4) Press the **FMS** Knob to remove the cursor.

Selecting a runway:

1) With the Airport Information Page displayed, press the **FMS** Knob to activate the cursor.
2) Turn the large **FMS** Knob to place the cursor in the 'RUNWAYS' Box, on the runway designator.
3) Turn the small **FMS** Knob to display the desired runway (if more than one) for the selected airport.
4) To remove the flashing cursor, press the **FMS** Knob.

Viewing a destination airport:

From the Airport Information Page press the **MENU** Key. Select 'View Destination Airport'. The Destination Airport is displayed.

The Airport Frequencies Box uses the descriptions and abbreviations listed in the following table:

Communication Frequencies			Navigation Frequencies
Approach *	Control	Pre-Taxi	ILS
Arrival *	CTA *	Radar	LOC
ASOS	Departure *	Ramp	
ATIS	Gate	Terminal *	
AWOS	Ground	TMA *	
Center	Helicopter	Tower	
Class B *	Multicom	TRSA *	
Class C *	Other	Unicom	
Clearance			
* May include Additional Information			

Table 5-5 Airport Frequency Abbreviations

A departure, arrival, or approach can be loaded using the softkeys on the Airport Information Page. See the Procedures section for details. METARs or TAFs applicable to the selected airport can be selected for display (see the Hazard Avoidance section for details about weather).

The G900X provides a **NRST** Softkey on the PFD, which gives the pilot quick access to nearest airport information (very useful if an immediate landing is required). The Nearest Airports Window displays a list of up to 25 nearest airports (three entries can be displayed at one time). If there are more than three they are displayed in a scrollable list. If there are no nearest airports available, "NONE WITHIN 200NM" is displayed.

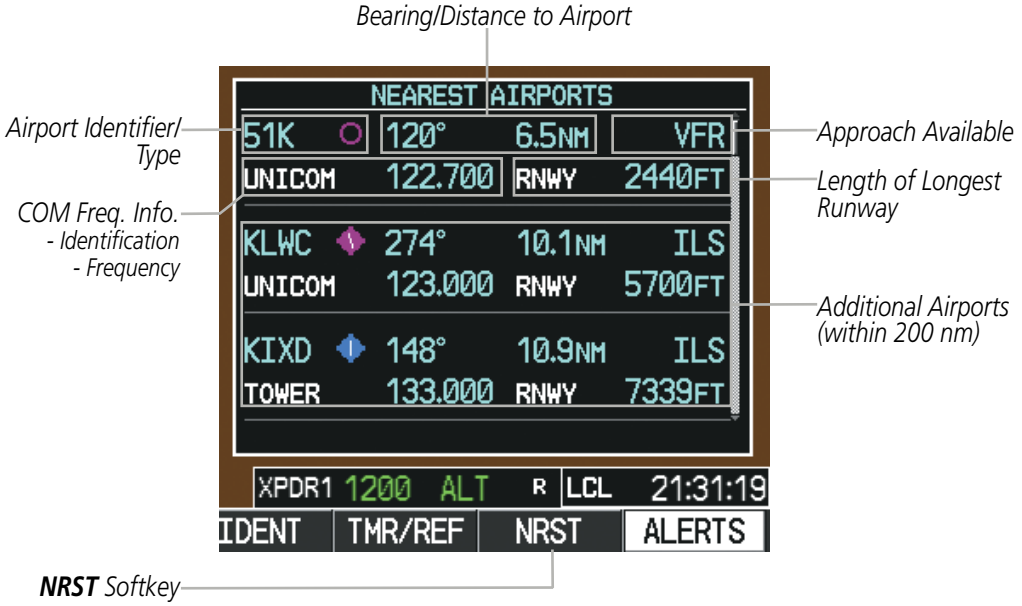


Figure 5-41 Nearest Airports Window on PFD

Pressing the **ENT** Key displays the PFD Airport Information Window for the highlighted airport. Pressing the **ENT** Key again returns to the Nearest Airports Window with the cursor on the next airport in the list. Continued presses of the **ENT** Key sequences through the information pages for all airports in the Nearest Airports list.

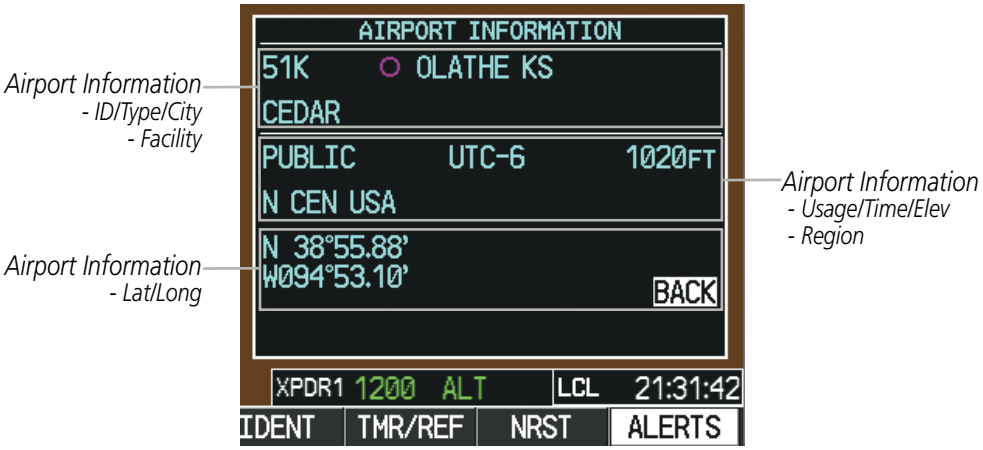


Figure 5-42 Airport Information Window on PFD

The Nearest Airports Page on the MFD is first in the group of NRST pages because of its potential use in the event of an in-flight emergency. In addition to displaying a map of the currently selected airport and surrounding area, the page displays nearest airport information in five boxes labeled 'NEAREST AIRPORTS', 'INFORMATION', 'RUNWAYS', 'FREQUENCIES', and 'APPROACHES'.

The selected airport is indicated by a white arrow, and a dashed white line is drawn on the navigation map from the aircraft position to the nearest airport. Up to five nearest airports, one runway, up to three frequencies, and up to three approaches are visible at one time. If there are more than can be shown, each list can be scrolled. If there are no items for display in a boxed area, text indicating that fact is displayed. The currently selected airport remains in the list until it is unselected.

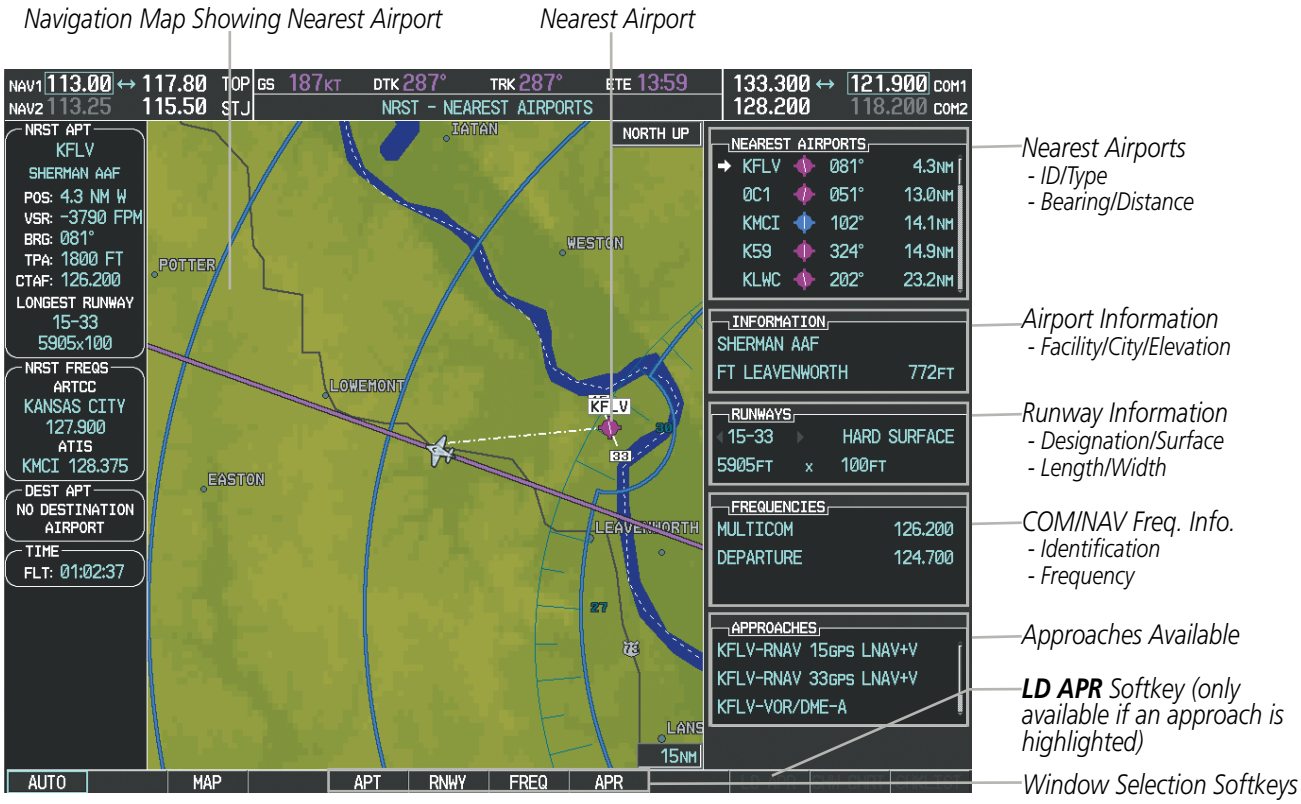


Figure 5-43 Nearest Airport Page

Viewing information for a nearest airport on the PFD:

1) Press the **NRST** Softkey to display the Nearest Airports Window. Press the **FMS** Knob to activate the cursor.
2) Highlight the airport identifier with the **FMS** Knob and press the **ENT** Key to display the Airport Information Window.
3) To return to the Nearest Airports Window press the **ENT** Key (with the cursor on 'BACK') or press the **CLR** Key. The cursor is now on the next airport in the nearest airports list. (Repeatedly pressing the **ENT** Key moves through the airport list, alternating between the Nearest Airports Window and the Airport Information Window.)
4) Press the **CLR** Key or the **NRST** Softkey to close the PFD Nearest Airports Window.

Viewing information for a nearest airport on the MFD:

1) Turn the large **FMS** Knob to select the NRST page group.
2) Turn the small **FMS** Knob to select the Nearest Airports Page (it is the first page of the group, so it may already be selected). If there are no Nearest Airports available, "NONE WITHIN 200 NM" is displayed.
3) Press the **APT** Softkey; or press the **FMS** Knob; or press the **MENU** Key, highlight 'Select Airport Window' and press the **ENT** Key. The cursor is placed in the 'NEAREST AIRPORTS' Box. The first airport in the nearest airports list is highlighted.
4) Turn the **FMS** Knob to highlight the desired airport. (Pressing the **ENT** Key also moves to the next airport.)
5) Press the **FMS** Knob to remove the flashing cursor.

Viewing runway information for a specific airport:

1) With the Nearest Airports Page displayed, press the **RNWY** Softkey; or press the **MENU** Key, highlight 'Select Runway Window'; and press the **ENT** Key. The cursor is placed in the 'RUNWAYS' Box.
2) Turn the small **FMS** Knob to select the desired runway.
3) Press the **FMS** Knob to remove the flashing cursor.

See the Audio Panel and CNS Section for frequency selection and the Procedures section for approaches.

The Nearest Airports Box on the System Setup Page defines the minimum runway length and surface type used when determining the 25 nearest airports to display on the MFD Nearest Airports Page. A minimum runway length and/or surface type can be entered to prevent airports with small runways or runways that are not appropriately surfaced from being displayed. Default settings are 0 feet (or meters) for runway length and "HARD/SOFT" for runway surface type.

Selecting nearest airport surface matching criteria:

1) Use the **FMS** Knob to select the System Setup Page.
2) Press the **FMS** Knob momentarily to activate the flashing cursor.
3) Turn the large **FMS** Knob to highlight the runway surface field in the Nearest Airports Box.
4) Turn the small **FMS** Knob to select the desired runway option (ANY, HARD ONLY, HARD/SOFT, WATER).
5) Press the **ENT** Key.
6) Press the **FMS** Knob to remove the flashing cursor.

Selecting nearest airport minimum runway length matching criteria:

1) Use the **FMS** Knob to select the System Setup Page.
2) Press the **FMS** Knob momentarily to activate the flashing cursor.
3) Turn the large **FMS** Knob to highlight the minimum length field in the Nearest Airport Box.
4) Use the **FMS** Knob to enter the minimum runway length (zero to 25,000 feet) and press the **ENT** Key.
5) Press the **FMS** Knob to remove the flashing cursor.

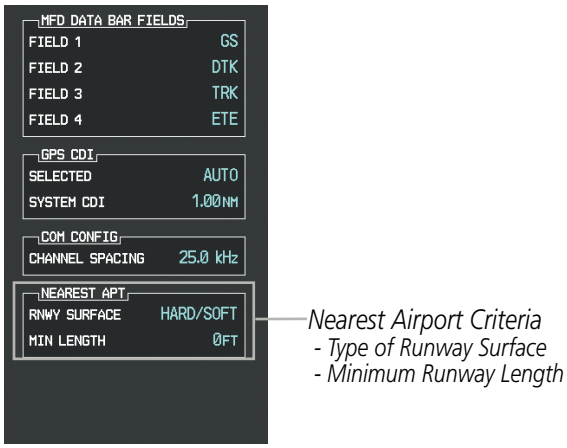


Figure 5-44 System Setup Page - Nearest Airport Selection Criteria

INTERSECTIONS

NOTE: *The VOR displayed on the Intersection Information Page is the nearest VOR, not necessarily the VOR used to define the intersection.*

The Intersection Information Page is used to view information about intersections. In addition to displaying a map of the currently selected intersection and surrounding area, the Intersection Information Page displays intersection information in three boxes labeled 'INTERSECTION', 'INFORMATION', and 'NEAREST VOR'.

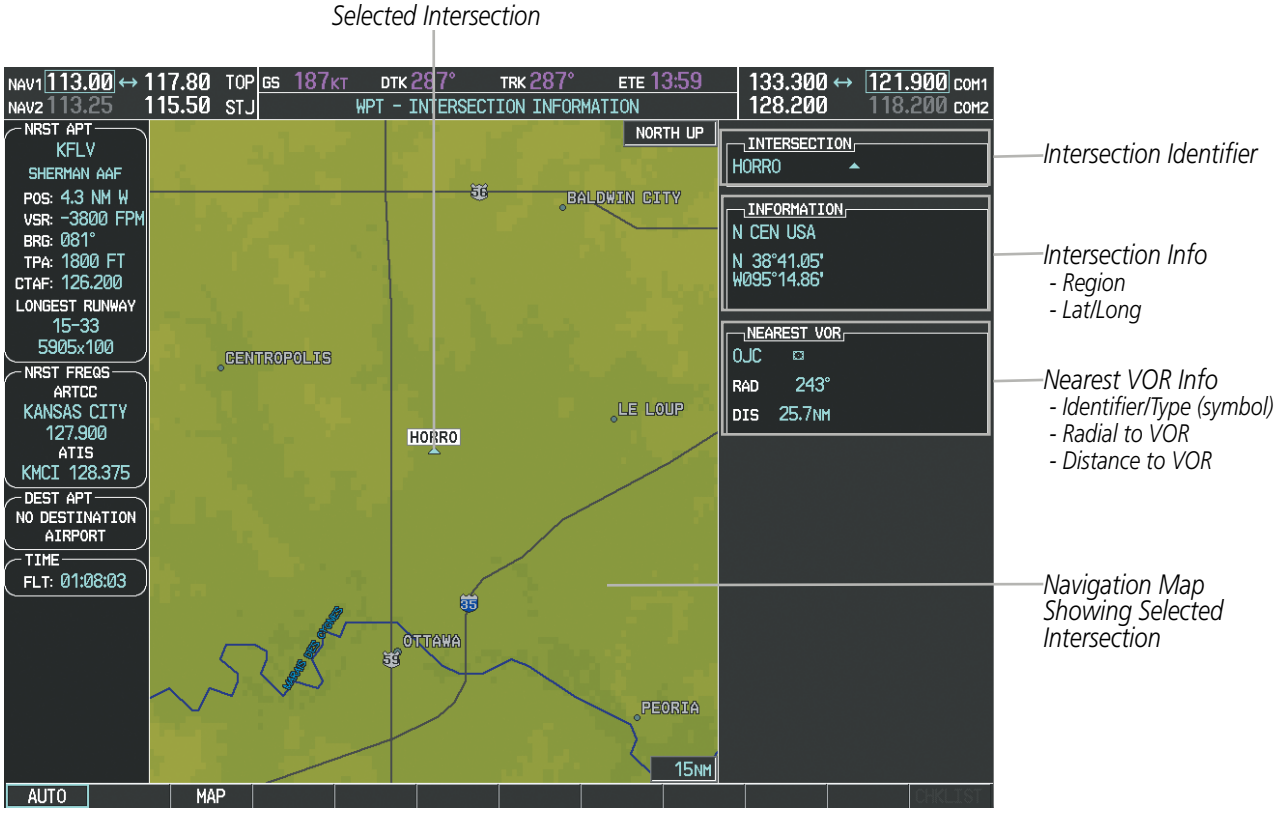


Figure 5-45 Intersection Information Page

Selecting an intersection:

1) With the Intersection Information Page displayed, enter an identifier in the Intersection Box.
2) Press the **ENT** Key.
3) Press the **FMS** Knob to remove the flashing cursor.

Or:

1) With the Nearest Intersections Page displayed, press the **FMS** Knob.
2) Press the **ENT** Key or turn either **FMS** Knob to select an identifier in the Nearest Intersection Box.
3) Press the **FMS** Knob to remove the flashing cursor.

The Nearest Intersections Page can be used to quickly find an intersection close to the flight path. In addition to displaying a map of the surrounding area, the page displays information for up to 25 nearest intersections in three boxes labeled 'NEAREST INT', 'INFORMATION', and 'REFERENCE VOR'.

The selected intersection is indicated by a white arrow. Up to eleven Intersections are visible at a time. If there are more than can be shown, the list can be scrolled. If there are no items for display, text indicating that fact is displayed.

NOTE: *The list only includes waypoints that are within 200 nm.*

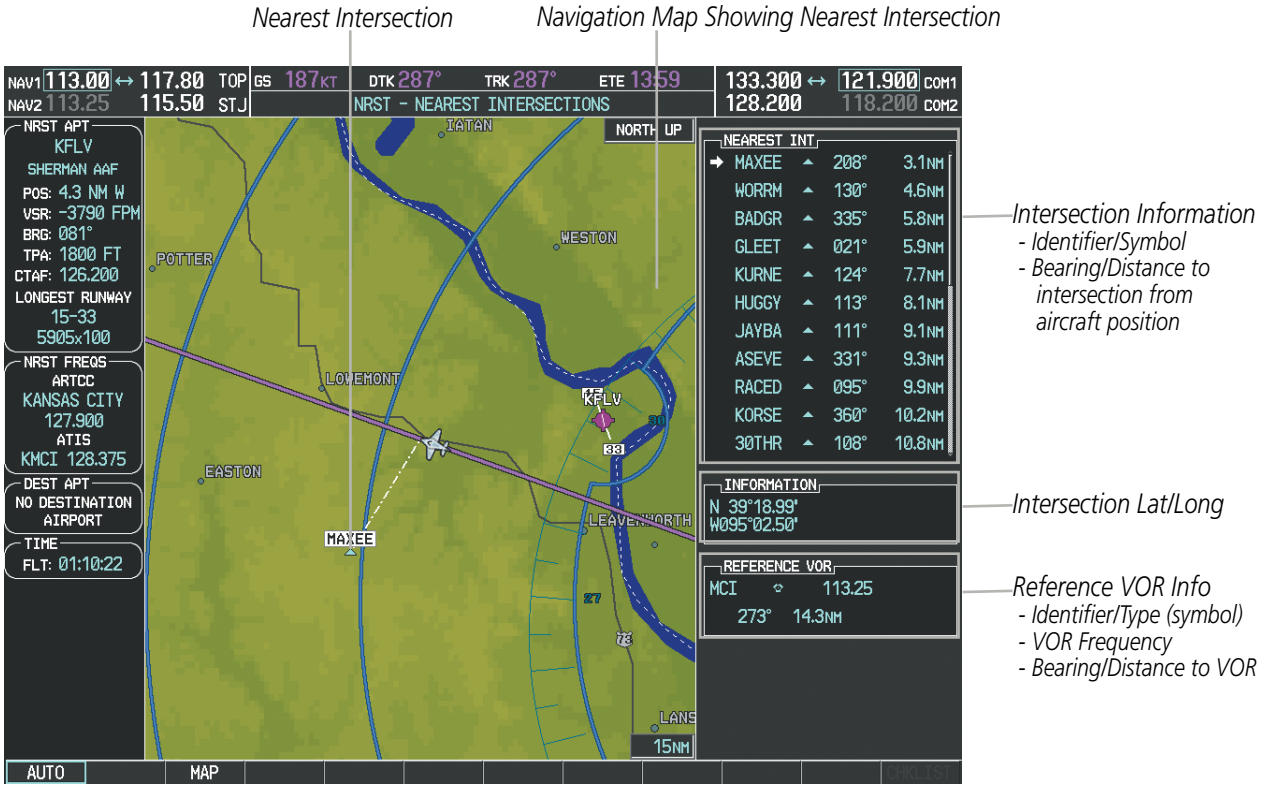


Figure 5-46 Nearest Intersections Page

NDBs

The NDB Information Page is used to view information about NDBs. In addition to displaying a map of the currently selected NDB and surrounding area, the page displays NDB information in four boxes labeled 'NDB', 'INFORMATION', 'FREQUENCY', and 'NEAREST AIRPORT'.

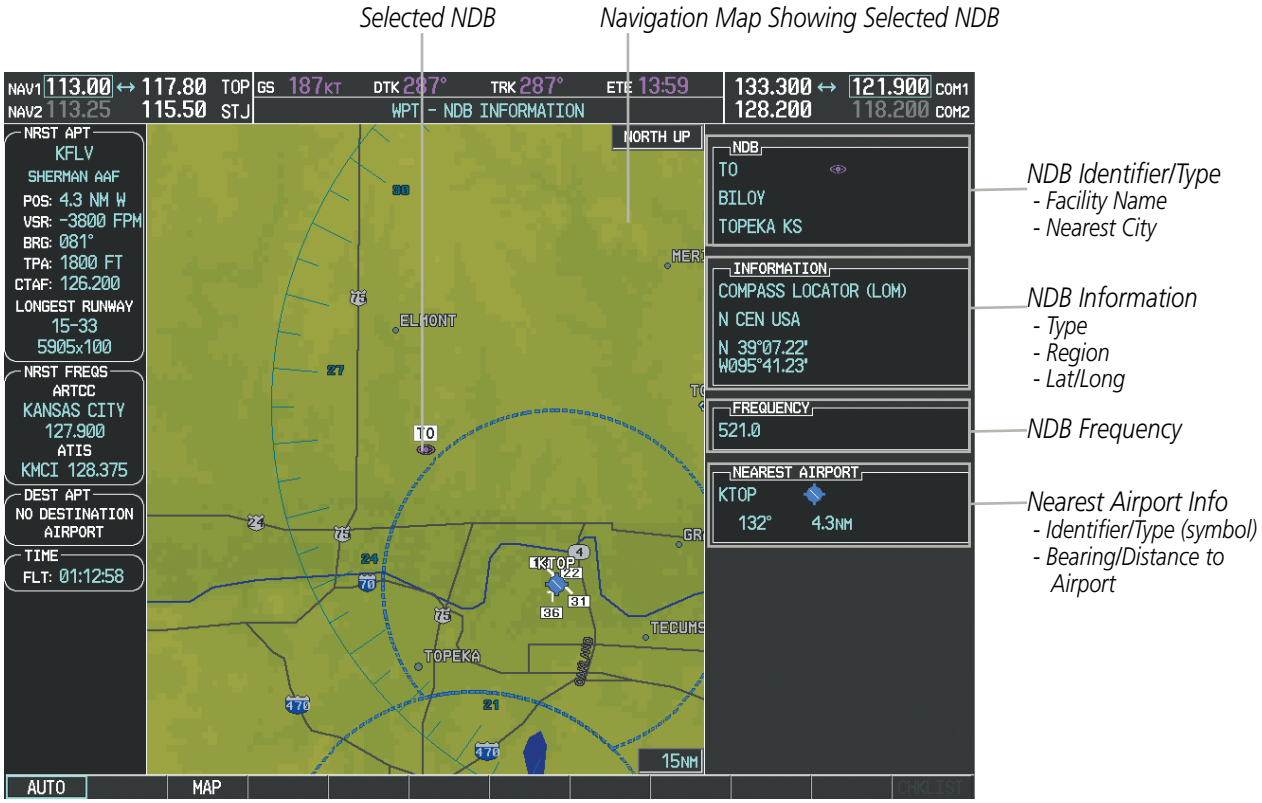


Figure 5-47 NDB Information Page

NOTE: *Compass locator (LOM, LMM): a low power, low or medium frequency radio beacon installed in conjunction with the instrument landing system. When LOM is used, the locator is at the Outer Marker; when LMM is used, the locator is at the Middle Marker.*

Selecting an NDB:

1) With the NDB Information Page displayed, enter an identifier, the name of the NDB, or the city in which it's located in the NDB Box.
2) Press the **ENT** Key.
3) Press the **FMS** Knob to remove the flashing cursor.

Or:

1) With the Nearest NDB Page displayed, press the **FMS** Knob
2) Press the **ENT** Key or turn either **FMS** Knob to select an identifier in the Nearest NDB Box.
3) Press the **FMS** Knob to remove the flashing cursor.

The Nearest NDB Page can be used to quickly find a NDB close to the flight path. In addition to displaying a map of the surrounding area, the page displays information for up to 25 nearest NDBs in three boxes labeled 'NEAREST NDB', 'INFORMATION', and 'FREQUENCY'.

A white arrow before the NDB identifier indicates the selected NDB. Up to eleven NDBs are visible at a time. If there are more than can be shown, each list can be scrolled. The list only includes waypoints that are within 200nm. If there are no NDBs in the list, text indicating that there are no nearest NDBs is displayed. If there are no nearest NDBs in the list, the information and frequency fields are dashed.

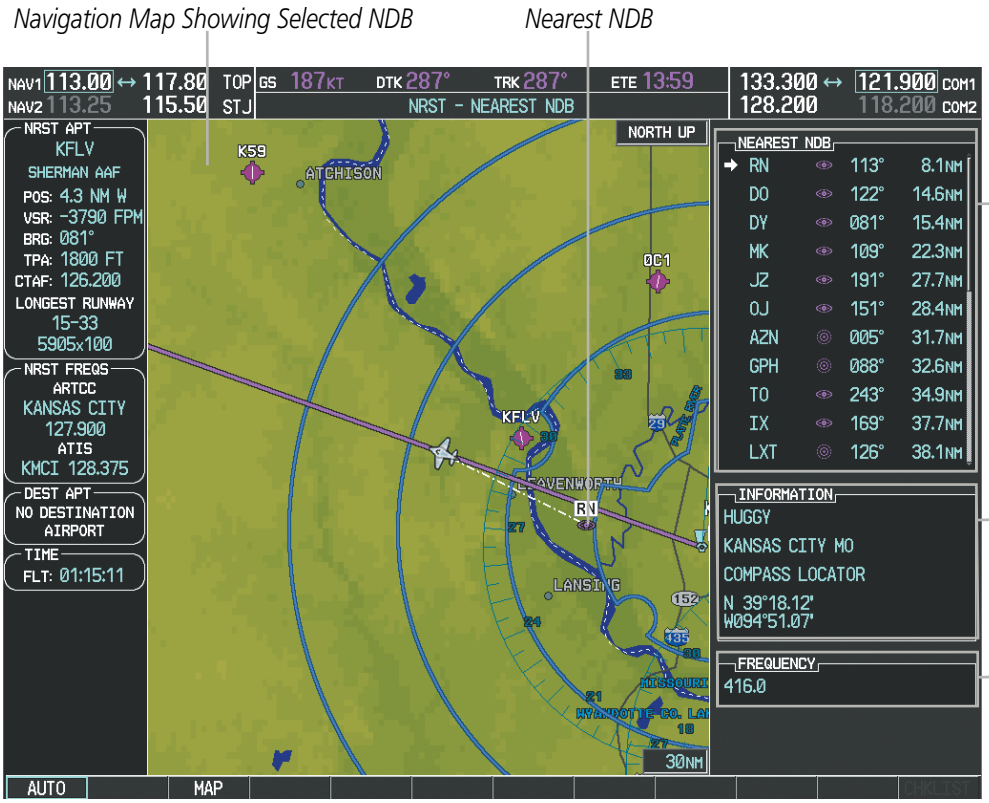


Figure 5-48 Nearest NDB Page

VORs

The VOR Information Page can be used to view information about VOR and ILS signals (since ILS signals can be received on a NAV receiver), or to quickly auto-tune a VOR or ILS frequency. Localizer information cannot be viewed on the VOR Information Page. If a VOR station is combined with a TACAN station it is listed as a VORTAC on the VOR Information Page and if it includes only DME, it is displayed as VOR-DME.

In addition to displaying a map of the currently selected VOR and surrounding area, the VOR Information Page displays VOR information in four boxes labeled 'VOR', 'INFORMATION', 'FREQUENCY', and 'NEAREST AIRPORT'.

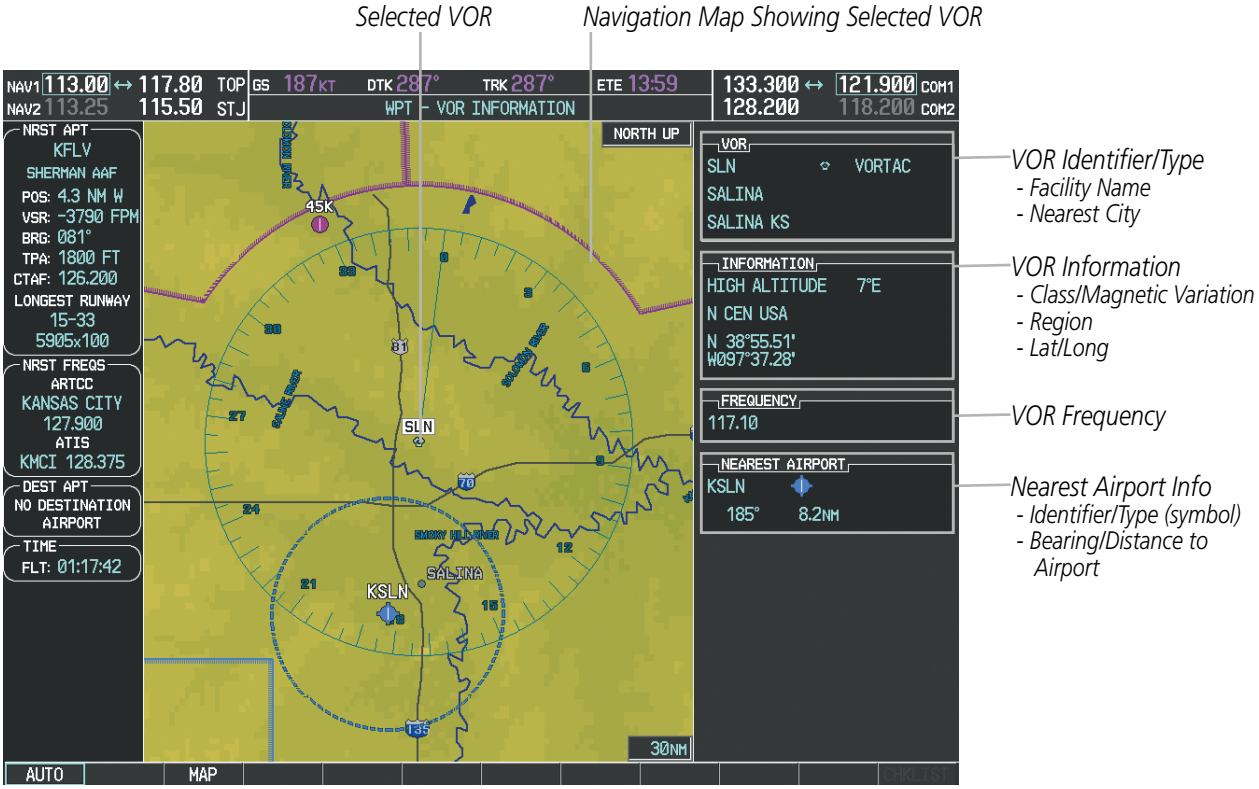


Figure 5-49 VOR Information Page

The VOR classes used in the VOR information box are: LOW ALTITUDE, HIGH ALTITUDE, and TERMINAL.

Selecting a VOR:

1) With the VOR Information Page displayed, enter an identifier, the name of the VOR, or the city in which it's located in the VOR Box.
2) Press the **ENT** Key.
3) Press the **FMS** Knob to remove the flashing cursor.

Or:

1) With the Nearest VOR Page displayed, press the **FMS** Knob or press the **VOR** Softkey.
2) Press the **ENT** Key or turn either **FMS** Knob to select an identifier in the Nearest VOR Box.
3) Press the **FMS** Knob to remove the flashing cursor.

Or:

1) With the Nearest VOR Page displayed, press the **MENU** Key.
2) Highlight 'Select VOR Window', and press the **ENT** Key.
3) Press the **ENT** Key or turn either **FMS** Knob to select an identifier in the Nearest VOR Box.
4) Press the **FMS** Knob to remove the flashing cursor.

The Nearest VOR Page can be used to quickly find a VOR station close to the aircraft. Also, a NAV frequency from a selected VOR station can be loaded from the Nearest VOR Page. In addition to displaying a map of the surrounding area, the Nearest VOR Page displays information for up to 25 nearest VOR stations in three boxes labeled 'NEAREST VOR', 'INFORMATION', and 'FREQUENCY'. The list only includes waypoints that are within 200 nm.

A white arrow before the VOR identifier indicates the selected VOR. Up to eleven VORs are visible at a time. If there are more than can be shown, each list can be scrolled. If there are no VORs in the list, text indicating that there are no nearest VORs is displayed. If there are no nearest VORs in the list, the information is dashed.

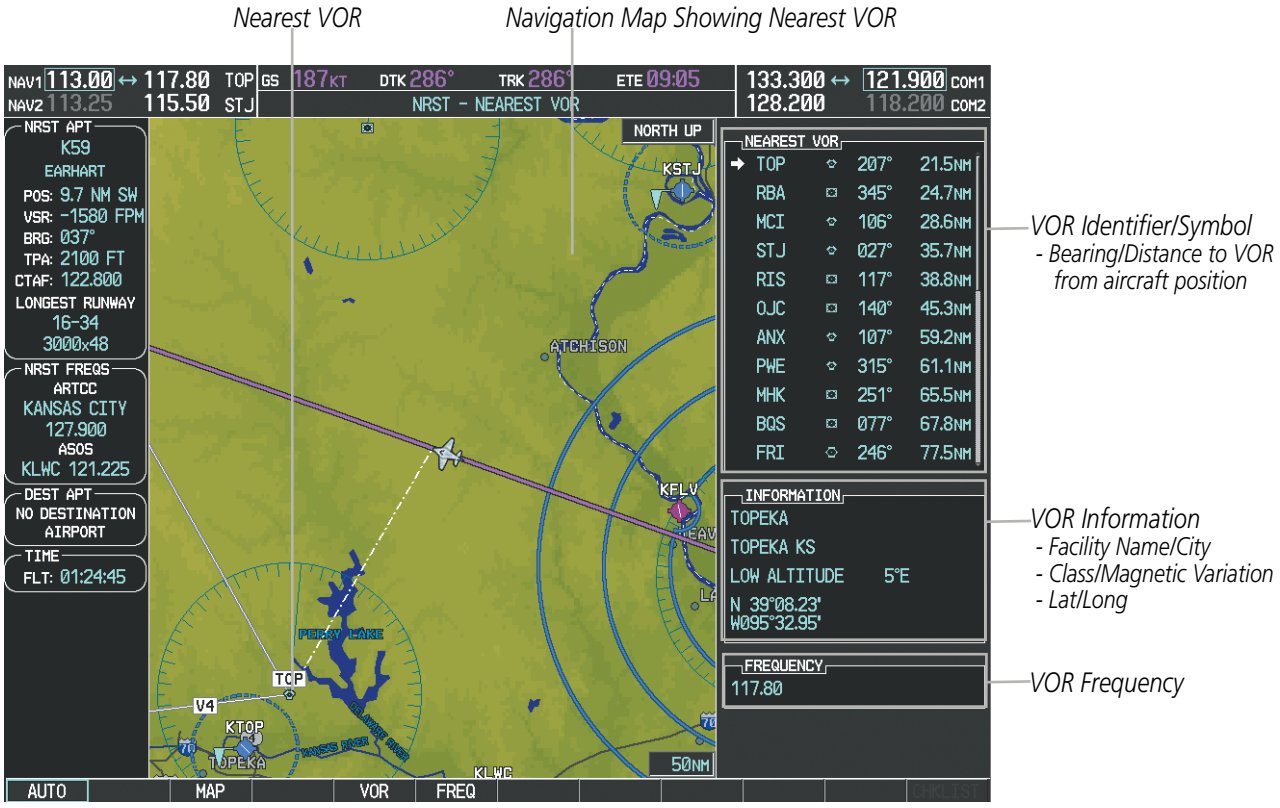


Figure 5-50 Nearest VOR Page

VRPs

The VRP Information Page is used to view information about visual reporting points (VRPs). In addition to displaying a map of the currently selected VRP and surrounding area, the VRP Information Page displays VRP information in two boxes labeled 'VRP' and 'INFORMATION".

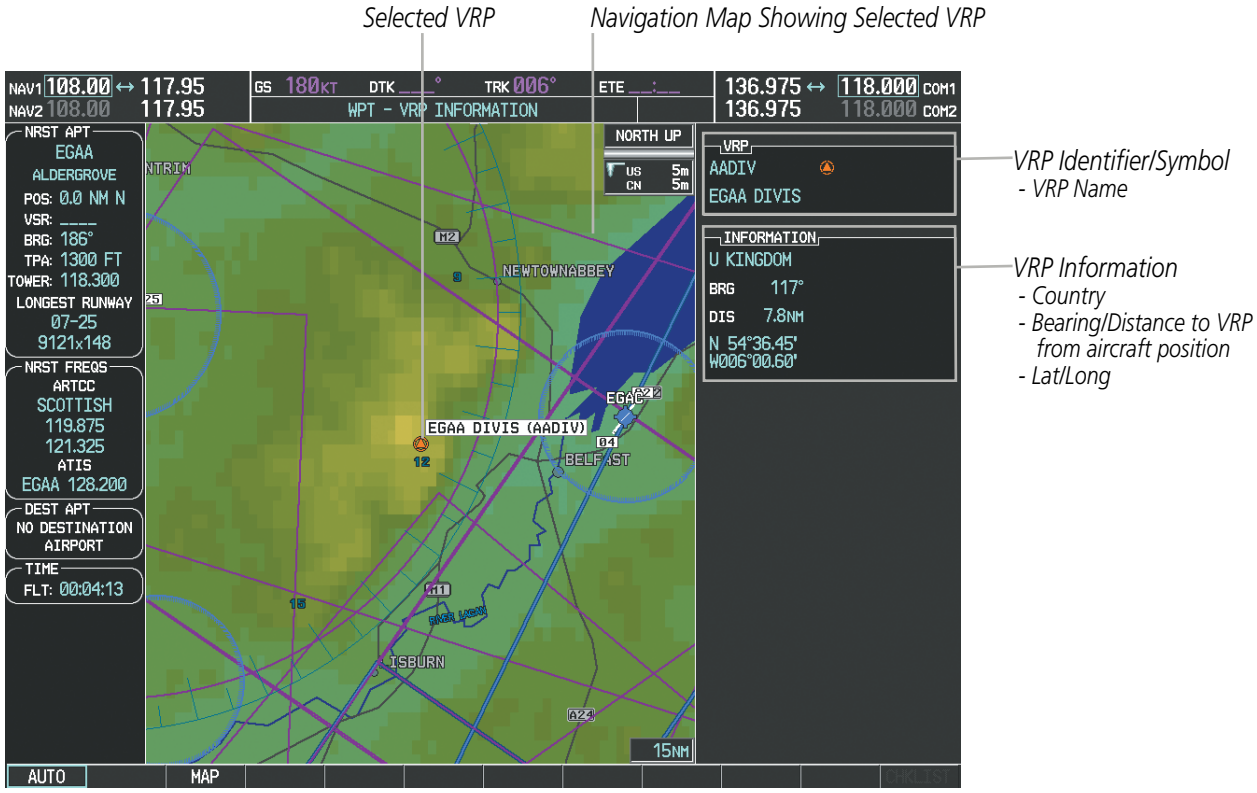


Figure 5-51 VRP Information Page

Selecting a VRP:

1) With the VRP Information Page displayed, enter the identifier or the name of the VRP in the VRP Box.
2) Press the **ENT** Key.
3) Press the **FMS** Knob to remove the flashing cursor.

Or:

1) With the Nearest VRP Page displayed, press the **FMS** Knob.
2) Press the **ENT** Key or turn either **FMS** Knob to select an identifier in the Nearest VRP Box.
3) Press the **FMS** Knob to remove the flashing cursor.

The Nearest VRP Page can be used to quickly find a VRP close to the aircraft. In addition to displaying a map of the surrounding area, the Nearest VRP Page displays information for up to 25 nearest VRPs in two boxes labeled 'NEAREST VRP' and 'INFORMATION'. The list only includes VRPs that are within 200 nm.

A white arrow before the VRP identifier indicates the selected VRP. Up to eleven VRPs are visible at a time. If there are more than can be shown, the list can be scrolled. If there are no VRPs in the list, text indicating that there are no nearest VRPs is displayed. If there are no nearest VRPs in the list, the information is dashed.

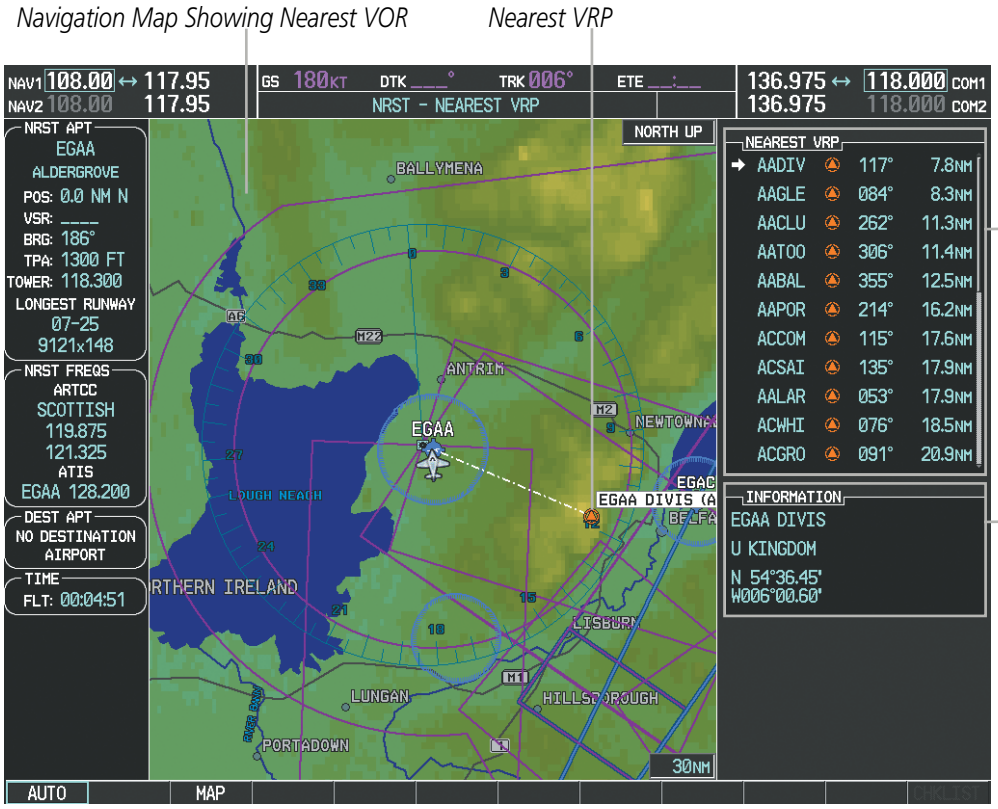


Figure 5-52 Nearest VRP Page

User Waypoints

The G900X can create and store up to 1,000 user-defined waypoints. User waypoints can be created from any map page (except PFD Inset Map, AUX-Trip Planning Page, or Procedure Pages) by selecting a position on the map using the **Joystick**, or from the User Waypoint Information Page by referencing a bearing/distance from an existing waypoint, bearings from two existing waypoints, or latitude and longitude. Once a waypoint has been created, it can be renamed, deleted, or moved. Temporary user waypoints are erased upon system power down.

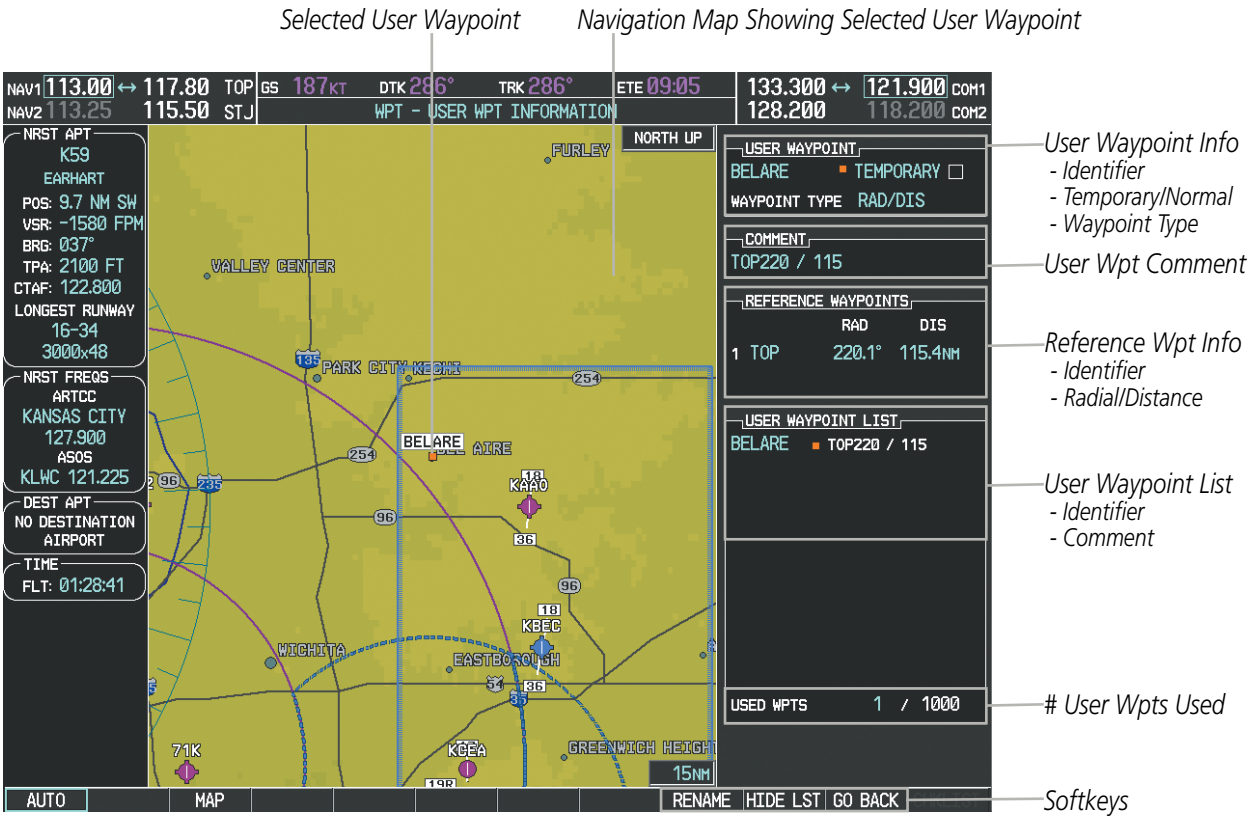


Figure 5-53 User Waypoint Information Page

Selecting a User Waypoint:

1) With the User Waypoint Information Page displayed, enter the name of the User Waypoint, or scroll to the desired waypoint in the User Waypoint List using the large **FMS** Knob.
2) Press the **ENT** Key.
3) Press the **FMS** Knob to remove the flashing cursor.

Or:

1) With the Nearest User Waypoints Page displayed, press the **FMS** Knob.
2) Press the **ENT** Key or turn either **FMS** Knob to select an identifier in the Nearest USR Box.
3) Press the FMS Knob to remove the flashing cursor.

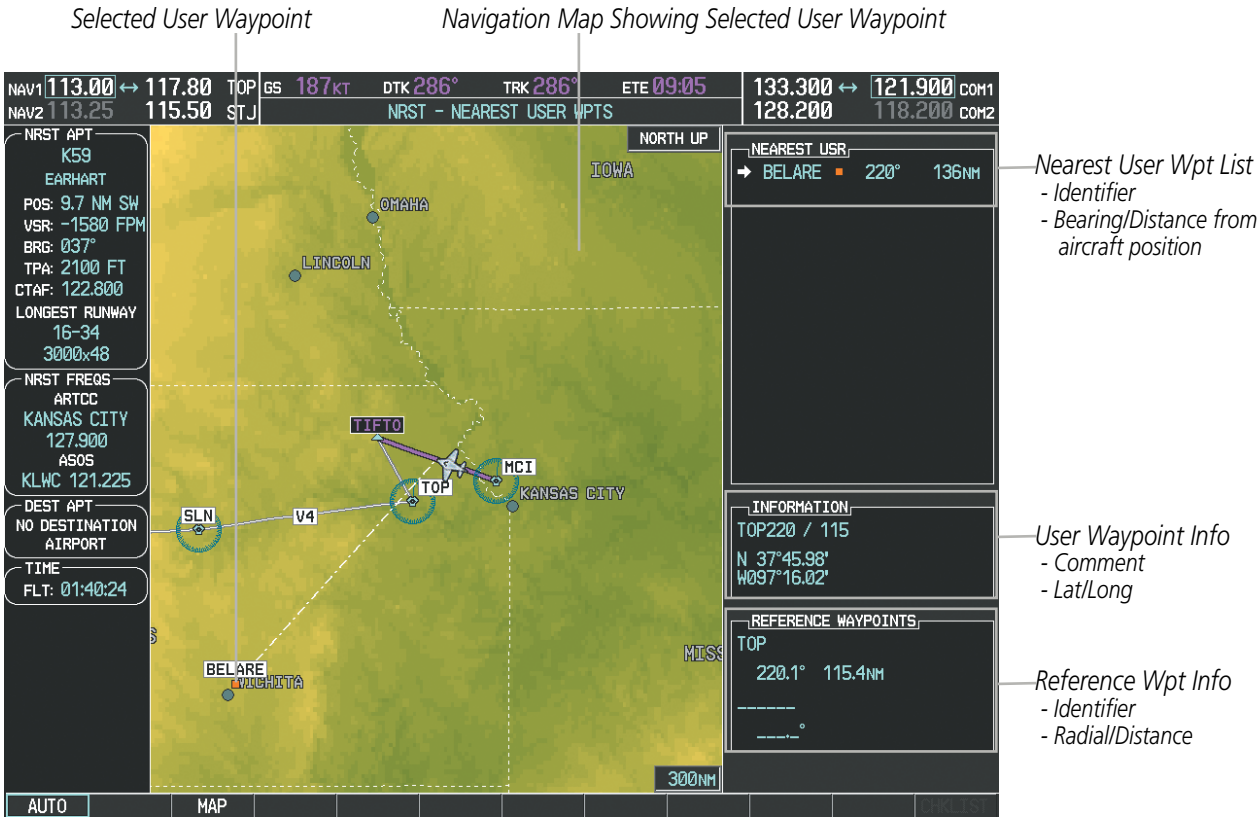


Figure 5-54 Nearest User Waypoint Page

CREATING USER WAYPOINTS

User waypoints can be created from the User Waypoint Information Page in the following ways:

Creating user waypoints from the User Waypoint Information Page:

1) Press the **NEW** Softkey, **or** press the **MENU** Key and select 'Create New User Waypoint'.
2) Enter a user waypoint name (up to six characters).
3) Press the **ENT** Key. The current aircraft position is the default location of the new waypoint.
4) If desired, define the type and location of the waypoint in one of the following ways:

   Select "RAD/RAD" using the small **FMS** Knob, press the **ENT** Key, and enter the two reference waypoint identifiers and radials into the REFERENCE WAYPOINTS window using the **FMS** Knobs.

   Or:

   Select "RAD/DIS" using the small **FMS** Knob, press the **ENT** Key, and enter the reference waypoint identifier, the radial, and the distance into the REFERENCE WAYPOINTS window using the **FMS** Knobs.

   Or:

   Select "LAT/LON" using the small **FMS** Knob, press the **ENT** Key, and enter the latitude and longitude into the INFORMATION window using the **FMS** Knobs.

5) Press the **ENT** Key to accept the new waypoint.

6) If desired, change the storage method of the waypoint to "TEMPORARY" or "NORMAL" by moving the cursor to "TEMPORARY" and pressing the **ENT** Key to check or uncheck the box.

7) Press the **FMS** Knob to remove the flashing cursor.

Or:

1) Press the **FMS** Knob to activate the cursor.

2) Enter a user waypoint name (up to six characters).

3) Press the **ENT** Key. The message 'Are you sure you want to create the new User Waypoint AAAAAA?' is displayed.

4) With 'YES' highlighted, press the **ENT** Key.

5) If desired, define the type and location of the waypoint in one of the following ways:

   Select "RAD/RAD" using the small **FMS** Knob, press the **ENT** Key, and enter the two reference waypoint identifiers and radials into the REFERENCE WAYPOINTS window using the **FMS** Knobs.

   Or:

   Select "RAD/DIS" using the small **FMS** Knob, press the **ENT** Key, and enter the reference waypoint identifier, the radial, and the distance into the REFERENCE WAYPOINTS window using the **FMS** Knobs.

   Or:

   Select "LAT/LON" using the small **FMS** Knob, press the **ENT** Key, and enter the latitude and longitude into the INFORMATION window using the **FMS** Knobs.

6) Press the **ENT** Key to accept the new waypoint.

7) If desired, change the storage method of the waypoint to "TEMPORARY" or "NORMAL" by moving the cursor to "TEMPORARY" and pressing the **ENT** Key to check or uncheck the box.

8) Press the **FMS** Knob to remove the flashing cursor.



Figure 5-55 User Waypoint Information Page Menu

Creating user waypoints from map pages:

1) Press the **Joystick** to activate the panning function and pan to the map location of the desired user waypoint.
2) Press the **ENT** Key. The User Waypoint Information Page is displayed with the captured position.

NOTE: *If the pointer has highlighted a map database feature, one of three things happens upon pressing the* **ENT** *Key: 1) information about the selected feature is displayed instead of initiating a new waypoint, 2) a menu pops up allowing a choice between 'Review Airspaces' or 'Create User Waypoint', or 3) a new waypoint is initiated with the default name being the selected map item.*

3) Enter a user waypoint name (up to six characters).
4) Press the **ENT** Key to accept the selected name. The first reference waypoint box is highlighted.
5) If desired, define the type and location of the waypoint in one of the following ways:

   Select "RAD/RAD" using the small **FMS** Knob, press the **ENT** Key, and enter the two reference waypoint identifiers and radials into the REFERENCE WAYPOINTS window using the **FMS** Knobs.

   Or:

   Select "RAD/DIS" using the small **FMS** Knob, press the **ENT** Key, and enter the reference waypoint identifier, the radial, and the distance into the REFERENCE WAYPOINTS window using the **FMS** Knobs.

   Or:

   Select "LAT/LON" using the small **FMS** Knob, press the **ENT** Key, and enter the latitude and longitude into the INFORMATION window using the **FMS** Knobs.
6) Press the **ENT** Key to accept the new waypoint.
7) If desired, change the storage method of the waypoint to "TEMPORARY" or "NORMAL" by moving the cursor to "TEMPORARY" and pressing the **ENT** Key to check or uncheck the box.
8) Press the **FMS** Knob to remove the flashing cursor.
9) Press the **GO BACK** Softkey to return to the map page.

EDITING USER WAYPOINTS

Editing a user waypoint comment or location:

1) With the User Waypoint Information Page displayed, press the **FMS** Knob to activate the cursor.
2) Select a user waypoint in the User Waypoint List, if required, and press the **ENT** Key.
3) Move the cursor to the desired field.
4) Turn the small **FMS** Knob to make any changes.
5) Press the **ENT** Key to accept the changes.
6) Press the **FMS** Knob to remove the flashing cursor.

Renaming user waypoints:

1) Highlight a user waypoint in the User Waypoint List. Press the **RENAME** Softkey, or press the **MENU** Key and select 'Rename User Waypoint'.
2) Enter a new name.
3) Press the **ENT** Key. The message 'Do you want to rename the user waypoint AAAAAA to BBBBBB?' is displayed.
4) With 'YES' highlighted, press the **ENT** Key.
5) Press the **FMS** Knob to remove the flashing cursor.

Changing the location of an existing waypoint to the aircraft present position:

1) Enter a waypoint name or select the waypoint in the User Waypoint List, then press the **ENT** Key.
2) Press the **MENU** Key.
3) Select 'Use Present Position'.
4) Press the **ENT** Key twice. The new waypoint's location is saved.
5) Press the **FMS** Knob to remove the flashing cursor.

A system generated comment for a user waypoint incorporates the reference waypoint identifier, bearing, and distance. If a system generated comment has been edited, a new comment can be generated.

Resetting the comment field to the system generated comment:

1) Enter a waypoint name or select the waypoint in the User Waypoint List, then press the **ENT** Key.
2) Press the **MENU** Key.
3) Select 'Auto Comment'.
4) Press the **ENT** Key. The generated comment is based on the reference point used to define the waypoint.

The default type of user waypoint (normal or temporary) can be changed using the user waypoint information page menu. Temporary user waypoints are automatically deleted upon the next power cycle.

Changing the user waypoint storage duration default setting:

1) With the User Waypoint Information Page displayed, press the **MENU** Key.
2) Move the cursor to select 'Waypoint Setup', and press the **ENT** Key.
3) Select 'NORMAL' or 'TEMPORARY' as desired, and press the **ENT** Key.
4) Press the **FMS** Knob to remove the flashing cursor and return to the User Waypoint Information Page.

DELETING USER WAYPOINTS

Deleting a single user waypoint:

1) Highlight a User Waypoint in the User Waypoint List, or enter a waypoint in the User Waypoint field.
2) Press the **DELETE** Softkey or press the **CLR** Key. 'Yes' is highlighted in the confirmation window.
3) Press the **ENT** Key.
4) Press the **FMS** Knob to remove the flashing cursor.

Or:

1) Highlight a User Waypoint in the User Waypoint List, or enter a waypoint in the User Waypoint field.
2) Press the **MENU** Key.
3) Select 'Delete User Waypoint'.
4) Press the **ENT** Key twice to confirm the selection.
5) Press the **FMS** Knob to remove the flashing cursor.

NOTE: *The option to 'Delete All User Waypoints' is not available while the aircraft is in flight.*

Deleting all user waypoints:

1) Highlight a User Waypoint in the User Waypoint List.
2) Press the **MENU** Key.
3) Select 'Delete All User Waypoints'.
4) Press the **ENT** Key twice to confirm the selection.
5) Press the **FMS** Knob to remove the flashing cursor.

5.4 AIRSPACES

The G900X can display the following types of airspaces: Class B/TMA, Class C/TCA, Class D, Restricted, MOA (Military), Other Airspace, Air Defense Interdiction Zone (ADIZ), and Temporary Flight Restriction (TFR).

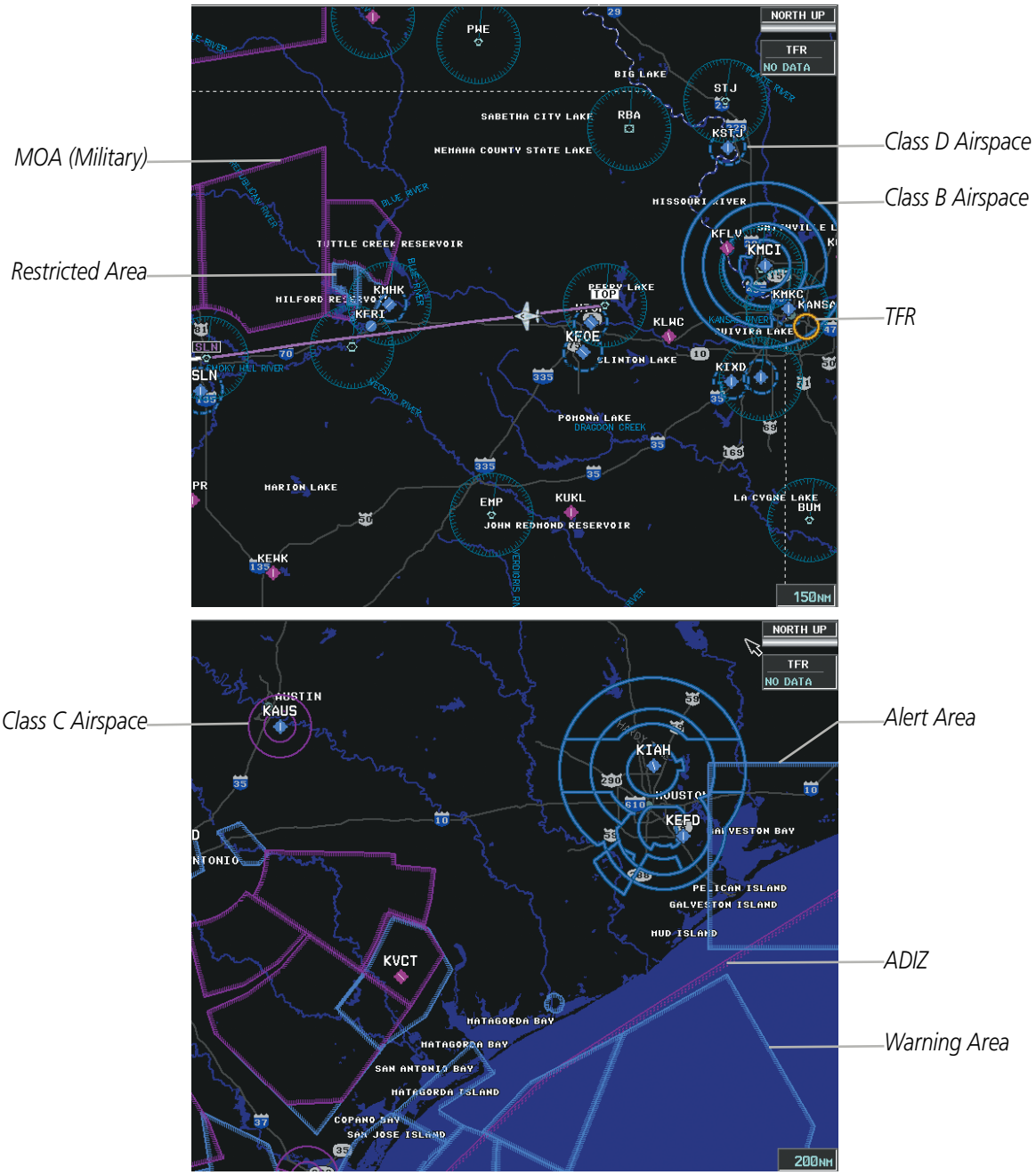


Figure 5-56 Airspaces

The Nearest Airspaces Page, Airspace Alerts Window, and Airspace Alerts on the PFD provide additional information about airspaces and the location of the aircraft in relationship to them.

The Airspace Alerts Box allows the pilot to turn the controlled/special-use airspace message alerts on or off. This does not affect the alerts listed on the Nearest Airspaces Page or the airspace boundaries depicted on the Navigation Map Page. It simply turns on/off the warning provided when the aircraft is approaching or near an airspace.

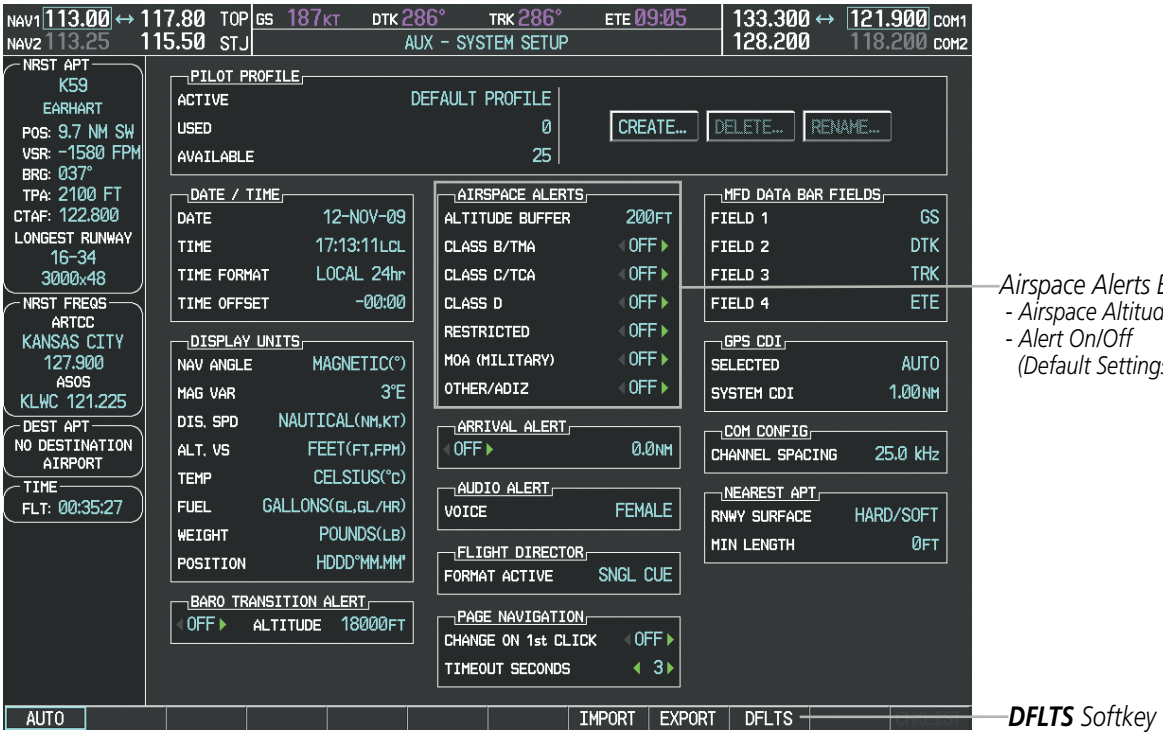
An altitude buffer is also provided which "expands" the vertical range above or below an airspace. For example, if the buffer is set at 500 feet, and the aircraft is more than 500 feet above/below an airspace, an alert message is not generated, but if the aircraft is less than 500 feet above/below an airspace and projected to enter it, the pilot is notified with an alert message. The default setting for the altitude buffer is 200 feet.

Changing the altitude buffer distance setting:

1) Use the **FMS** Knob to select the AUX - System Setup Page.
2) Press the **FMS** Knob momentarily to activate the flashing cursor.
3) Turn the large **FMS** Knob to highlight the altitude buffer field in the Airspace Alerts Box.
4) Use the **FMS** Knob to enter an altitude buffer value and press the **ENT** Key.
5) Press the **FMS** Knob to remove the flashing cursor.

Turning an airspace alert on or off:

1) Use the **FMS** Knob to select the AUX - System Setup Page.
2) Press the **FMS** Knob momentarily to activate the flashing cursor.
3) Turn the large **FMS** Knob to highlight the desired field in the Airspace Alerts Box.
4) Turn the small **FMS** Knob clockwise to turn the airspace alert ON or counterclockwise to turn the alert OFF.
5) Press the **FMS** Knob to remove the flashing cursor.



Airspace Alerts Box
- Airspace Altitude Buffer
- Alert On/Off
(Default Settings Shown)

***DFLTS** Softkey*

Figure 5-57 System Setup Page - Airspace Alerts

Map ranges for the airspace boundaries are selected from the Aviation Group in the Map Setup Menu. See Table 5-2 for the default and maximum ranges for each type of airspace and the symbol used to define the airspace area.

The Nearest Airspaces Page can be used to quickly find airspaces close to the flight path. In addition, a selected frequency associated with the airspace can be loaded from the Nearest Airspaces Page. In addition to displaying a map of airspace boundaries and surrounding area, the Nearest Airspaces Page displays airspace information in four boxes labeled 'AIRSPACE ALERTS', 'AIRSPACE, AGENCY', 'VERTICAL LIMITS', and 'FREQUENCIES'.

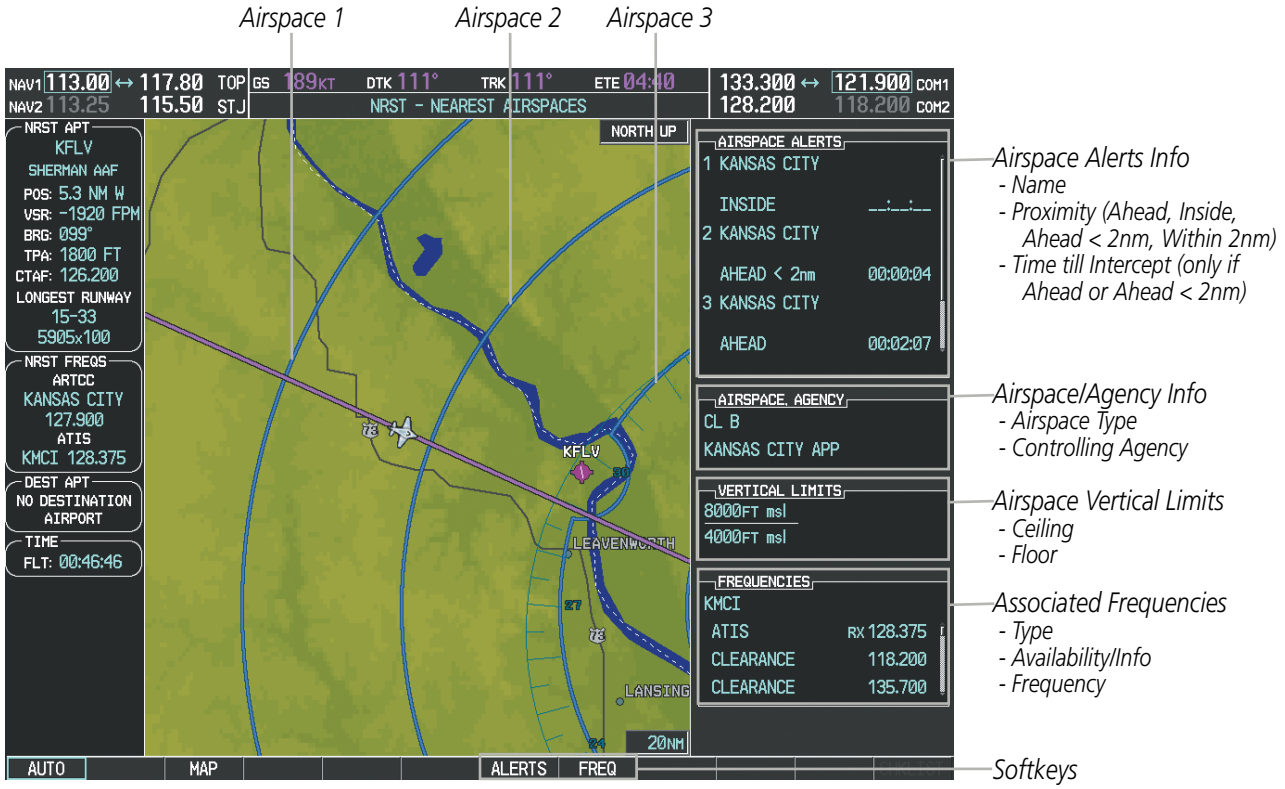


Figure 5-58 Nearest Airspaces Page

Airspace alerts and associated frequencies are shown in scrollable lists on the Nearest Airspaces Page. The **ALERTS** and **FREQ** softkeys place the cursor in the respective list. The **FREQ** Softkey is enabled only if one or more frequencies exist for a selected airspace.

Selecting and viewing an airspace alert with its associated information:

1) Select the Nearest Airspaces Page.
2) Press the **ALERTS** Softkey; or press the **FMS** Knob; or press the **MENU** Key, highlight 'Select Alerts Window', and press the **ENT** Key. The cursor is placed in the 'AIRSPACE ALERTS' Box.
3) Select the desired airspace.
4) Press the **FMS** Knob to remove the flashing cursor.

Pressing the PFD **ALERTS** Softkey displays the message window on the PFD. The following airspace alerts are displayed in the message window:

Message	Comments
INSIDE ARSPC – Inside airspace.	The aircraft is inside the airspace.
ARSPC AHEAD – Airspace ahead – less than 10 minutes.	Special use airspace is ahead of aircraft. The aircraft penetrates the airspace within 10 minutes.
ARSPC NEAR – Airspace near and ahead.	Special use airspace is near and ahead of the aircraft position.
ARSPC NEAR – Airspace near – less than 2 nm.	Special use airspace is within 2 nm of the aircraft position.

Table 5-6 PFD Airspace Alert Messages

The Smart Airspace function de-emphasizes airspaces above or below the current aircraft altitude. The function does not require the aircraft present position or flight path to enter the lateral boundaries of the airspace. If the current aircraft altitude is within 1100 feet of the vertical boundaries of the airspace, the airspace boundary is shown normally. If the current aircraft altitude is not within 1100 feet of the vertical boundaries of the airspace, the airspace boundary is shown subdued.



Smart Airspace Off — Smart Airspace On

Figure 5-59 Smart Airspace

Turning smart airspace on or off:

1) Use the **FMS** Knob to select the Navigation Map Page.
2) Press the **MENU** Key, and press the **ENT** Key. The cursor is placed in the 'GROUP' Box.
3) Turn the small **FMS** Knob to highlight the 'Aviation' in the 'GROUP' Box and press the **ENT** Key.
4) Turn the large **FMS** Knob to highlight the 'SMART AIRSPACE' field in the Aviation Map Setup Window.
5) Turn the small **FMS** Knob clockwise to turn smart airspace On or counterclockwise to turn smart airspace Off
6) Press the **FMS** Knob to remove the flashing cursor.

5.5 DIRECT-TO-NAVIGATION

The Direct-to method of navigation, initiated by pressing the **Direct-to** Key on either the MFD or PFD, is quicker to use than a flight plan when the desire is to navigate to a single point such as a nearby airport.

Once a direct-to is activated, the G900X establishes a point-to-point course line from the present position to the selected direct-to destination. Course guidance is provided until the direct-to is replaced with a new direct-to or flight plan, or cancelled.

A vertical navigation (VNV) direct-to creates a descent path (and provides guidance to stay on the path) from the current altitude to a selected altitude at the direct-to waypoint. Vertical navigation is based on barometric altitudes, not on GPS altitude, and is used for cruise and descent phases of flight.

The Direct-to Window allows selection and activation of direct-to navigation. The Direct-to Window displays selected direct-to waypoint data on the PFD and the MFD.



Figure 5-60 Direct-to Window - MFD



Figure 5-61 Direct-to Window - PFD

Any waypoint can be entered as a direct-to destination from the Direct-to Window.

Entering a waypoint identifier, facility name, or city as a direct-to destination:

1) Press the **Direct-to** Key. The Direct-to Window is displayed (with the active flight plan wayoint as the default selection or a blank waypoint field if no flight plan is active).
2) Turn the small **FMS** Knob clockwise to begin entering a waypoint identifier (turning it counter-clockwise brings up the waypoint selection submenu - press the **CLR** Key to remove it), or turn the large **FMS** Knob to select the facility name, or city field and turn the small **FMS** Knob to begin entering a facility name or city. If duplicate entries exist for the entered facility or city name, additional entries can be viewed by turning the small **FMS** Knob during the selection process.
3) Press the **ENT** Key. The 'Activate?' field is highlighted.
4) Press the **ENT** Key to activate the direct-to.

Any waypoint contained in the active flight plan can be selected as a direct-to waypoint from the Direct-to Window, the Active Flight Plan Page, or the Active Flight Plan Window.

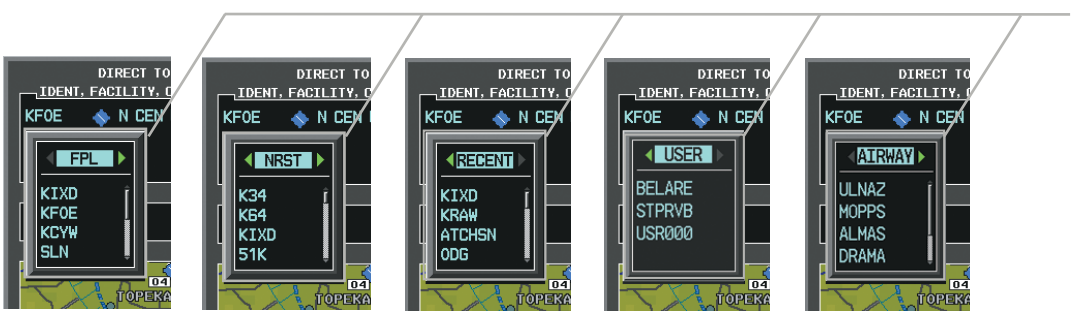


Figure 5-62 Waypoint Submenu

Selecting an active flight plan waypoint as a direct-to destination:

1) While navigating an active flight plan, press the **Direct-to** Key. The Direct-to Window is displayed with the active flight plan waypoint as the default selection.
2) Turn the small **FMS** Knob counter-clockwise to display a list of flight plan waypoints (the FPL list is populated only when navigating a flight plan).
3) Select the desired waypoint.
4) Press the **ENT** Key. The cursor is now displayed on 'ACTIVATE?'.
5) Press the **ENT** Key again to activate the direct-to.

Or:

1) Select the Active Flight Plan Page on the MFD, or the Active Flight Plan Window on the PFD.
2) Select the desired waypoint.
3) Press the **Direct-to** Key.
4) Press the **ENT** Key. The cursor is now displayed on 'ACTIVATE?'.
5) Press the **ENT** Key again to activate the direct-to.

Any NRST, RECENT, USER, or AIRWAY waypoint can be selected as a direct-to destination in the Direct-to Window.

Selecting a NRST, RECENT, USER, or AIRWAY waypoint as a direct-to destination:

1) Press the **Direct-to** Key. The Direct-to Window is displayed (with the active flight plan destination as the default selection or a blank destination if no flight plan is active).
2) Turn the small **FMS** Knob counter-clockwise to display a list of FPL waypoints (the FPL list is populated only when navigating a flight plan, and the AIRWAY list is available only when the active leg is part of an airway).
3) Turn the small **FMS** Knob clockwise to display the NRST, RECENT, USER, or AIRWAY waypoints.
4) Turn the large **FMS** Knob clockwise to select the desired waypoint.
5) Press the **ENT** Key. The cursor is now displayed on 'ACTIVATE?'.
6) Press the **ENT** Key again to activate the direct-to.

The Direct-to Window can be displayed from any page and allows selection and activation of direct-to navigation. If the direct-to is initiated from any page except the WPT pages, the default waypoint is the active flight plan waypoint (if a flight plan is active) or a blank waypoint field. Direct-to requests on any WPT page defaults to the displayed waypoint.

Selecting any waypoint as a direct-to destination:

1) Select the page or window containing the desired waypoint type and select the desired waypoint.
2) Press the **Direct-to** Key to display the Direct-to Window with the selected waypoint as the direct-to destination.
3) Press the **ENT** Key. The cursor is now displayed on 'ACTIVATE?'.
4) Press **ENT** again to activate the direct-to.

Selecting a nearby airport as a direct-to destination:

1) Press the **NRST** Softkey on the PFD; or turn the **FMS** Knob to display the Nearest Airports Page and press the **FMS** Knob.
2) Select the desired airport (the nearest one is already selected).
3) Press the **Direct-to** Key.
4) Press the **ENT** Key. The cursor is now displayed on 'ACTIVATE?'.
5) Press the **ENT** Key again to activate the direct-to.

Direct-to destinations may also be selected by using the pointer on the navigation map pages. If no airport, NAVAID, or user waypoint exists at the desired location, a temporary waypoint named 'MAPWPT' is automatically created at the location of the map arrow.

Selecting a waypoint as a direct-to destination using the pointer:

1) From a navigation map page, press the **Joystick** to display the pointer.
2) Move the **Joystick** to place the pointer at the desired destination location.
3) If the pointer is placed on an existing airport, NAVAID, or user waypoint, the waypoint name is highlighted.

4) Press the **Direct-to** Key to display the Direct-to Window with the selected point entered as the direct-to destination.

5) Press the **ENT** Key. The cursor is now displayed on 'ACTIVATE?'.

6) Press the **ENT** Key again to activate the direct-to.

Cancelling a Direct-to:

1) Press the **Direct-to** Key to display the Direct-to Window.

2) Press the **MENU** Key.

3) With 'Cancel Direct-To NAV' highlighted, press the **ENT** Key. If a flight plan is still active, the G900X resumes navigating the flight plan along the closest leg.



Page Menu
- Cancel Direct-To Navigation

Figure 5-63 Direct-to Window - Cancelling Direct-to Navigation

When navigating a direct-to, the G900X sets a direct great circle course to the selected destination. The course to a destination can also be manually selected using the course field ('COURSE') on the Direct-to Window.

Selecting a manual direct-to course:

1) Press the **Direct-to** Key. The Direct-to Window is displayed with the destination field highlighted.

2) Highlight the course field.

3) Enter the desired course.

4) Press the **ENT** Key. The cursor is now displayed on 'ACTIVATE?'.

5) Press the **ENT** Key again to activate the direct-to.

Reselecting the direct course from the current position:

1) Press the **Direct-to** Key. The Direct-to Window is displayed with the destination field highlighted.
2) Press the **ENT** Key. The cursor is now displayed on 'ACTIVATE?'.
3) Press the **ENT** Key again to activate the direct-to.

A direct-to with altitude constraints creates a descent path (and provides guidance to stay on the path) from the aircraft's current altitude to the altitude of the direct-to waypoint. The altitude is reached at the waypoint, or at the specified distance along the flight path if an offset distance has been entered. All VNV altitudes prior to the direct-to destination are removed from the active flight plan upon successful activation of the direct-to. All VNV altitudes following the direct-to waypoint are retained. See the section on Vertical Navigation for more information regarding the use and purpose of VNV altitudes and offset distances.

Entering a VNV altitude and along-track offset for the waypoint:

1) Press the **Direct-to** Key to display the Direct-to Window.
2) Turn the large **FMS** Knob to place the cursor over the 'VNV' altitude field.
3) Enter the desired altitude.
4) Press the **ENT** Key. The option to select MSL or AGL is now displayed.
5) Turn the small **FMS** Knob to select 'MSL' or 'AGL'.
6) Press the **ENT** Key. The cursor is now flashing in the VNV offset distance field.
7) Enter the desired along-track distance before the waypoint.
8) Press the **ENT** Key. The 'Activate?' field is highlighted.
9) Press the **ENT** Key to activate.

Removing a VNV altitude constraint:

1) Press the **Direct-to** Key to display the Direct-to Window.
2) Press the **MENU** Key.
3) With 'Clear Vertical Constraints' highlighted, press the **ENT** Key.



Page Menu
- Clear Vertical Navigation Constraints

Figure 5-64 Direct-to Window - Clearing Vertical Constraints

5.6 FLIGHT PLANNING

Flight planning on the G900X consists of building a flight plan by entering waypoints one at a time, adding waypoints along airways, and inserting departures, airways, arrivals, or approaches as needed. The G900X allows flight planning information to be entered from either the MFD or PFD. The flight plan is displayed on maps using different line widths, colors, and types, based on the type of leg and the segment of the flight plan currently being flown (departure, enroute, arrival, approach, or missed approach).

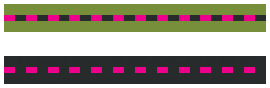
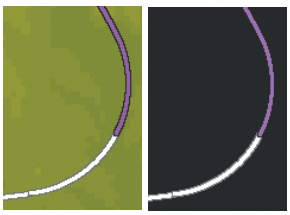
Flight Plan Leg Type	Symbol
Active Course Leg (TOPO On) Active Course Leg (TOPO Off)	
Active Heading Leg or Active Roll Steering Path (TOPO On) Active Heading Leg or Active Roll Steering Path (TOPO Off)	
Course Leg in the current flight segment (TOPO On) Course Leg in the current flight segment (TOPO Off)	
Course Leg not in the current flight segment (TOPO On) Course Leg not in the current flight segment (TOPO Off)	
Heading Leg or Roll Steering Path (TOPO On) Heading Leg or Roll Steering Path (TOPO Off)	
Turn Anticipation Arc (TOPO On/TOPO Off)	

Table 5-7 Flight Plan Leg Symbols

Up to 99 flight plans with up to 100 waypoints each can be created and stored in memory. One flight plan can be activated at a time and becomes the active flight plan. The active flight plan is erased when the system is turned off and overwritten when another flight plan is activated. When storing flight plans with an approach, departure, or arrival, the G900X uses the waypoint information from the current database to define the waypoints. If the database is changed or updated, the G900X automatically updates the information if the procedure has not been modified. If an approach, departure, or arrival procedure is no longer available, the procedure is deleted from the affected stored flight plan(s), and an alert is displayed (see Miscellaneous Messages in Appendix A) advising that one or more stored flight plans need to be edited.

Whenever an approach, departure, or arrival procedure is loaded into the active flight plan, a set of approach, departure, or arrival waypoints is inserted into the flight plan along with a header line describing the instrument procedure the pilot selected. The original enroute portion of the flight plan remains active (unless an instrument procedure is activated) when the procedure is loaded.

When the database is updated, the airways need to be reloaded also. Each airway segment is reloaded from the database given the entry waypoint, the airway identifier and the exit waypoint. This reloads the sequence of waypoints between the entry and exit waypoints (the sequence may change when the database is updated). The update of an airway can fail during this process. If that happens, the airway waypoints are changed to regular (non-airway) flight plan waypoints, and an alert is displayed (see Miscellaneous Messages in Appendix A).

The following could cause the airway update to fail:

- Airway identifier, entry waypoint or exit waypoint not found in the new database.
- Airway entry/exit waypoint is not an acceptable waypoint for the airway – either the waypoint is no longer on the airway, or there is a new directional restriction that prevents it being used.
- Loading the new airway sequence would exceed the capacity of the flight plan.

FLIGHT PLAN CREATION

There are three methods to create or modify a flight plan:

- Active Flight Plan Page on the MFD (create/modify the active flight plan)
- Active Flight Plan Window on the PFD (create/modify the active flight plan)
- Flight Plan Catalog Page on the MFD (create/modify a stored flight plan)

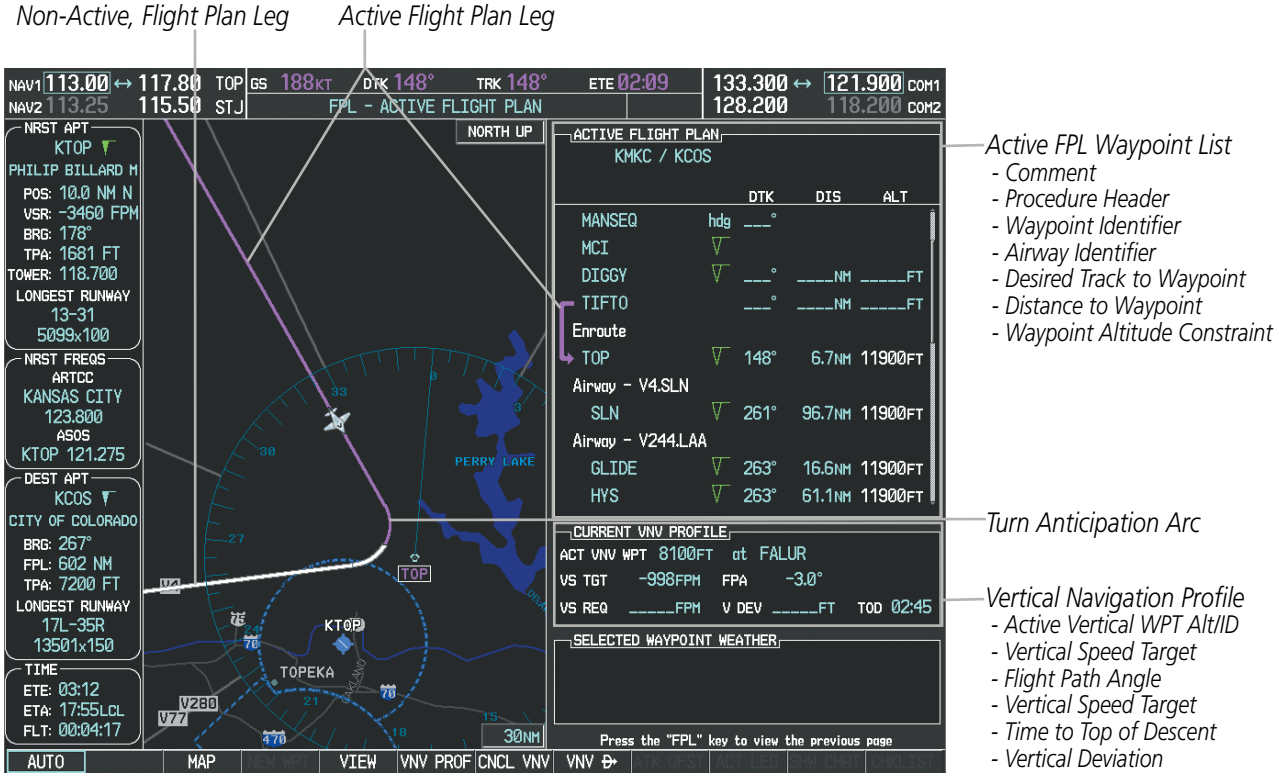


Figure 5-65 Active Flight Plan Page



Figure 5-66 Active Flight Plan Window on PFD

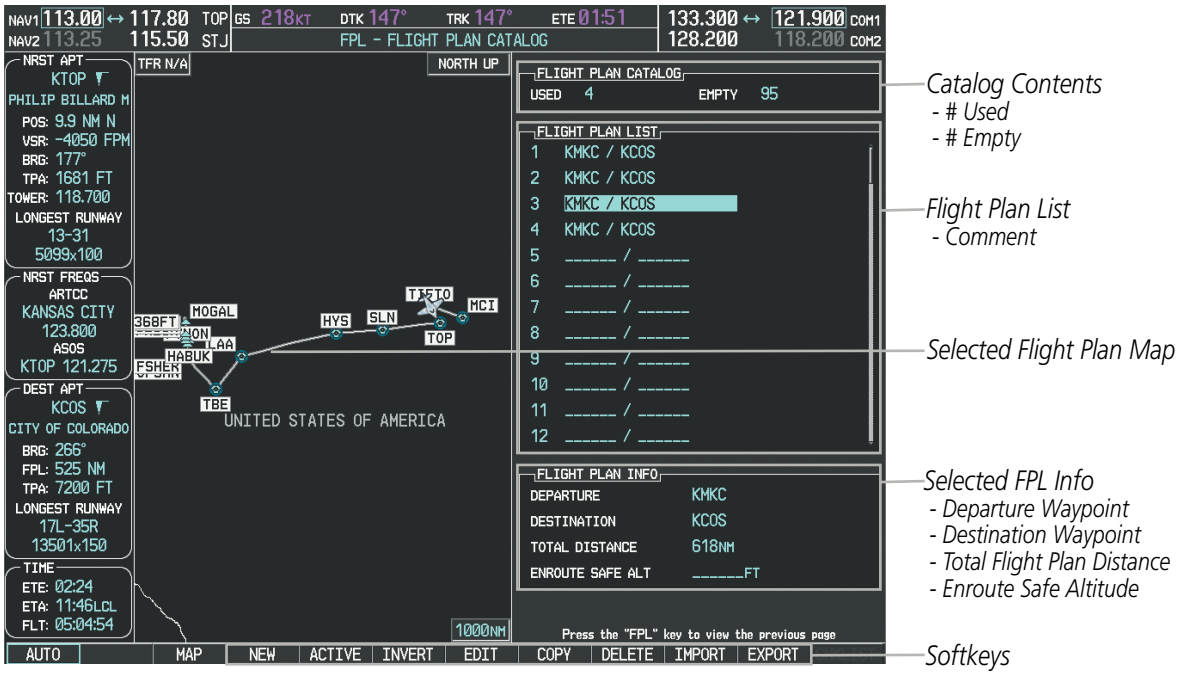


Figure 5-67 Flight Plan Catalog Page

The active flight plan is listed on the active Flight Plan Page on the MFD, and in the Active Flight Plan Window on the PFD. It is the flight plan to which the G900X is currently providing guidance, and is shown on the navigation maps. Stored flight plans are listed on the Flight Plan Catalog Page, and are available for activation (becomes the active flight plan).

NOTE: *The system supports AFCS lateral guidance for all leg types (using NAV or FMS APPR mode). The system does not support course deviation for any heading leg types (VA, VD, VI, VM, or VR).*

Creating an active flight plan:

1) Press the **FPL** Key.
2) Press the **FMS** Knob to activate the cursor (only on MFD).
3) Turn the small **FMS** Knob to display the Waypoint Information Window. (Turning it clockwise displays a blank Waypoint Information Window, turning it counter-clockwise displays the Waypoint Information Window with a waypoint selection submenu allowing selection of active flight plan, nearest, recent, user, or airway waypoints).
4) Enter the identifier, facility, or city name of the departure waypoint or select a waypoint from the submenu of waypoints and press the **ENT** Key. The active flight plan is modified as each waypoint is entered.
5) Repeat step numbers 3 and 4 to enter each additional flight plan waypoint.
6) When all waypoints have been entered, press the **FMS** Knob to remove the cursor.

Creating a stored flight plan:

1) Press the **FPL** Key.
2) Turn the small **FMS** Knob clockwise to display the Flight Plan Catalog Page.
3) Press the **NEW** Softkey; or press the **MENU** Key, highlight 'Create New Flight Plan', and press the **ENT** Key to display a blank flight plan for the first empty storage location.
4) Turn the small **FMS** Knob to display the Waypoint Information Window. (Turning it clockwise displays a blank Waypoint Information Window, turning it counter-clockwise displays the Waypoint Information Window with a waypoint selection submenu allowing selection of active flight plan, nearest, recent, user, or airway waypoints).
5) Enter the identifier, facility, or city name of the departure waypoint or select a waypoint from the submenu of waypoints and press the **ENT** Key.
6) Repeat step numbers 4 and 5 to enter each additional flight plan waypoint.
7) When all waypoints have been entered, press the **FMS** Knob to return to the Flight Plan Catalog Page. The new flight plan is now in the list.

Flight plans can be imported from an SD Card or exported to an SD Card from the Stored Flight Plan Page.

Importing a Flight Plan from an SD Card

1) Insert the SD card containing the flight plan in the top card slot on the MFD.
2) Press the **FPL** Key to display the Active Flight Plan Page on the MFD.
3) Turn the small **FMS** Knob to select the Flight Plan Catalog Page.
4) Press the **FMS** Knob to activate the cursor.
5) Turn either **FMS** Knob to highlight an empty or existing flight plan.
6) Press the **IMPORT** Softkey; or press the **MENU** Key, select "Import Flight Plan", and press the **ENT** Key.

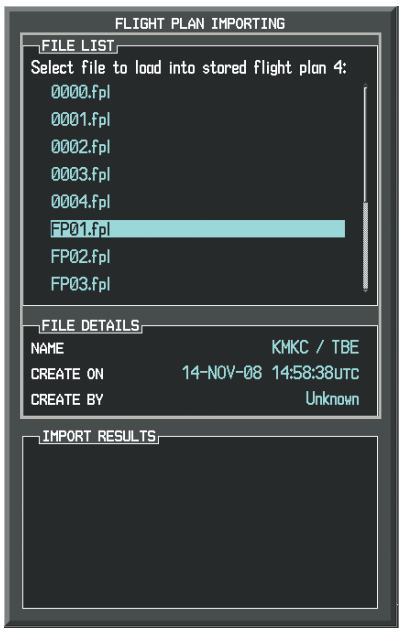
   If an empty slot is selected, a list of the available flight plans on the SD card will be displayed.

   Or:

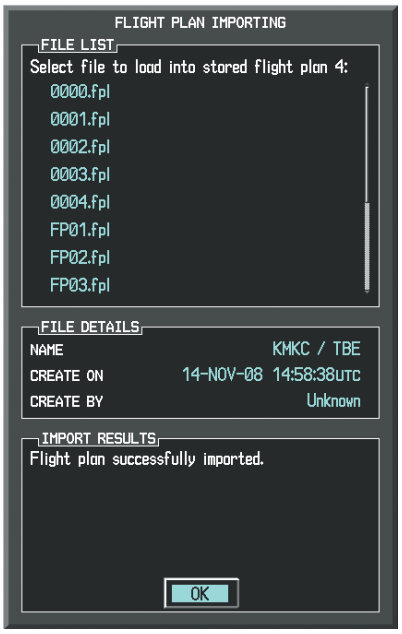
   If an existing flight plan is selected, an "Overwrite existing flight plan? OK or CANCEL" prompt is displayed. Press the **ENT** Key to choose to overwrite the selected flight plan and see the list of available flight plans on the SD card. If overwriting the existing flight plan is not desired, select "CANCEL" using the **FMS** Knob, press the **ENT** Key, select another flight plan slot, and press the **IMPORT** Softkey again.
7) Turn the small **FMS** Knob to highlight the desired flight plan for importing.
8) Press the **ENT** Key to initiate the import.
9) Press the **ENT** Key again to confirm the import.



Import/Export Softkeys



List of Flight Plans to Import & Details for the Selected File



Import Successful

Figure 5-68 Flight Plan Import

NOTE: *If the imported flight plan contains a waypoint with a name that duplicates the name of a waypoint already stored on the system, the system compares the coordinates of the imported waypoint with those of the existing waypoint. If the coordinates are different, the imported waypoint is automatically renamed by adding characters to the end of the name.*

Exporting a Flight Plan to an SD Card

1) Insert the SD card into the top card slot on the MFD.
2) Press the **FPL** Key to display the Active Flight Plan Page on the MFD.
3) Turn the small **FMS** Knob to select the Flight Plan Catalog Page.
4) Press the **FMS** Knob to activate the cursor.
5) Turn the large **FMS** Knob to highlight the flight plan to be exported.
6) Press the **EXPORT** Softkey; or press the **MENU** Key, select "Export Flight Plan".
7) If desired, change the name for the exported file by turning the large **FMS** Knob to the left to highlight the name, then use the small and large **FMS** knobs to enter the new name, and press the **ENT** Key.
8) Press the **ENT** Key to initiate the export.
9) Press the **ENT** Key to confirm the export.

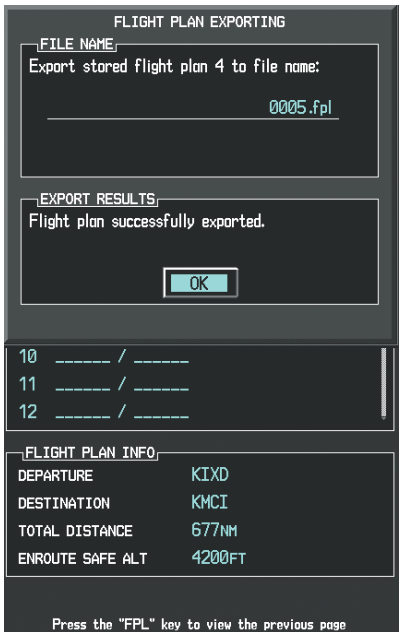
NOTE: *The exported flight plan will not contain any procedures or airways.*



Import/Export Softkeys



Stored Flight Plan to be Exported & Exported Flight Plan Name



Export Successful

Figure 5-69 Flight Plan Export

Flight plans can be transferred to the system from a mobile device via the Flight Stream 210 Bluetooth wireless connection.

Previewing a flight plan transfer from a wireless connection:

1) When a flight plan transfer has been initiated from a mobile device, a Pending Flight Plan pop-up alert appears in the lower right corner of the MFD, and an Connext annunciation appears to the right of the MFD page name.
2) Press the **ENT** Key to display the Preview Flight Plan Page on the MFD.

   Or:

   Select the **PREVIEW** Softkey to display the Preview Flight Plan Page on the MFD.

   Or:

   Press the **MENU** Key, select 'Preview Flight Plan', and press the **ENT** Key. The Preview Flight Plan Page is displayed.

Ignoring a flight plan transfer from a wireless connection:

1) When a flight plan transfer has been initiated from a mobile device, a Pending Flight Plan pop-up alert appears in the lower right corner of the MFD, and an Connext annunciation appears to the right of the MFD page name.
2) Press the **CLR** Key to remove the pop-up alert and ignore the pending flight plan. The pending flight plan will still be available on the Flight Plan Catalog page.

   Or:

   Select the **IGNORE** Softkey to remove the pop-up alert and ignore the pending flight plan. The pending flight plan will still be available on the Flight Plan Catalog page.



Figure 5-70 Pending Flight Plan Transfer

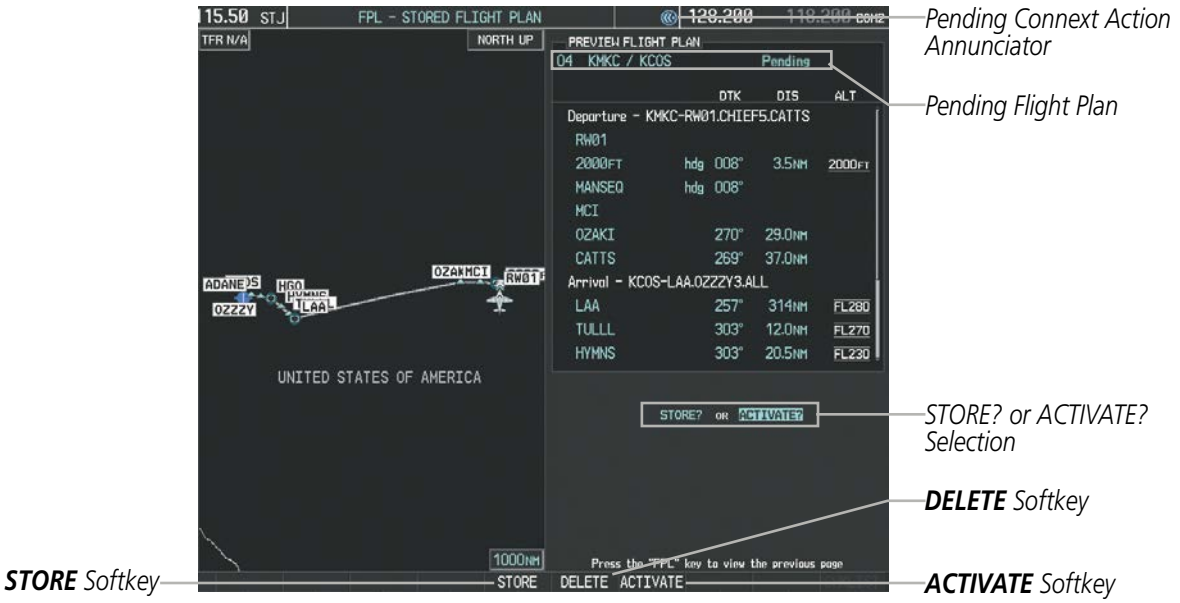


Figure 5-71 Preview Flight Plan Page

Storing a pending flight plan:

1) Press the **FPL** Key and turn the small **FMS** Knob to display the Flight Plan Catalog Page.
2) Press the **FMS** Knob to activate the cursor, and turn the **FMS** Knob to highlight the pending flight plan.
3) Press the **ENT** Key to display the Preview Flight Plan Page on the MFD.
4) Select the **STORE** Softkey to store the flight plan.

   Or:

   Press the **FMS** Knob to activate the cursor, and turn the **FMS** Knob to highlight 'STORE?'. Press the **ENT** Key to store the flight plan.

   Or:

   Press the **MENU** Key, select 'Store Flight Plan', and press the **ENT** Key to store the flight plan.
5) The pending flight plan is stored and the pending annunciation is removed.

Activating a pending flight plan:

1) Press the **FPL** Key and turn the small **FMS** Knob to display the Flight Plan Catalog Page.

2) Press the **FMS** Knob to activate the cursor, and turn the **FMS** Knob to highlight the pending flight plan.

3) Press the **ENT** Key to display the Preview Flight Plan Page on the MFD.

4) Select the **ACTIVATE** Softkey to activate the flight plan.

Or:

Press the **FMS** Knob to activate the cursor, and turn the **FMS** Knob to highlight 'ACTIVATE?'. Press the **ENT** Key to activate the flight plan.

Or:

Press the **MENU** Key, select 'Activate Flight Plan', and press the **ENT** Key to activate the flight plan.

5) The pending flight plan becomes the active flight plan and is removed from the Flight Plan Catalog Page.

Deleting a pending flight plan:

1) Press the **FPL** Key and turn the small **FMS** Knob to display the Flight Plan Catalog Page.

2) Press the **FMS** Knob to activate the cursor, and turn the **FMS** Knob to highlight the desired pending flight plan.

3) Select the **DELETE** Softkey; press the **CLR** Key; or press the **MENU** Key, highlight 'Delete Flight Plan', and press the **ENT** Key. The 'Delete Flight Plan XX?' window is displayed.

4) With 'OK' highlighted, press the **ENT** Key to delete the pending flight plan. To cancel the request, press the **CLR** Key, or highlight 'CANCEL' and press the **ENT** Key.

Deleting all pending flight plans:

1) Press the **FPL** Key and turn the small **FMS** Knob to display the Flight Plan Catalog Page.

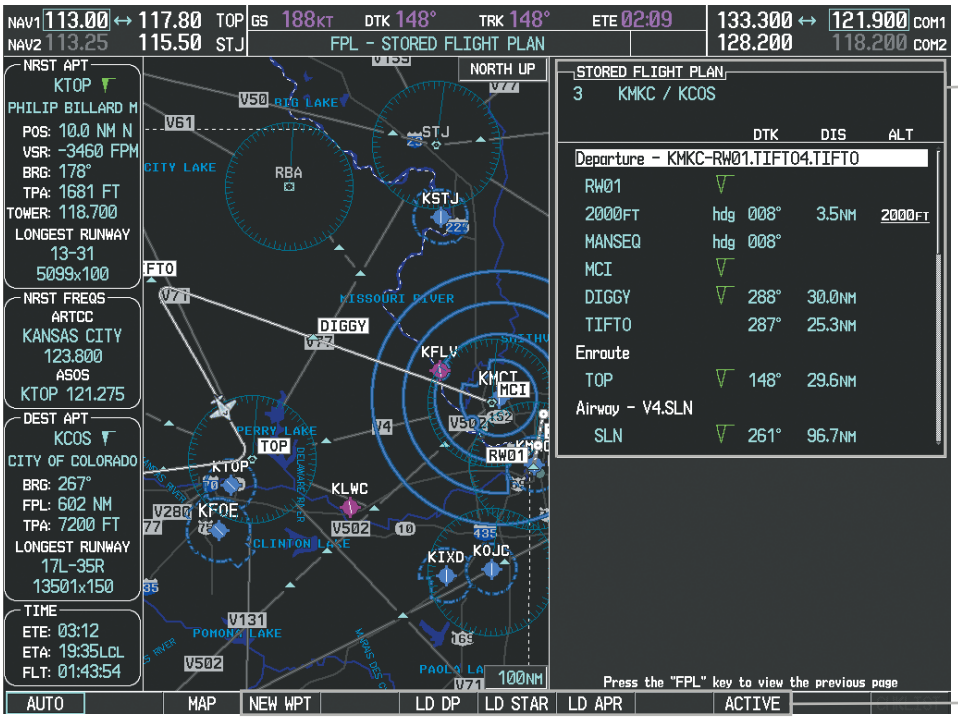
2) Press the **MENU** Key.

3) Highlight 'Delete All Pending' and press the **ENT** Key. A 'Delete all pending flight plans?' confirmation window is displayed.

4) With 'OK' highlighted, press the **ENT** Key to delete all pending flight plans. To cancel the request, press the **CLR** Key, or highlight 'CANCEL' and press the **ENT** Key.

ADDING WAYPOINTS TO AN EXISTING FLIGHT PLAN

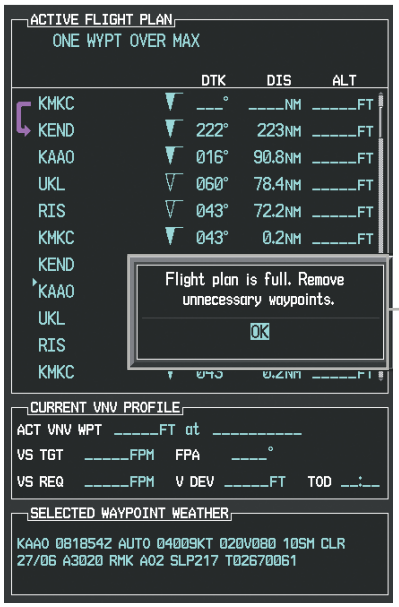
Waypoints can be added to the active flight plan or any stored flight plan. Choose the flight plan, select the desired point of insertion, enter the waypoint, and it is added in front of the selected waypoint. Flight plans are limited to 100 waypoints (including waypoints within airways and procedures). If the number of waypoints in the flight plan exceeds 100, the message "Flight plan is full. Remove unnecessary waypoints." appears and the new waypoint(s) are not added to the flight plan.



Stored Flight Plan Selected
- *Memory Slot*
- *Comment*
- *Procedure Identifier*
- *Waypoint Identifier*
- *Airway Identifier*
- *Desired Track to Waypoint*
- *Distance to Waypoint*
- *Waypoint Altitude Constraint*

Softkeys

Figure 5-72 Stored Flight Plan Page



Flight Plan Full Message

Figure 5-73 Active Flight Plan Page - FPL Full

Adding a waypoint to a stored flight plan:

1) On the Flight Plan Catalog Page, press the **FMS** Knob to activate the cursor.
2) Highlight the desired flight plan.
3) Press the **EDIT** Softkey; or press the **ENT** Key, turn the large **FMS** Knob clockwise to select "EDIT" and press the **ENT** Key. The Stored Flight Plan Page is displayed.
4) Select the point in the flight plan to add the new waypoint. The new waypoint is placed directly in front of the highlighted waypoint.
5) Turn the small **FMS** Knob to display the Waypoint Information Window. (Turning it clockwise displays a blank Waypoint Information Window, turning it counter-clockwise displays the Waypoint Information Window with a waypoint selection submenu allowing selection of active flight plan, nearest, recent, user, or airway waypoints).
6) Enter the identifier, facility, or city name of the waypoint or select a waypoint from the submenu of waypoints and press the **ENT** Key. The new waypoint now exists in the flight plan.

NOTE: *If the identifier entered in the Waypoint Information Window has duplicates, a Duplicate Waypoint Window is displayed. Use the FMS Knob to select the correct waypoint.*

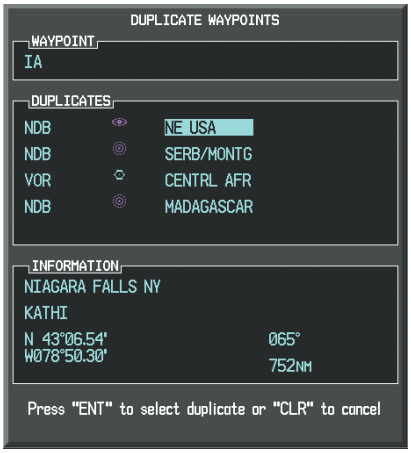


Figure 5-74 Duplicate Waypoints Window

Adding a waypoint to the active flight plan:

1) Press the **FPL** Key.
2) Press the **FMS** Knob to activate the cursor (not required on the PFD).
3) Select the point in the flight plan before which to add the new waypoint. The new waypoint is placed directly in front of the highlighted waypoint.
4) Turn the small **FMS** Knob to display the Waypoint Information Window. (Turning it clockwise displays a blank Waypoint Information Window, turning it counter-clockwise displays the Waypoint Information Window with a waypoint selection submenu allowing selection of active flight plan, nearest, recent, user, or airway waypoints).
5) Enter the identifier, facility, or city name of the waypoint or select a waypoint from the submenu of waypoints and press the **ENT** Key. The active flight plan is modified as each waypoint is entered.

Creating and adding user waypoints to the active flight plan:

1) Press the **Joystick** to activate the panning function on the Active Flight Plan Page and pan to the map location of the desired user waypoint.

2) Press the **LD WPT** Softkey; or press the **MENU** Key, select 'Load Waypoint', and press the **ENT** Key. The user waypoint is created with a name of USRxxx (using the next available in sequence) and is added to the end of the active flight plan.

ADDING AIRWAYS TO A FLIGHT PLAN

Airways can be added to the active flight plan or any stored flight plan. Choose a flight plan (add the desired airway entry point if not already in the flight plan), select the waypoint after the desired airway entry point, select the airway, and it is added in front of the selected waypoint. An airway can only be loaded if there is a waypoint in the flight plan that is part of the desired airway and is not part of an arrival or approach procedure. The G900X also anticipates the desired airway and exit point based on loaded flight plan waypoints.

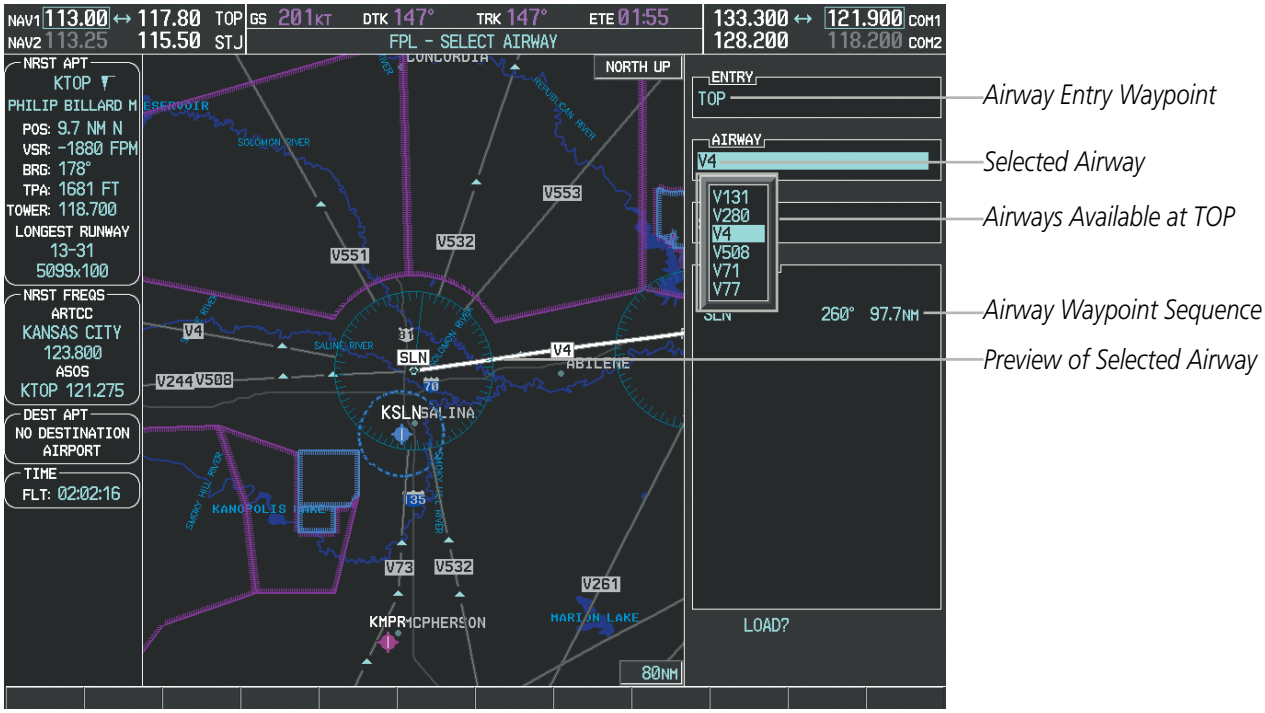


Figure 5-75 Select Airway Page - Selecting Airway

Adding an airway to a flight plan:

1) Press the **FPL** Key.

2) Press the **FMS** Knob to activate the cursor (not required on the PFD).

3) Turn the large **FMS** Knob to highlight the waypoint after the desired airway entry point. If this waypoint is not a valid airway entry point, a valid entry point should be entered at this time.

4) Turn the small **FMS** Knob one click clockwise and press the **LD AIRWY** Softkey, or press the **MENU** Key and select "Load Airway". The Select Airway Page is displayed. The **LD AIRWY** Softkey or the "Load Airway" menu item is available only when a valid airway entry waypoint has been chosen (the waypoint ahead of the cursor position).

5) Turn the **FMS** Knob to select the desired airway from the list, and press the **ENT** Key. Low altitude airways are shown first in the list, followed by "all" altitude airways, and then high altitude airways.

6) Turn the **FMS** Knob to select the desired airway exit point from the list, and press the **ENT** Key. 'LOAD?' is highlighted.

7) Press the **ENT** Key. The system returns to editing the flight plan with the new airway inserted.



Figure 5-76 Select Airway Page - Selecting Exit Point

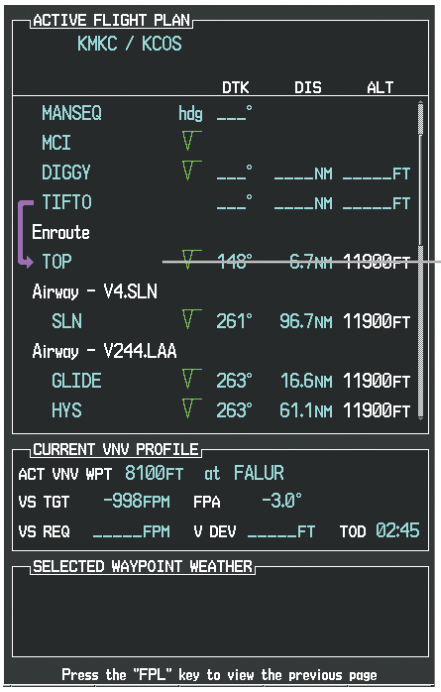


Figure 5-77 Active Flight Plan Page - Airway Inserted

RESTRICTIONS ON ADDING AIRWAYS

Some airways have directional restrictions on all or part of the route. Airway "A2" in Europe has a directional restriction over the whole route such that it can be flown only in the direction MTD-ABB-BNE-DEVAL.

Airway "UR975" in North Africa has more complicated directional restrictions within the list of airway waypoints AMANO, VAKOR, LIBRO, NELDA, DIRKA, GZO, KOSET, and SARKI:

- Starting from AMANO, the airway can be flown only to LIBRO.
- Starting from SARKI, the airway can be flown only to LIBRO.
- Between NELDA and GZO, the airway can be flown in either direction.

In the US, airways that are "one-way" for specified hours of operation are not uncommon. These airways are always bidirectional in the G900X database.

The system only allows correct airway sequences to be inserted. If the pilot subsequently inverts the flight plan, the system inverts the airway waypoint sequence and removes the airway header.

ADDING PROCEDURES TO A STORED FLIGHT PLAN

The G900X allows the pilot to insert pre-defined instrument procedures from the navigation database into a flight plan. The procedures are designed to facilitate routing of traffic leaving an airport (departure), arriving at an airport (arrival), and landing at an airport (approach). See the procedures section for more details.

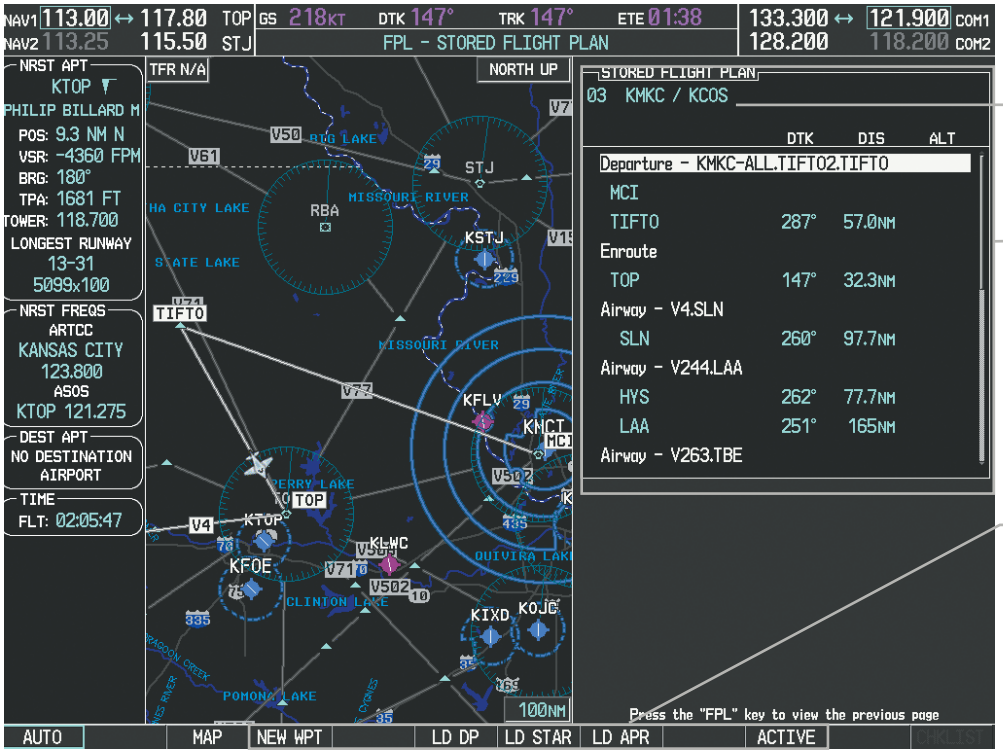


Figure 5-78 Stored Flight Plan Page

DEPARTURE (DP)

A Departure Procedure (DP) is loaded at the departure airport in the flight plan. Only one departure can be loaded at a time in a flight plan. The route is defined by selection of a departure, the transition waypoints, and a runway.

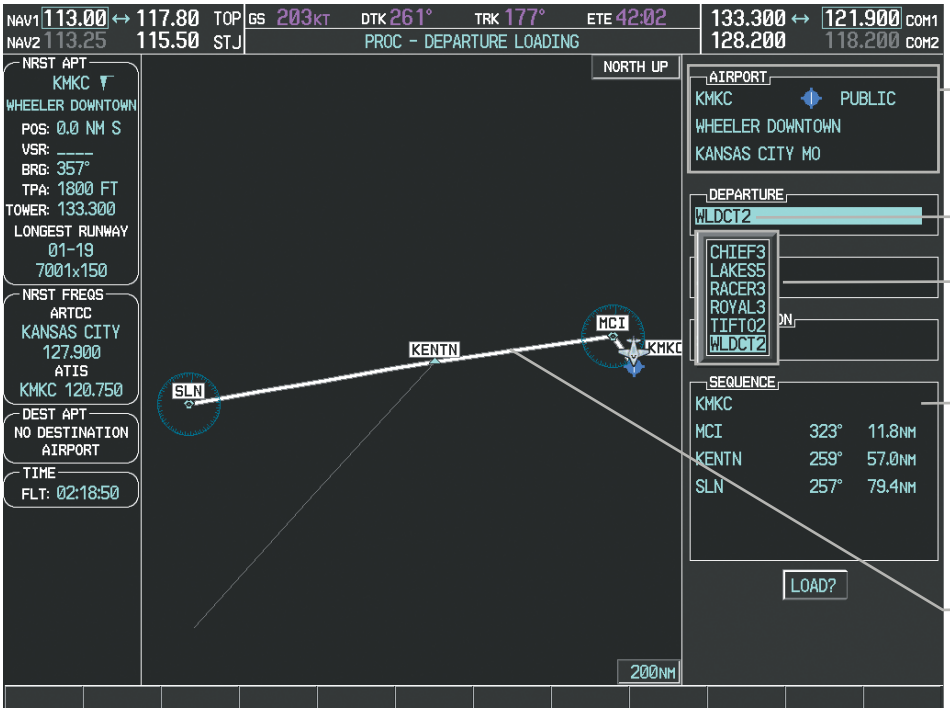


Figure 79 Departure Loading Page - Selecting the Departure

Loading a departure procedure into a stored flight plan:

1) Select a stored flight plan from the Flight Plan Catalog Page.
2) Press the **EDIT** Softkey; or press the **MENU** Key, select 'Edit Flight Plan', and press the **ENT** Key. The Stored Flight Plan Page is displayed.
3) Press the **LD DP** Softkey; or press the **MENU** Key, select "Load Departure", and press the **ENT** Key. The Departure Loading Page is displayed.
4) Select a departure. Press the **ENT** Key.
5) Select a runway served by the selected departure, if required. Press the **ENT** Key.
6) Select a transition for the selected departure. Press the **ENT** Key.
7) Press the **ENT** Key to load the selected departure procedure.

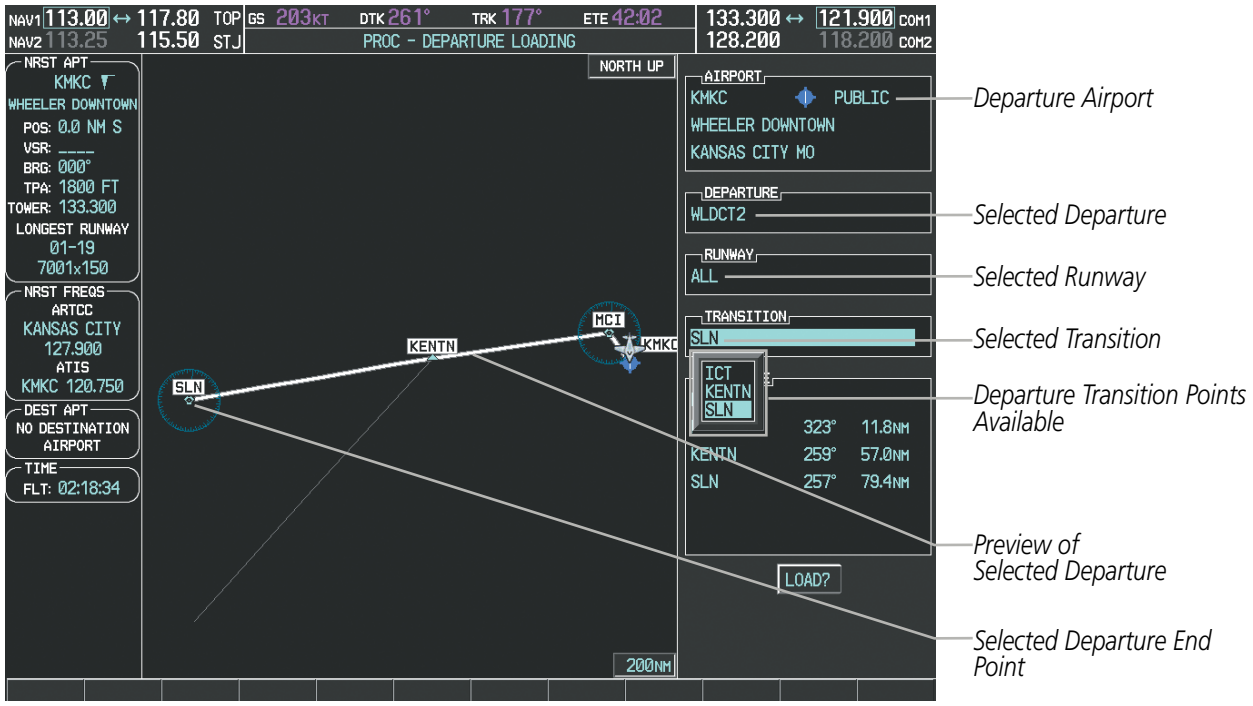


Figure 5-80 Departure Loading Page - Selecting Transition

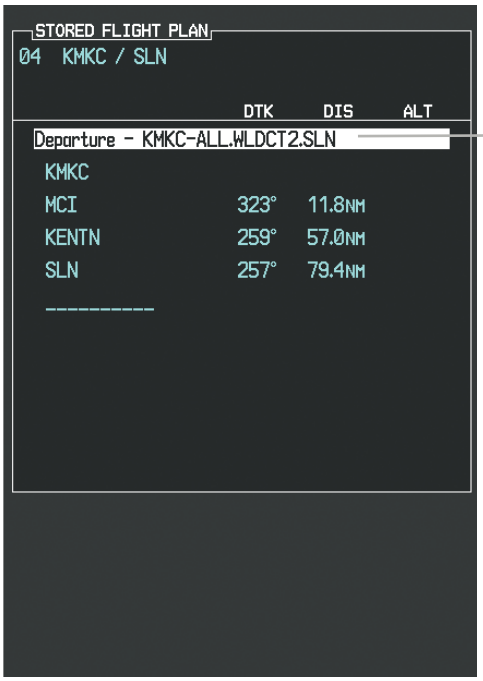


Figure 5-81 Stored Flight Plan Page - Departure Inserted

ARRIVAL (STAR)

A Standard Terminal Arrival (STAR) is loaded at the destination airport in the flight plan. Only one arrival can be loaded at a time in a flight plan. The route is defined by selection of an arrival, the transition waypoints, and a runway.

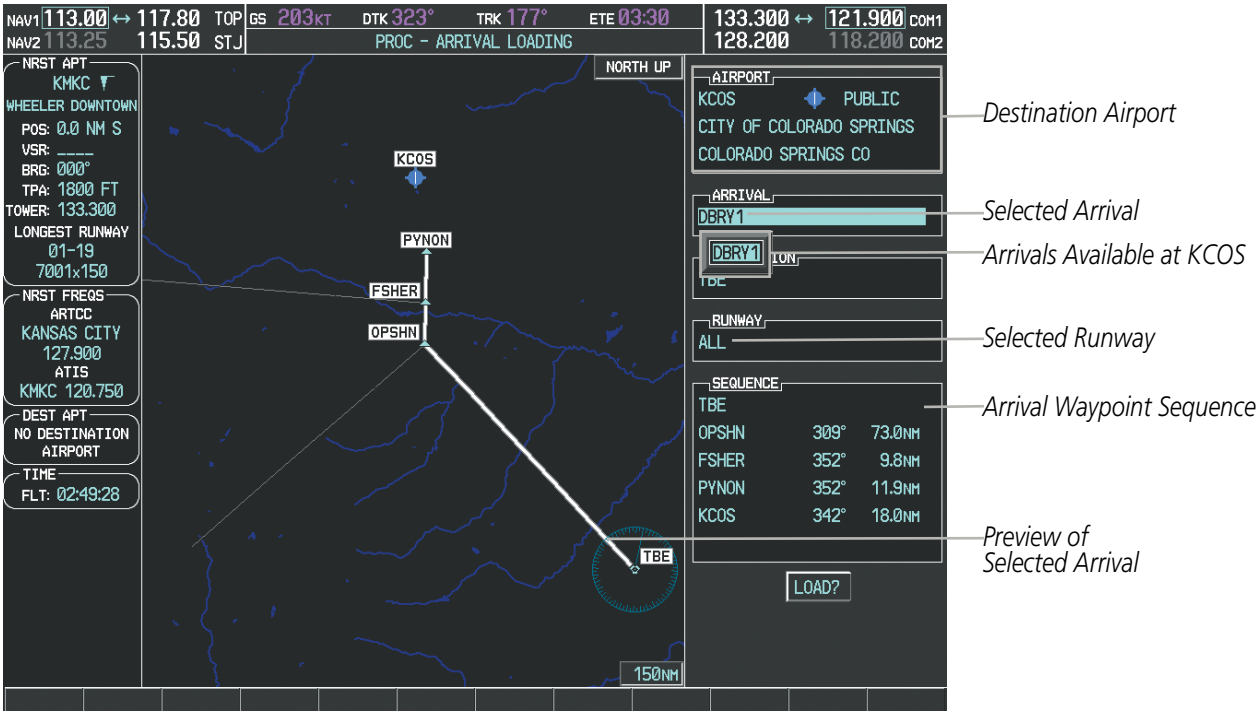


Figure 5-82 Arrival Loading Page - Selecting the Arrival

Loading an arrival procedure into a stored flight plan:

1) Select a stored flight plan from the Flight Plan Catalog Page.
2) Press the **EDIT** Softkey; or press the **MENU** Key, select 'Edit Flight Plan', and press the **ENT** Key. The Stored Flight Plan Page is displayed.
3) Press the **LD STAR** Softkey; or press the **MENU** Key, select "Load Arrival", and press the **ENT** Key. The Arrival Loading Page is displayed.
4) Select an arrival. Press the **ENT** Key.
5) Select a transition for the selected arrival. Press the **ENT** Key.
6) Select a runway served by the selected arrival, if required. Press the **ENT** Key.
7) Press the **ENT** Key to load the selected arrival procedure.

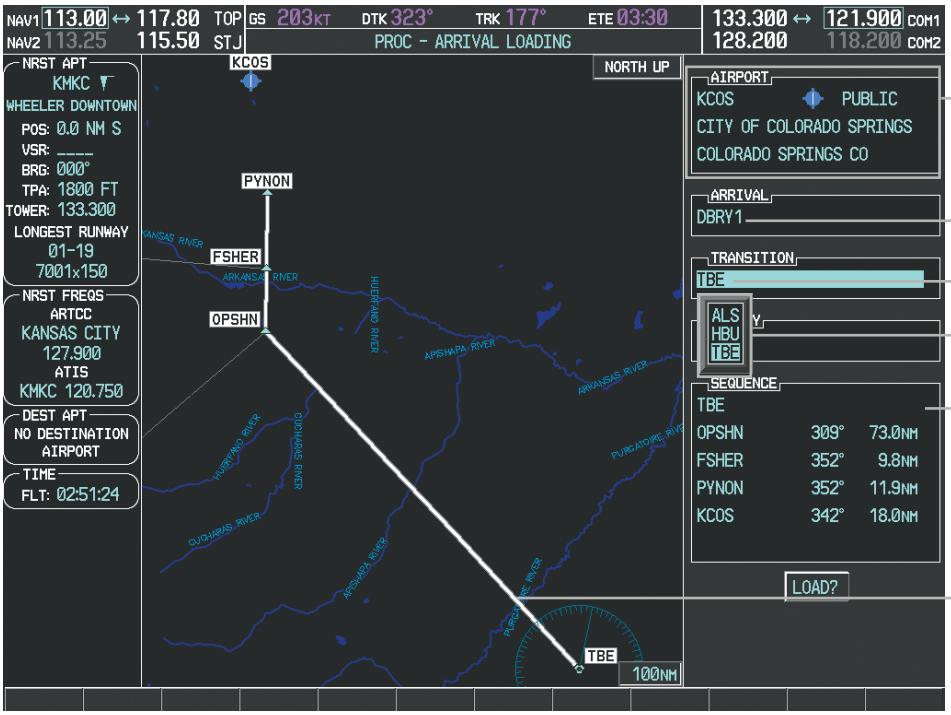


Figure 5-83 Arrival Loading Page - Selecting the Transition

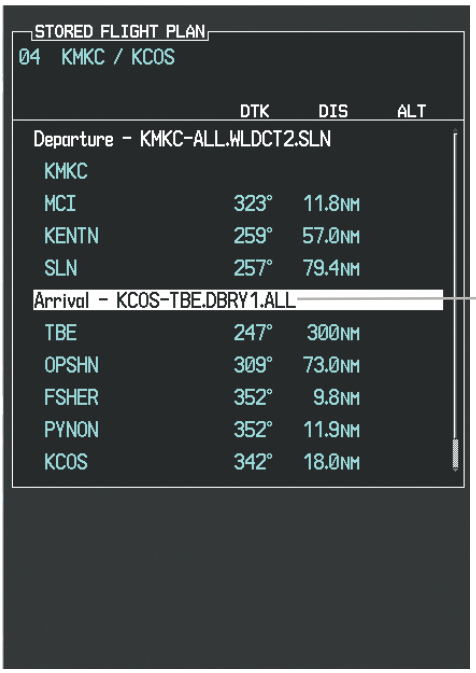


Figure 5-84 Stored Flight Plan Page - Arrival Inserted

APPROACH (APPR)

An Approach Procedure (APPR) can be loaded at any airport that has an approach available. Only one approach can be loaded at a time in a flight plan. The route for a selected approach is defined by designating transition waypoints.

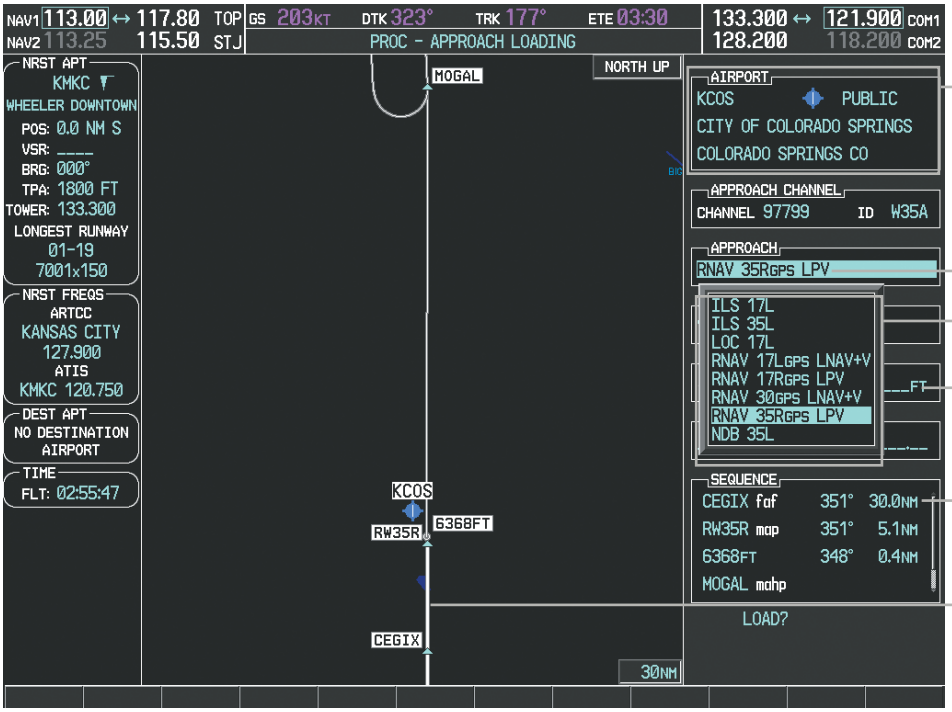


Figure 5-85 Approach Loading Page - Selecting the Approach

Loading an approach procedure into a stored flight plan:

1) Select a stored flight plan from the Flight Plan Catalog Page.
2) Press the **EDIT** Softkey; or press the **MENU** Key, select 'Edit Flight Plan', and press the **ENT** Key. The Stored Flight Plan Page is displayed.
3) Press the **LD APR** Softkey; or press the **MENU** Key, select "Load Approach", and press the **ENT** Key. The Approach Loading Page is displayed.
4) Select the airport and approach:
   a) Use the **FMS** Knob to select an airport and press the **ENT** Key.
   b) Select an approach from the list and press the **ENT** Key.

   Or:

   a) If necessary, push the **FMS** Knob to exit the approach list, and use the large **FMS** Knob to move the cursor to the APPROACH CHANNEL field.
   b) Use the **FMS** Knob to enter the approach channel number, and press the **ENT** Key to accept the approach channel number. The airport and approach are selected.
5) Select a transition for the selected approach. Press the **ENT** Key.
6) Press the **ENT** Key to load the selected approach procedure.

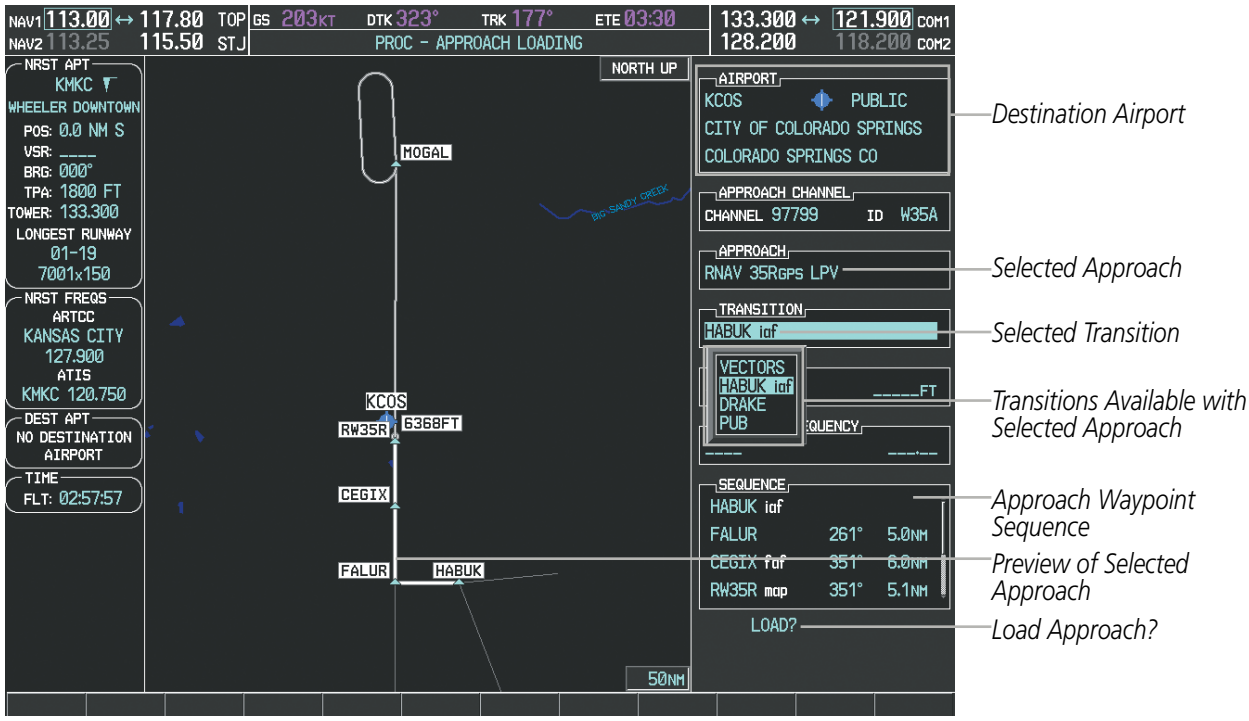


Figure 5-86 Approach Loading Page - Selecting the Transition

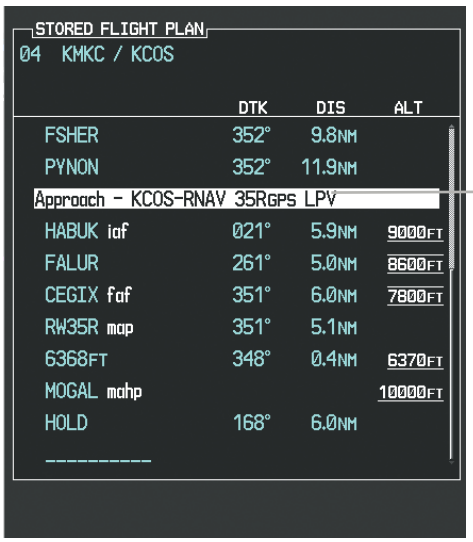


Figure 5-87 Stored Flight Plan Page - Approach Inserted

FLIGHT PLAN STORAGE

The G900X can store up to 99 flight plans, numbered 1 through 99. The active flight plan is erased when the G900X is powered off or when another flight plan is activated. Details about each stored flight plan can be viewed on the Flight Plan Catalog Page and on the Stored Flight Plan Page.

Viewing information about a stored flight plan:

1) Press the **FPL** Key on the MFD to display the Active Flight Plan Page.
2) Turn the small **FMS** Knob clockwise one click to display the Flight Plan Catalog Page.
3) Press the **FMS** Knob to activate the cursor and turn the **FMS** Knob to highlight the desired flight plan.
4) The Flight Plan Information is displayed showing departure, destination, total distance, and enroute safe altitude information for the selected Flight Plan.
5) Press the **EDIT** Softkey to open the Stored Flight Plan Page and view the waypoints in the flight plan.
6) Press the **FMS** Knob to exit the Stored Flight Plan Page.

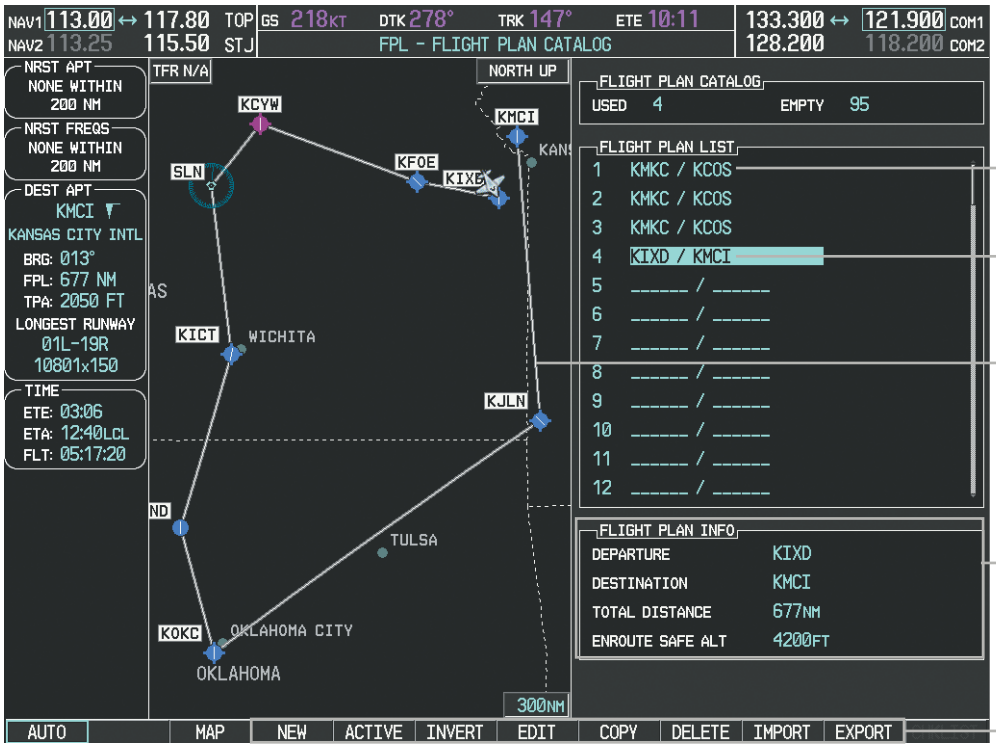


Figure 5-88 Stored Flight Plan Information

Storing an active flight plan from the Active Flight Plan Page or the Active Flight Plan Window:

1) Press the **MENU** Key.
2) Highlight 'Store Flight Plan'.
3) Press the **ENT** Key.
4) With 'OK' highlighted, press the **ENT** Key. The flight plan is stored in the next available position in the flight plan list on the Flight Plan Catalog Page.

ACTIVATE A FLIGHT PLAN

Activating a stored flight plan erases the active flight plan and replaces it with the flight plan being activated. Inverting a stored flight plan reverses the waypoint order, erases the active flight plan, and replaces it with the flight plan being activated (the stored flight plan is not changed).

Activating a stored flight plan on the MFD:

1) Press the **FPL** Key and turn the small **FMS** Knob to display the Flight Plan Catalog Page.
2) Press the **FMS** Knob to activate the cursor, and turn the **FMS** Knob to highlight the desired flight plan.
3) Press the **ACTIVE** Softkey; or press the **ENT** Key twice; or press the **MENU** Key, highlight 'Activate Flight Plan', and press the **ENT** Key. The 'Activate Stored Flight Plan?' window is displayed.
4) With 'OK' highlighted, press the **ENT** Key. To cancel the request, press the **CLR** Key, or highlight 'CANCEL' and press the **ENT** Key.

Inverting and activating a stored flight plan on the MFD:

1) Press the **FPL** Key and turn the small **FMS** Knob to display the Flight Plan Catalog Page.
2) Press the **FMS** Knob to activate the cursor, and turn the **FMS** Knob to highlight the desired flight plan.
3) Press the **INVERT** Softkey; or press the **MENU** Key, highlight 'Invert & Activate FPL?', and press the **ENT** Key. The 'Invert and activate stored flight plan?' window is displayed.
4) With 'OK' highlighted, press the **ENT** Key. To cancel the request, press the **CLR** Key, or highlight 'CANCEL' and press the **ENT** Key.

COPY A FLIGHT PLAN

The G900X allows copying a flight plan into a new flight plan memory slot, allowing editing, etc., without affecting the original flight plan. This can be used to duplicate an existing stored flight plan for use in creating a modified version of the original stored flight plan.

Copying a stored flight plan on the MFD:

1) Press the **FPL** Key and turn the small **FMS** Knob to display the Flight Plan Catalog Page.
2) Press the **FMS** Knob to activate the cursor, and turn the **FMS** Knob to highlight the desired flight plan.
3) Press the **COPY** Softkey; or press the **MENU** Key, highlight 'Copy Flight Plan', and press the **ENT** Key. The 'Copy to Flight Plan XX?' window is displayed.
4) With 'OK' highlighted, press the **ENT** Key to copy the flight plan. To cancel the request, press the **CLR** Key, or highlight 'CANCEL' and press the **ENT** Key.

DELETE A STORED FLIGHT PLAN

Individual or all stored flight plans can be deleted from the G900X memory.

Deleting a stored flight plan:

1) Press the **FPL** Key and turn the small **FMS** Knob to display the Flight Plan Catalog Page.
2) Press the **FMS** Knob to activate the cursor, and turn the **FMS** Knob to highlight the desired flight plan.

3) Press the **DELETE** Softkey; press the **CLR** Key; or press the **MENU** Key, highlight 'Delete Flight Plan', and press the **ENT** Key. The 'Delete Flight Plan XX?' window is displayed.

4) With 'OK' highlighted, press the **ENT** Key to delete the flight plan. To cancel the request, press the **CLR** Key, or highlight 'CANCEL' and press the **ENT** Key.

NOTE: *The option to delete all stored flight plans is not available while the aircraft is in flight.*

Deleting all stored flight plans:

1) Press the **FPL** Key and turn the small **FMS** Knob to display the Flight Plan Catalog Page.

2) Press the **MENU** Key.

3) Highlight 'Delete All' and press the **ENT** Key. A 'Delete all flight plans?' confirmation window is displayed.

4) With 'OK' highlighted, press the **ENT** Key to delete all flight plans. To cancel the request, press the **CLR** Key, or highlight 'CANCEL' and press the **ENT** Key.

FLIGHT PLAN EDITING

The active flight plan or any stored flight plan can be edited. The edits made to the active flight plan affect navigation as soon as they are entered.

DELETING THE ACTIVE FLIGHT PLAN

The G900X allows deletion of an active flight plan. Deleting the active flight plan suspends navigation by the G900X.

Deleting the active flight plan:

1) Press the **FPL** Key to display the Active Flight Plan Page (MFD) or the Active Flight Plan Window (PFD).

2) Press the **MENU** Key, highlight 'Delete Flight Plan', and press the **ENT** Key. The 'Delete all waypoints in flight plan?' window is displayed.

3) With 'OK' highlighted, press the **ENT** Key to delete the active flight plan. To cancel the request, press the **CLR** Key, or highlight 'CANCEL' and press the **ENT** Key.

DELETING FLIGHT PLAN ITEMS

Individual waypoints, entire airways, and entire procedures can be deleted from a flight plan. Some waypoints in the final approach segment (such as the FAF or MAP) can not be deleted individually. Attempting to delete a waypoint that is not allowed results in a window displaying 'Invalid flight plan modification.'

Deleting an individual waypoint from the active flight plan:

1) Press the **FPL** Key to display the Active Flight Plan Page (MFD) or the Active Flight Plan Window (PFD).

2) Press the **FMS** Knob to activate the cursor (not required on the PFD) and turn the large **FMS** Knob to highlight the waypoint to be deleted.

3) Press the **CLR** Key. The 'Remove XXXXX?' window is displayed.

4) With 'OK' highlighted, press the **ENT** Key. To cancel the request, press the **CLR** Key, or highlight 'CANCEL' and press the **ENT** Key.

5) Press the **FMS** Knob to remove the flashing cursor.

Deleting an entire airway from the active flight plan:

1) Press the **FPL** Key to display the Active Flight Plan Page (MFD) or the Active Flight Plan Window (PFD).

2) Press the **FMS** Knob to activate the cursor (not required on the PFD) and turn the large **FMS** Knob to highlight the white header of the airway to be deleted.

3) Press the **CLR** Key. The 'Remove <airway name>?' window is displayed.

4) With 'OK' highlighted, press the **ENT** Key. To cancel the request, press the **CLR** Key, or highlight 'CANCEL' and press the **ENT** Key.

5) Press the **FMS** Knob to remove the flashing cursor.

Deleting an entire procedure from the active flight plan:

1) Press the **FPL** Key to display the Active Flight Plan Page (MFD) or the Active Flight Plan Window (PFD).

2) Press the **FMS** Knob to activate the cursor (not required on the PFD) and turn the large **FMS** Knob to highlight the white header of the procedure to be deleted.

3) Press the **CLR** Key. The 'Remove <procedure name> from flight plan?' window is displayed.

4) With 'OK' highlighted, press the **ENT** Key. To cancel the request, press the **CLR** Key, or highlight 'CANCEL' and press the **ENT** Key.

5) Press the **FMS** Knob to remove the flashing cursor.

Or:

1) Press the **FPL** Key to display the Active Flight Plan Page (MFD) or the Active Flight Plan Window (PFD).

2) Press the **MENU** Key to display the Page Menu and turn the **FMS** Knob to highlight 'Remove <procedure>'.

3) Press the **ENT** Key. The 'Remove <procedure name> from flight plan?' window is displayed.

4) With 'OK' highlighted, press the **ENT** Key. To cancel the request, press the **CLR** Key, or highlight 'CANCEL' and press the **ENT** Key.

Deleting an individual waypoint from a stored flight plan:

1) Press the **FPL** Key to display the Active Flight Plan Page.

2) Turn the small **FMS** Knob clockwise one click to display the Flight Plan Catalog Page.

3) Press the **FMS** Knob to activate the cursor and turn the **FMS** Knob to highlight the flight plan to be edited.

4) Press the **EDIT** Softkey; or press the **MENU** Key, select 'Edit Flight Plan' and press the **ENT** Key. The Stored Flight Plan Page is displayed.

5) Turn the large **FMS** Knob to highlight the waypoint to be deleted.

6) Press the **CLR** Key. The 'Remove XXXXX?' window is displayed.

7) With 'OK' highlighted, press the **ENT** Key. To cancel the request, press the **CLR** Key, or highlight 'CANCEL' and press the **ENT** Key.

8) Press the **FMS** Knob to remove the flashing cursor.

Deleting an entire airway from a stored flight plan:

1) Press the **FPL** Key to display the Active Flight Plan Page.
2) Turn the small **FMS** Knob clockwise one click to display the Flight Plan Catalog Page.
3) Press the **FMS** Knob to activate the cursor and turn the **FMS** Knob to highlight the flight plan to be edited.
4) Press the **EDIT** Softkey; or press the **MENU** Key, select 'Edit Flight Plan' and press the **ENT** Key. The Stored Flight Plan Page is displayed.
5) Turn the large **FMS** Knob to highlight the white header of the airway to be deleted.
6) Press the **CLR** Key. The 'Remove <airway name>?' window is displayed.
7) With 'OK' highlighted, press the **ENT** Key. To cancel the request, press the **CLR** Key, or highlight 'CANCEL' and press the **ENT** Key.
8) Press the **FMS** Knob to remove the flashing cursor.

Deleting an entire procedure from a stored flight plan:

1) Press the **FPL** Key to display the Active Flight Plan Page.
2) Turn the small **FMS** Knob clockwise one click to display the Flight Plan Catalog Page.
3) Press the **FMS** Knob to activate the cursor and turn the **FMS** Knob to highlight the flight plan to be edited.
4) Press the **EDIT** Softkey; or press the **MENU** Key, select 'Edit Flight Plan' and press the **ENT** Key. The Stored Flight Plan Page is displayed.
5) Turn the large **FMS** Knob to highlight the white header of the procedure to be deleted.
6) Press the **CLR** Key. The 'Remove <procedure name> from flight plan?' window is displayed.
7) With 'OK' highlighted, press the **ENT** Key. To cancel the request, press the **CLR** Key, or highlight 'CANCEL' and press the **ENT** Key.
8) Press the **FMS** Knob to remove the flashing cursor.

Or:

1) Press the **FPL** Key to display the Active Flight Plan Page.
2) Turn the small **FMS** Knob clockwise one click to display the Flight Plan Catalog Page.
3) Press the **FMS** Knob to activate the cursor and turn the **FMS** Knob to highlight the flight plan to be edited.
4) Press the **EDIT** Softkey; or press the **MENU** Key, select 'Edit Flight Plan' and press the **ENT** Key. The Stored Flight Plan Page is displayed.
5) Press the **MENU** Key to display the Page Menu and turn the **FMS** Knob to highlight 'Remove <procedure>'.
6) Press the **ENT** Key. The 'Remove <procedure name> from flight plan?' window is displayed.
7) With 'OK' highlighted, press the **ENT** Key. To cancel the request, press the **CLR** Key, or highlight 'CANCEL' and press the **ENT** Key.
8) Press the **FMS** Knob to remove the flashing cursor.

CHANGING FLIGHT PLAN COMMENTS (NAMES)

The comment field (or name) of each flight plan can be changed to something that is useful for identification.

Changing the active flight plan comment:

1) Press the **FPL** Key to display the Active Flight Plan Page.
2) Press the **FMS** Knob to activate the cursor and turn the large **FMS** Knob to highlight the comment field.
3) Use the **FMS** Knobs to edit the comment.
4) Press the **ENT** Key to accept the changes.
5) Press the **FMS** Knob to remove the flashing cursor.

Changing a stored flight plan comment:

1) Press the **FPL** Key to display the Active Flight Plan Page.
2) Turn the small **FMS** Knob clockwise one click to display the Flight Plan Catalog Page.
3) Press the **FMS** Knob to activate the cursor and turn the **FMS** Knob to highlight the flight plan to be edited.
4) Press the **EDIT** Softkey; or press the **MENU** Key, select 'Edit Flight Plan' and press the **ENT** Key. The Stored Flight Plan Page is displayed.
5) Turn the large **FMS** Knob to highlight the comment field.
6) Use the **FMS** Knobs to edit the comment.
7) Press the **ENT** Key to accept the changes.
8) Press the **FMS** Knob to remove the flashing cursor.

ALONG TRACK OFFSETS

A waypoint having an "along track offset" distance from an existing waypoint can be entered into a flight plan. Along track offset waypoints lie along the path of the existing flight plan, and can be used to make the system reach a specified altitude before or after reaching the specified flight plan waypoint. Offset distances can be entered from 1 to 999 nm in increments of 1 nm. Entering a negative offset distance results in an along track offset waypoint inserted before the selected waypoint, whereas entering a positive offset distance results in an along track offset waypoint inserted after the selected waypoint. Multiple offset waypoints are allowed.

A waypoint must be adjacent to its parent waypoint in the flight plan, so the system limits the along-track distance to less than the length of the leg before or after the selected waypoint. If the selected waypoint is the active waypoint, the distance is limited to less than the distance to go to the active waypoint. Assigning an along track offset to a leg with indeterminate length is not permitted. An along track offset is not allowed at or after the final approach fix of an approach.

An along track offset distance cannot be modified once entered. If the along track offset distance must be changed, the existing along track offset waypoint must be deleted and a new one created with the new offset distance.

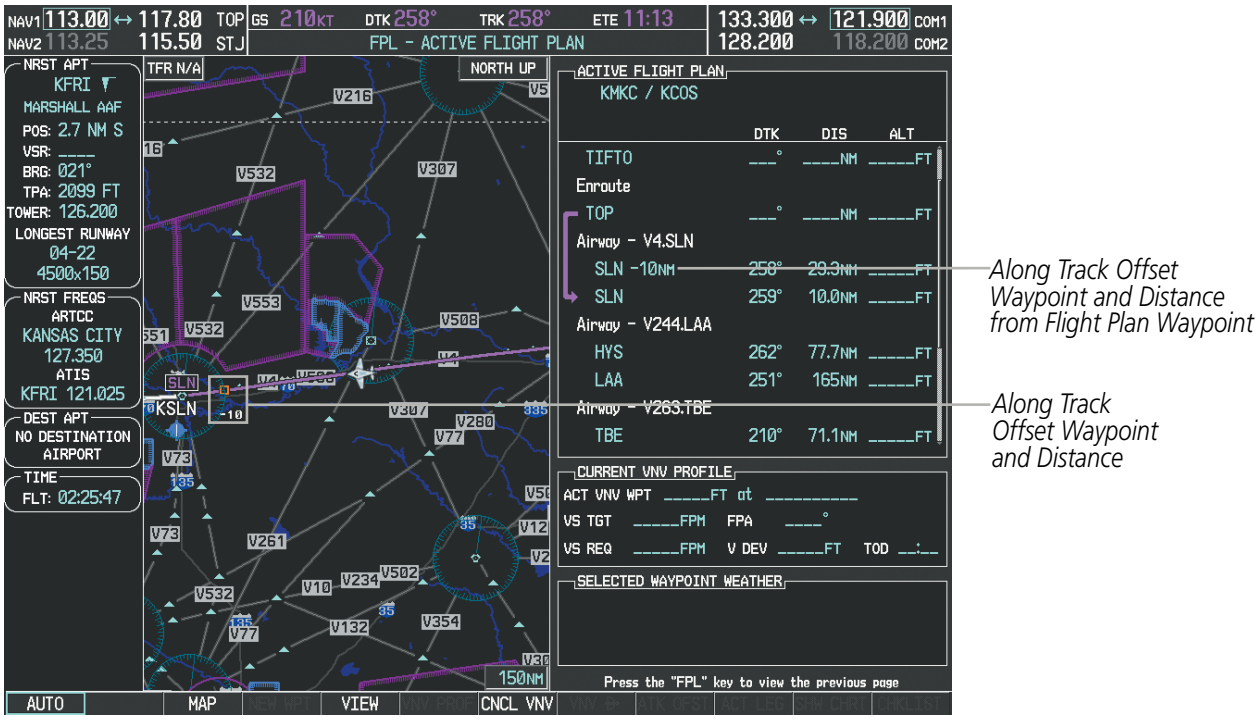


Figure 5-89 Along Track Offset

Entering an along track offset distance:

1) Press the **FPL** Key to display the Active Flight Plan Page (MFD) or the Active Flight Plan Window (PFD).
2) Press the **FMS** Knob to activate the cursor (not required on the PFD) and turn the large **FMS** Knob to highlight the waypoint for the along track offset.
3) Press the **ATK OFST** Softkey (MFD only); or press the **MENU** Key, highlight 'Create ATK Offset Waypoint', and press the **ENT** Key.
4) Enter a positive or negative offset distance in the range of +/- 1 to 999 nm (limited by leg distances).
5) Press the **ENT** Key to create the offset waypoint.
6) Press the **FMS** Knob to remove the flashing cursor.

PARALLEL TRACK

The Parallel Track (PTK) feature allows creation of a parallel course offset of 1 to 50 nm left or right of the current flight plan. When Parallel Track is activated, the course line drawn on the map pages shows the parallel course, and waypoint names have a lower case "p" placed after the identifier.

Using direct-to, loading an approach, a holding pattern, or editing and activating the flight plan automatically cancels Parallel Track. Parallel Track is also cancelled if a course change occurs greater than 120° or the parallel tracks overlap as a result of the course change.

NOTE: *Vertical navigation is unavailable while the Parallel Track feature is active.*

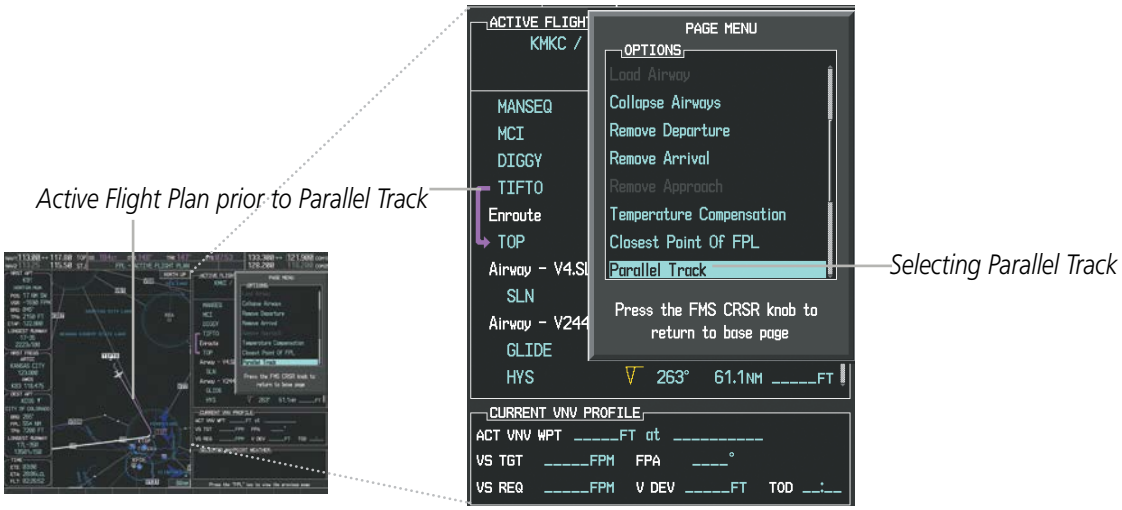


Figure 5-90 Active Flight Plan Window - Selecting Parallel Track

Activating parallel track:

1) Press the **FPL** Key to display the Active Flight Plan Page (MFD) or the Active Flight Plan Window (PFD).
2) Press the **MENU** Key, highlight 'Parallel Track', and press the **ENT** Key. The Parallel Track Window is displayed with the direction field highlighted.
3) Turn the small **FMS** Knob to select 'Left' or 'Right' and press the **ENT** Key. The 'DISTANCE' field is highlighted.
4) Turn the small **FMS** Knob to enter a distance from 1-99 nm and press the **ENT** Key. 'ACTIVATE PARALLEL TRACK' is highlighted.
5) Press the **ENT** Key to activate parallel track. Press the **FMS** Knob or the **CLR** Key to cancel the parallel track activation.

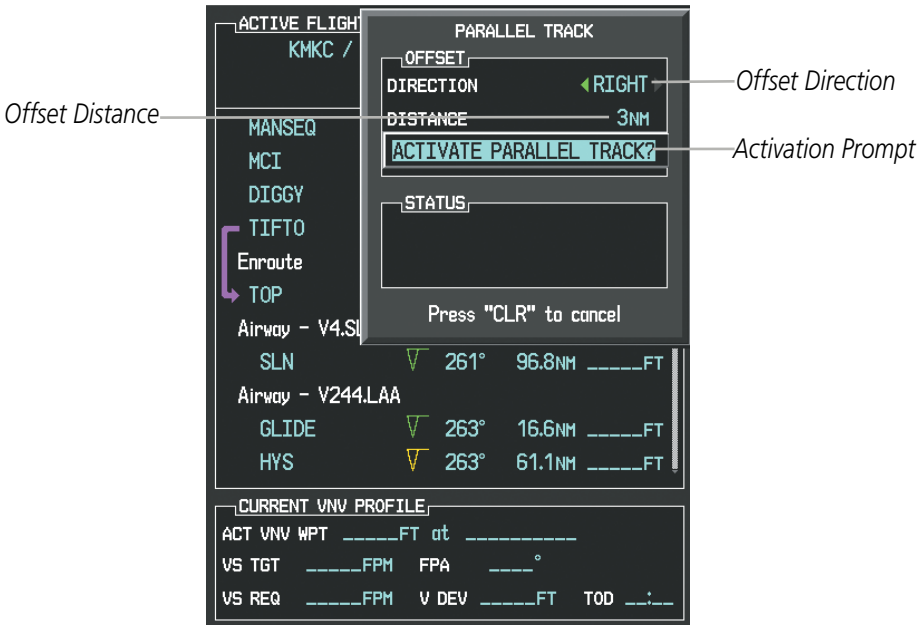


Figure 5-91 Parallel Track Window

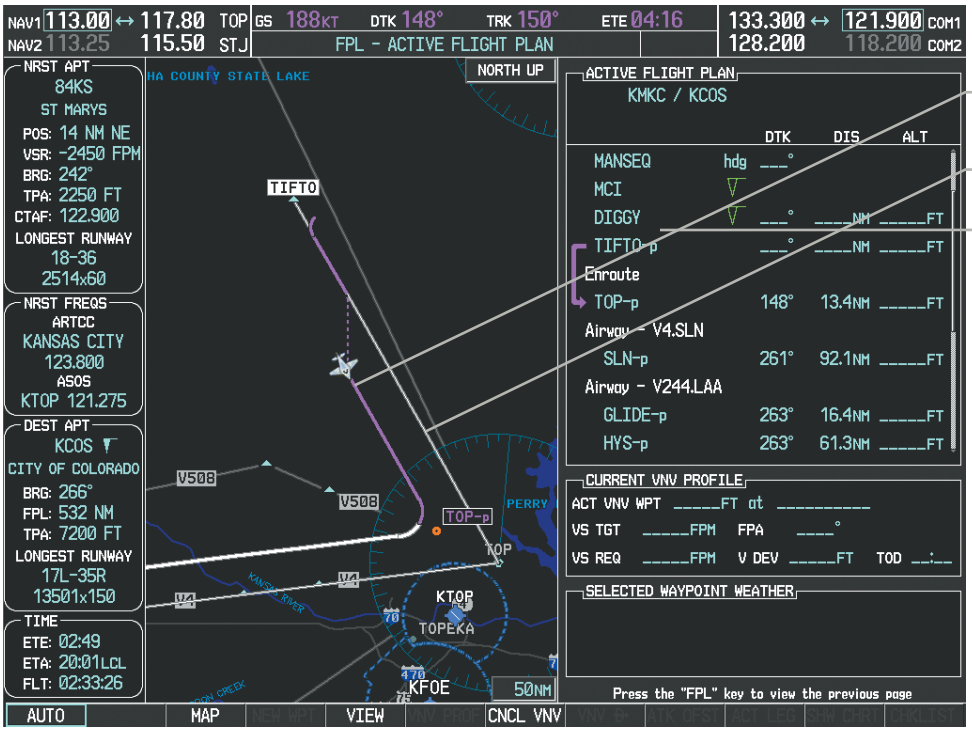


Figure 5-92 Parallel Track Active

If the parallel track proposed by the offset direction and distance is not allowed by the system, the activation prompt is displayed, but disabled. Parallel Track cannot be activated if a course is set using direct-to or if the active leg is the first leg of the departure procedure. Attempting to activate parallel track with these conditions

results in the message 'Parallel Track Unavailable Invalid Route Geometry'. If an approach leg is active the status indicates that the system is unable to activate the parallel track with the message 'Parallel Track Unavailable Approach Leg Active'. If the offset direction and distance results in an unreasonable route geometry the status indicates that the system is unable to activate the parallel track because of invalid geometry.

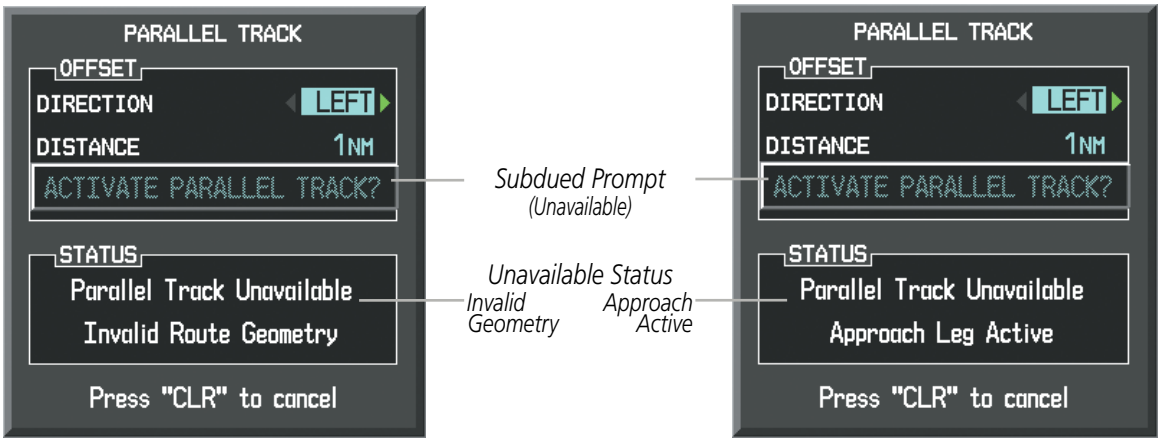


Figure 5-93 Parallel Track Unavailable

If the active leg is not a track between two fixes (TF) or a course to a fix (DF) leg, the status indicates that the system is unable to activate the parallel track because parallel track is not available for the active leg type.

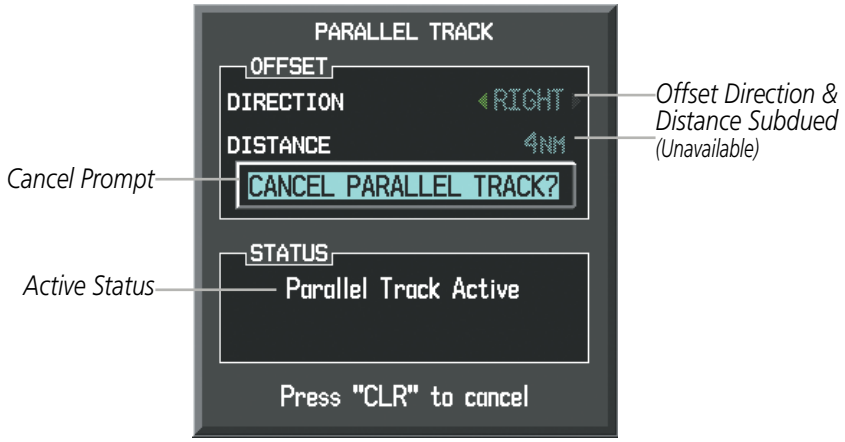


Figure 5-94 Cancelling Parallel Track

Cancelling parallel track:

1) Press the **FPL** Key to display the Active Flight Plan Page (MFD) or the Active Flight Plan Window (PFD).
2) Press the **MENU** Key, highlight 'Parallel Track', and press the **ENT** Key. The Parallel Track Window is displayed with 'CANCEL PARALLEL TRACK?' highlighted.
3) Press the **ENT** Key.

ACTIVATING A FLIGHT PLAN LEG

The G900X allows selection of a highlighted leg as the "active leg" (the flight plan leg which is currently used for navigation guidance).

Activating a flight plan leg:

1) Press the **FPL** Key to display the Active Flight Plan Page (MFD) or the Active Flight Plan Window (PFD).
2) Press the **FMS** Knob to activate the cursor (not required on the PFD) and turn the large **FMS** Knob to highlight the destination waypoint for the desired leg.
3) Press the **ACT LEG** Softkey (MFD only); or press the **MENU** Key, highlight 'Activate Leg', and press the **ENT** Key. A confirmation window is displayed with 'ACTIVATE' highlighted.
4) Press the **ENT** Key to activate the flight plan leg. To cancel, press the **CLR** Key, or highlight 'CANCEL' and press the **ENT** Key.
5) Press the **FMS** Knob to remove the flashing cursor.

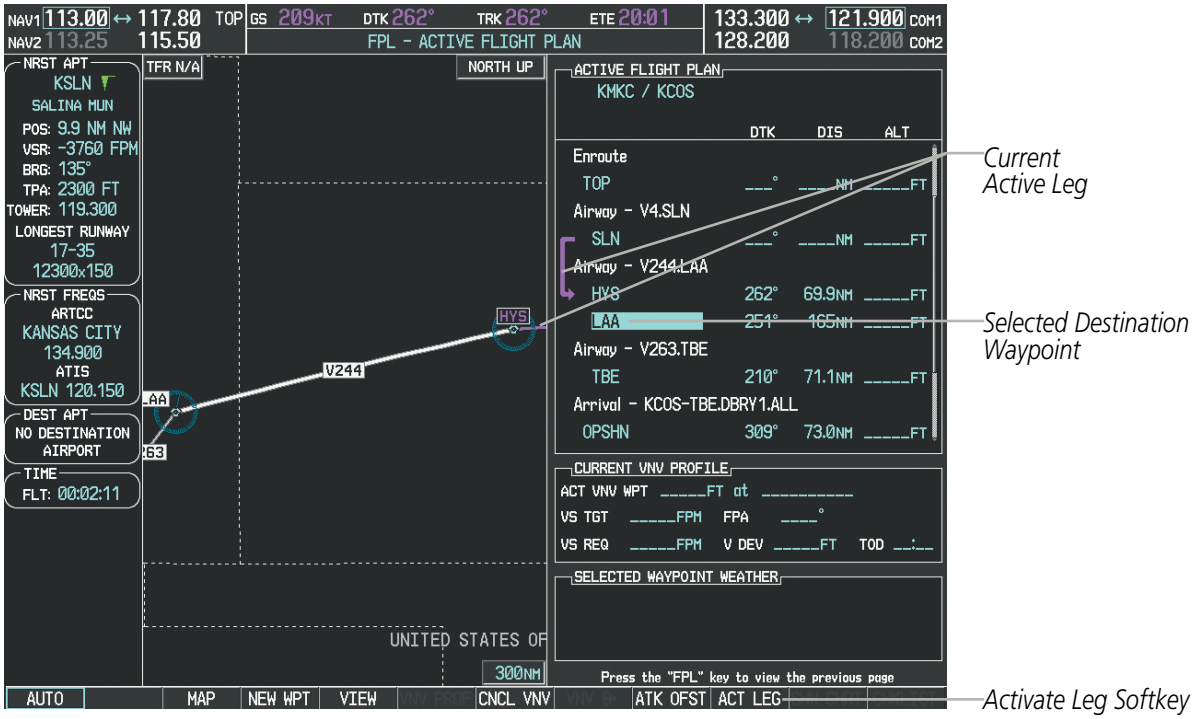


Figure 5-95 Active Flight Plan Page - Selecting the Leg Destination Waypoint

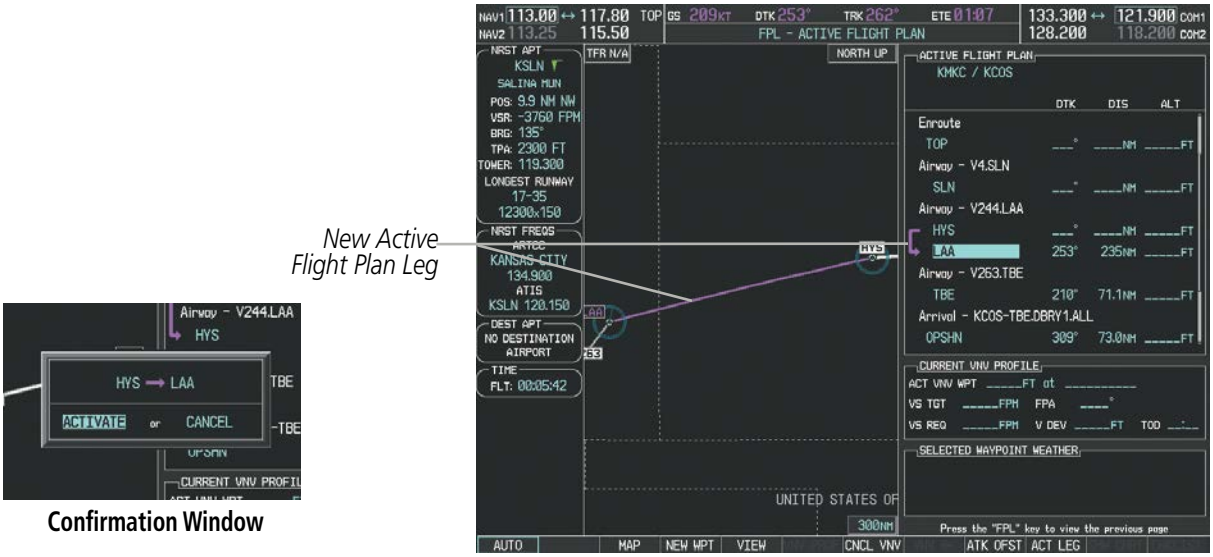


Figure 5-96 Active Flight Plan Page - New Active Leg

INVERTING A FLIGHT PLAN

Any flight plan may be inverted (reversed) for navigation back to the original departure point.

Inverting the active flight plan:

1) Press the **FPL** Key to display the Active Flight Plan Page (MFD) or the Active Flight Plan Window (PFD).
2) Press the **MENU** Key, highlight 'Invert Flight Plan', and press the **ENT** Key. An 'Invert Active Flight Plan?' confirmation window is displayed.
3) Select 'OK'.
4) Press the **ENT** Key to invert and activate the active flight plan. To cancel, press the **CLR** Key, or highlight 'CANCEL' and press the **ENT** Key.

Inverting and activating a stored flight plan:

1) Press the **FPL** Key and turn the small **FMS** Knob to display the Flight Plan Catalog Page.
2) Press the **FMS** Knob to activate the cursor, and turn the **FMS** Knob to highlight the desired flight plan.
3) Press the **INVERT** Softkey; or press the **MENU** Key, highlight 'Invert & Activate FPL?', and press the **ENT** Key. The 'Invert and activate stored flight plan?' window is displayed.
4) With 'OK' highlighted, press the **ENT** Key. To cancel the request, press the **CLR** Key, or highlight 'CANCEL' and press the **ENT** Key.

FLIGHT PLAN VIEWS

Information about flight plans can be viewed in more than one way. The active flight plan can be configured to show cumulative distance over the length of the flight plan or the distance for each leg of the flight plan; and the active flight plan can be viewed in a narrow or wide view. In the wide view, additional information is displayed: Fuel Remaining (FUEL REM), Estimated Time Enroute (ETE), Estimated Time of Arrival (ETA), and Bearing to the waypoint (BRG).

Switching between leg-to-leg waypoint distance and cumulative waypoint distance:

1) Press the **FPL** Key on the MFD to display the Active Flight Plan Page.
2) Press the **VIEW** Softkey to display the **CUM** and **LEG-LEG** Softkeys.
3) Press the **CUM** Softkey to view cumulative waypoint distance, or press the **LEG-LEG** Softkey to view leg-to-leg waypoint distance.
4) Press the **BACK** Softkey to return to the top level active flight plan softkeys.

Active Flight Plan Leg to Leg Distance

Active Flight Plan Cumulative Distance



WIDE *Softkey,* **NARROW** *Softkey,* **LEG-LEG** *Softkey,* **CUM** *Softkey*

Figure 5-97 Active Flight Plan - Leg to Leg vs. Cumulative Distance

Switching between wide and narrow view:

1) Press the **FPL** Key on the MFD to display the Active Flight Plan Page.
2) Press the **VIEW** Softkey to display the **WIDE** and **NARROW** Softkeys.
3) Press the **WIDE** Softkey to display the wide view, or press the **NARROW** Softkey to display the narrow view.
4) Press the **BACK** Softkey to return to the top level active flight plan softkeys.

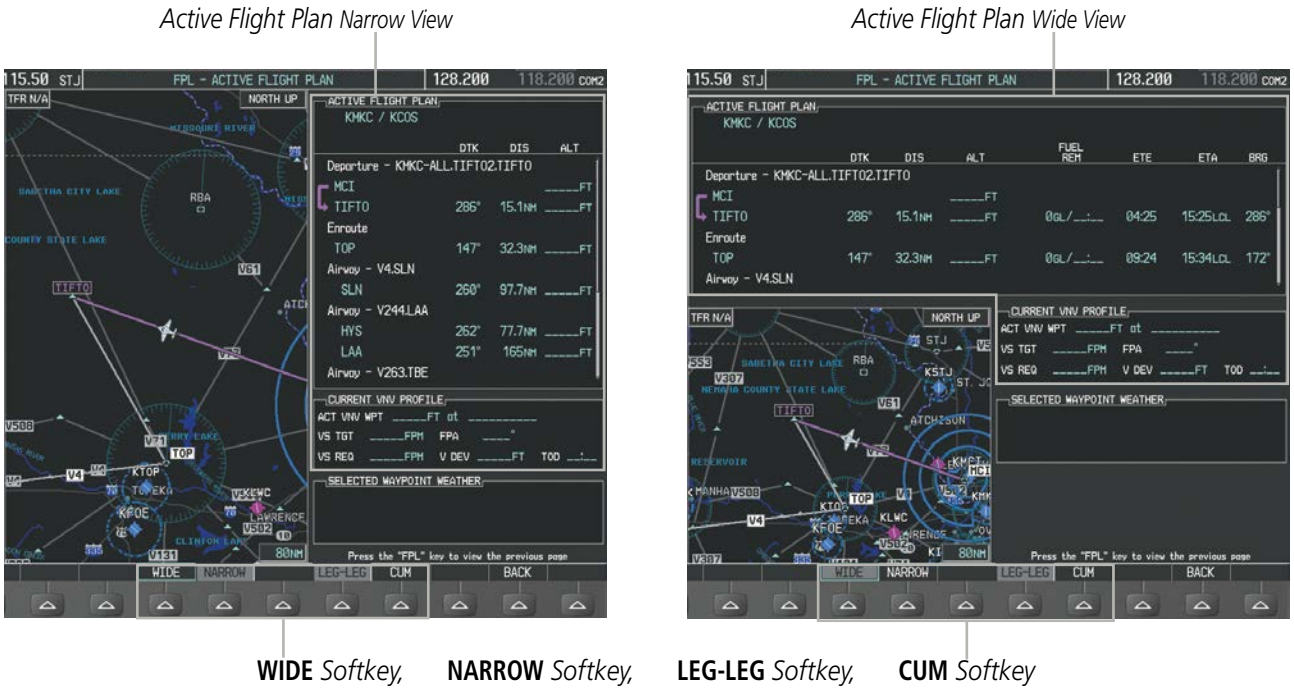


Figure 5-98 Active Flight Plan - Wide vs. Narrow View

COLLAPSING AIRWAYS

The G900X allows airways on the active flight plan to be collapsed or expanded from the Active Flight Plan Page/Window. When airways have been collapsed, it is indicated on the airway heading.

When airways are collapsed, leg-to-leg computed values such as DIS or ETE shown for the exit waypoint reflect the total of all the legs on the airway that have been hidden in the collapsed display. The DTK value is inhibited because it is not usable in this context.

The Active Flight Plan Page always keeps the following three waypoints visible: "From" waypoint, "To" waypoint, and "Next" waypoint. To prevent one or more of these waypoints from being hidden in a collapsed airway segment, the airway segment that contains either the "To" or the "Next" waypoint is automatically expanded. When an airway is loaded, airways are automatically expanded to facilitate flight plan review.

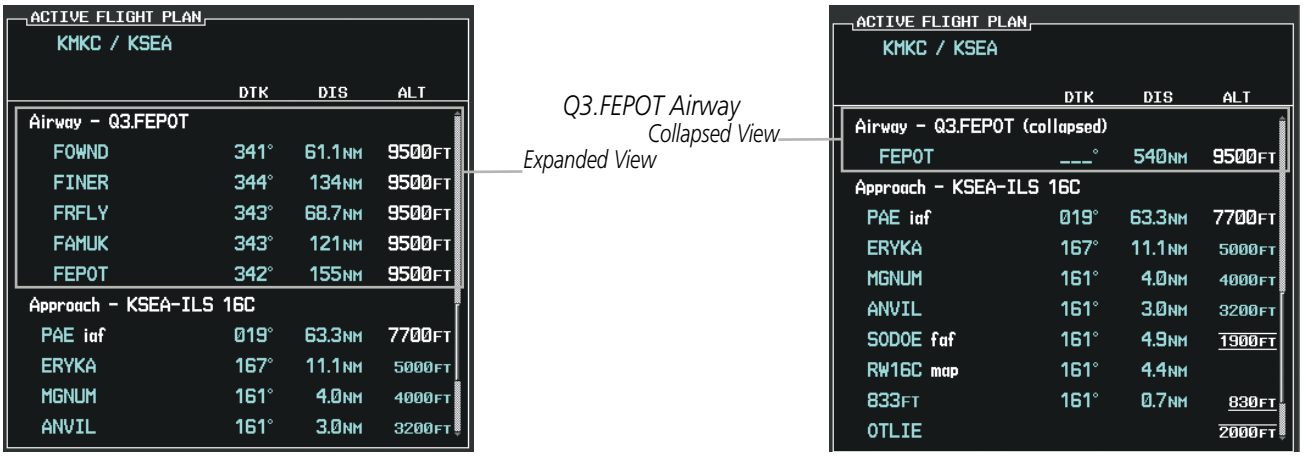


Figure 5-99 Expanded/Collapsed Airways

Collapsing/expanding the airways in the active flight plan:

1) Press the **FPL** Key to display the Active Flight Plan Page (MFD) or the Active Flight Plan Window (PFD).
2) Press the **MENU** Key, highlight 'Collapse Airways' or 'Expand Airways', and press the **ENT** Key. The airways are collapsed/expanded.

CLOSEST POINT OF FPL

'Closest Point of FPL' calculates the bearing and closest distance at which a flight plan passes a reference waypoint, and creates a new user waypoint along the flight plan at the location closest to a chosen reference waypoint.

Determining the closest point along the active flight plan to a selected waypoint:

1) Press the **FPL** Key to display the Active Flight Plan Page (MFD) or the Active Flight Plan Window (PFD).
2) Press the **MENU** Key, highlight 'Closest Point Of FPL", and press the **ENT** Key. A window appears with the reference waypoint field highlighted.
3) Enter the identifier of the reference waypoint and press the **ENT** Key. The G900X displays the bearing (BRG) and distance (DIS) to the closest point along the flight plan to the selected reference waypoint and creates a user waypoint at this location. The name for the new user waypoint is derived from the identifier of the reference waypoint.

USER-DEFINED HOLDING PATTERNS

A holding pattern can be defined at any active flight plan waypoint, at the aircraft present position, or at a direct-to waypoint.

Creating a user-defined hold at an active flight plan waypoint:

1) Press the **FPL** Key to display the Active Flight Plan Page (MFD) or the Active Flight Plan Window (PFD).
2) Press the **FMS** Knob to activate the cursor (not required on the PFD) and turn the large **FMS** Knob to highlight the waypoint for the hold.
3) Press the **MENU** Key, highlight 'Hold At Waypoint', and press the **ENT** Key. The HOLD AT window appears with the course field highlighted.
4) Use the **FMS** Knobs to edit the entry course, and press the **ENT** Key.
5) Use the small **FMS** Knob to select 'INBOUND' or 'OUTBOUND' course direction, and press the **ENT** Key.
6) Use the small **FMS** Knob to select 'TIME' or 'DIST' length mode, and press the **ENT** Key.
7) Use the **FMS** Knobs to edit the length, and press the **ENT** Key.
8) Use the small **FMS** Knob to select 'RIGHT' or 'LEFT' turn direction, and press the **ENT** Key.
9) Use the **FMS** Knobs to edit the Expect Further Clearance Time (EFC TIME), and press the **ENT** Key.
10) Press the **ENT** Key while 'LOAD?' is highlighted to insert the hold into the flight plan.

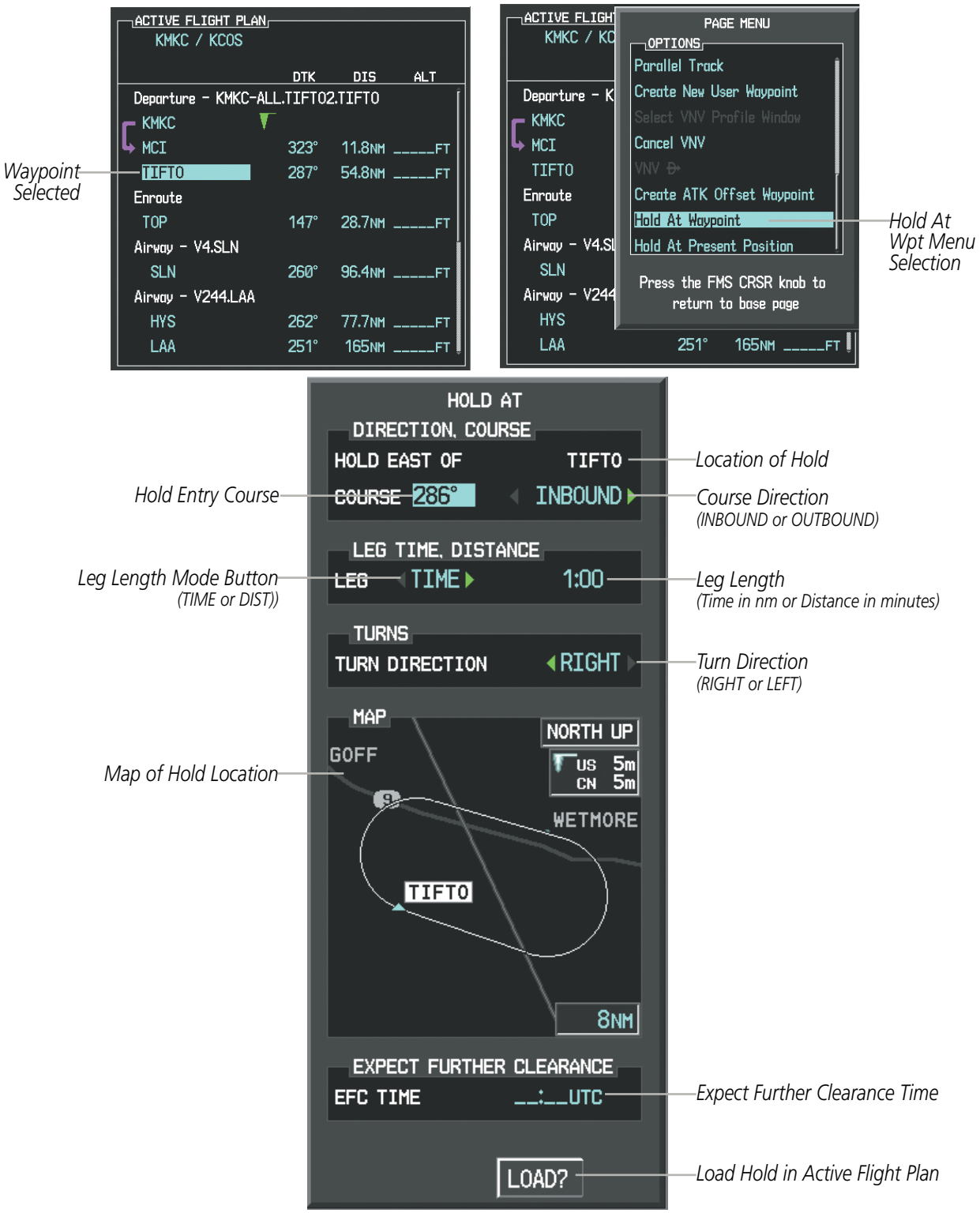


Figure 5-100 Creating a User Defined Holding Pattern at an Active Flight Plan Waypoint

Creating a user-defined hold at the aircraft present position:

1) Press the **FPL** Key to display the Active Flight Plan Page (MFD) or the Active Flight Plan Window (PFD).
2) Press the **MENU** Key, highlight 'Hold At Present Position', and press the **ENT** Key. The HOLD AT window appears with the course field highlighted.
3) If desired, use the **FMS** Knobs to edit the entry course, and press the **ENT** Key.
4) Use the small **FMS** Knob to select 'INBOUND' or 'OUTBOUND' course direction, and press the **ENT** Key.
5) Use the small **FMS** Knob to select 'TIME' or 'DIST' length mode, and press the **ENT** Key.
6) Use the **FMS** Knobs to edit the length, and press the **ENT** Key.
7) Use the small **FMS** Knob to select 'RIGHT' or 'LEFT' turn direction, and press the **ENT** Key.
8) Use the **FMS** Knobs to edit the Expect Further Clearance Time (EFC TIME), and press the **ENT** Key.
9) Press the **ENT** Key while 'ACTIVATE?' is highlighted to create an Offroute Direct-to hold waypoint at the aircraft present position and activate the hold.

Creating a user-defined hold at a direct-to waypoint:

1) Press a **Direct-to** Key and set up the direct-to waypoint as desired, but select 'HOLD?' instead of 'ACTIVATE?' when finished (MFD or PFD).
2) Use the **FMS** Knobs to edit the entry course, and press the **ENT** Key.
3) Use the small **FMS** Knob to select 'INBOUND' or 'OUTBOUND' course direction, and press the **ENT** Key.
4) Use the small **FMS** Knob to select 'TIME' or 'DIST' length mode, and press the **ENT** Key.
5) Use the **FMS** Knobs to edit the length, and press the **ENT** Key.
6) Use the small **FMS** Knob to select 'RIGHT' or 'LEFT' turn direction, and press the **ENT** Key.
7) Use the **FMS** Knobs to edit the Expect Further Clearance Time (EFC TIME), and press the **ENT** Key.
8) Press the **ENT** Key while 'ACTIVATE?' is highlighted to activate the direct-to with the user-defined hold defined at the direct-to waypoint. (If the direct-to wayoint is part of the active flight plan, the HOLD is inserted into the active flight plan. If the direct-to waypoint is not part of the active flight plan, an off-route direct-to hold is created.)

Exiting a user-defined hold inserted into the active flight plan:

Press the **SUSP** Softkey. The system will provide guidance to follow the holding pattern to the inbound course and resume automatic waypoint sequencing.

Removing a user-defined hold inserted into the active flight plan:

1) Press the **FPL** Key to display the Active Flight Plan Page (MFD) or the Active Flight Plan Window (PFD).
2) Press the **FMS** Knob to activate the cursor (not required on the PFD) and turn the large **FMS** Knob to highlight the HOLD waypoint.
3) Press the **CLR** Key. A 'Remove Holding Pattern?' confirmation window is displayed.
4) Select 'OK' and press the **ENT** Key. The holding pattern is removed from the active flight plan. Select 'CANCEL' and press the **ENT** Key to cancel the removal of the holding pattern.

Removing a user-defined hold at an off-route direct-to:

1) Press a **Direct To** Key to display the DIRECT TO Window (PFD or MFD).
2) Press the **MENU** Key to display the PAGE MENU with the cursor on the 'Cancel Direct-To NAV' selection.
3) Press the **ENT** Key. The holding pattern is removed.

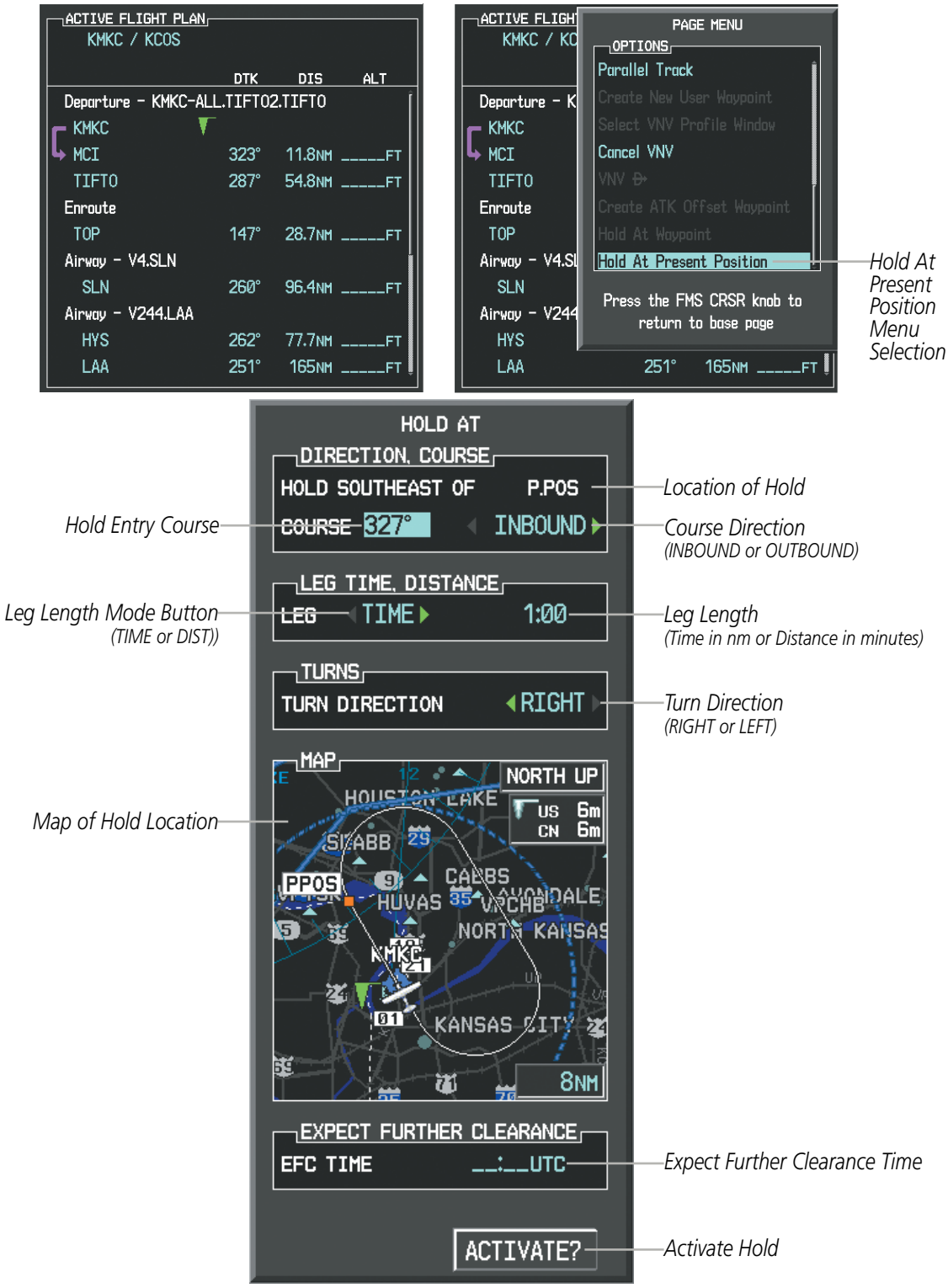


Figure 5-101 Creating a User Defined Holding Pattern at the Aircraft Present Position

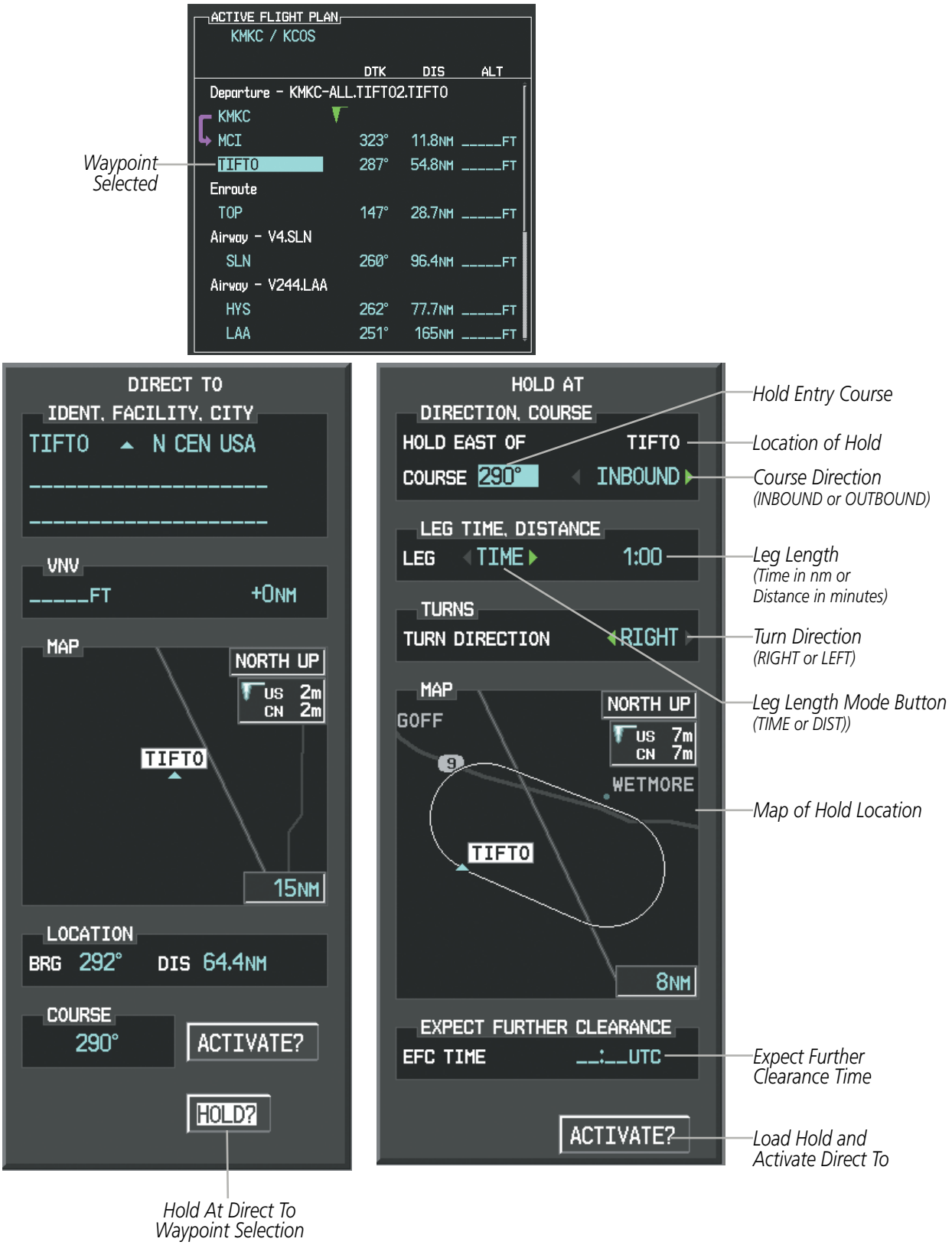


Figure 5-102 Creating a User Defined Holding Pattern at a Direct To Waypoint

5.7 VERTICAL NAVIGATION

NOTE: *The system supports vertical path guidance and altitude constraints for the following leg types: AF, CD, CF, CI, CR, DF, FC, FD, PI, RF, and TF. Altitude constraints are not retained in stored flight plans.*

The G900X system Vertical Navigation (VNV) feature provides vertical profile guidance during the enroute and teminal phases of flight. Guidance based on specified altitudes at waypoints in the active flight plan or to a direct-to waypoint is provided. It includes vertical path guidance to a descending path, which is provided as a linear deviation from the desired path. The desired path is defined by a line joining two waypoints with specified altitudes or as a vertical angle from a specified waypoint/altitude. The vertical waypoints are integrated into the active flight plan.

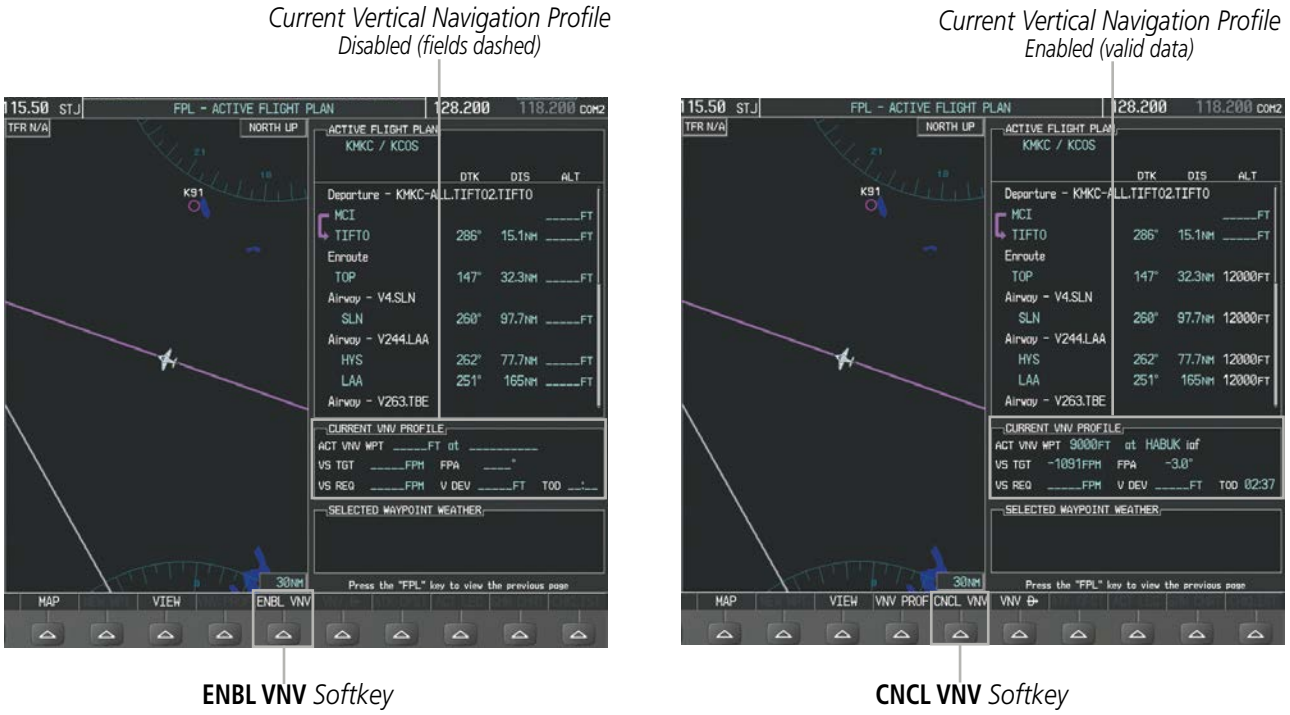


Figure 5-103 Enabling/Disabling Vertical Navigation

Enabling VNV guidance:

1) Press the **FPL** Key to display the Active Flight Plan Page on the MFD.
2) Press the **ENBL VNV** Softkey; or press the **MENU** Key, highlight 'Enable VNV', and press the **ENT** Key. Vertical navigation is enabled, and vertical guidance begins with the waypoint shown in the CURRENT VNV PROFILE box (defaults first waypoint in the active flight plan with an altitude enabled for vertical navigation (e.g., HABUK)).

Disabling VNV guidance:

1) Press the **FPL** Key to display the Active Flight Plan Page on the MFD.
2) Press the **CNCL VNV** Softkey; or press the **MENU** Key, highlight 'Cancel VNV', and press the **ENT** Key. Vertical navigation is disabled.

Canceling vertical navigation results in vertical deviation (V DEV), vertical speed required (VS REQ), and time to top of descent/bottom of descent (TIME TO TOD/BOD) going invalid. The Vertical Deviation Indicator (VDI) and Required Vertical Speed Indication (RVSI) on the PFD are removed, and the V DEV, VS REQ, and TIME TO TOD items displayed in the CURRENT VNV PROFILE box are dashed. VNV remains disabled until manually enabled. Vertical guidance in reversionary mode can only be enabled for a direct-to waypoint.

The G900X allows a vertical navigation direct-to to any waypoint in the active flight plan with an altitude constraint "designated" for vertical guidance. Pressing the **VNV Direct-to** Softkey on the Active Flight Plan Page allows the flight plan to be flown, while vertical guidance based on the altitude constraint at the VNV direct-to waypoint is provided. The altitude change begins immediately and is spread along the flight plan from current position to the vertical direct-to waypoint, not just along the leg for the direct-to waypoint. A direct-to with altitude constraint activated by pressing the **Direct-to** Key also provides vertical guidance, but would bypass flight plan waypoints between the current position in the flight plan and the direct-to waypoint. A top of descent (TOD) point is computed based on the default flight path angle; descent begins once the TOD is reached.

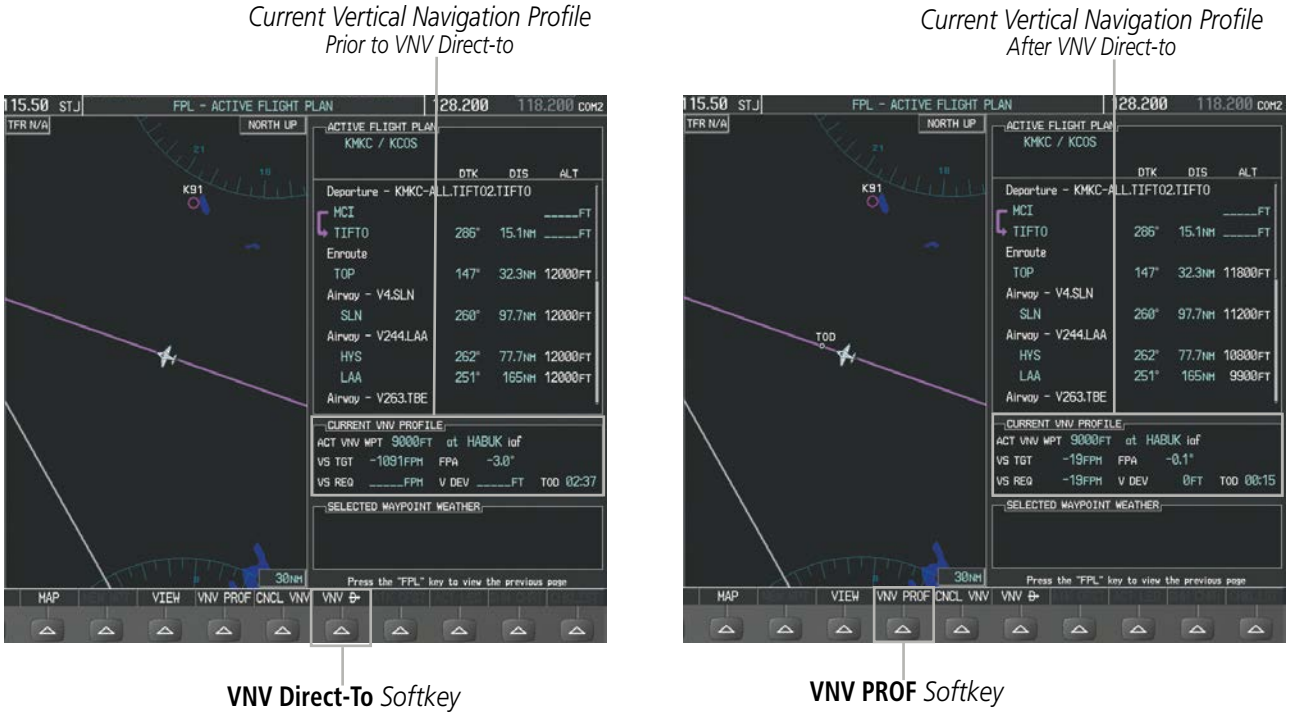


Figure 5-104 Vertical Navigation Direct-To

Activating a vertical navigation direct-to:

1) Press the **FPL** Key to display the Active Flight Plan Page on the MFD.
2) Press the **FMS** Knob to activate the cursor and turn the **FMS** Knob to highlight the desired waypoint.

NOTE: *The selected waypoint must have a designated altitude constraint (cyan number) to be used. If not, the first waypoint in the flight plan with a designated altitude constraint is selected.*

3) Press the **VNV Direct-To** Softkey; or press the **MENU** Key, highlight 'VNV Direct-To', and press the **ENT** Key. An 'Activate vertical Direct-to to: NNNNNFT at XXXXXX?' confirmation window is displayed.

4) Press the **ENT** Key. Vertical guidance begins to the altitude constraint for the selected waypoint.

5) Press the **FMS** Knob to remove the flashing cursor.

The vertical navigation profile can be modified by directly entering a vertical speed target (VS TGT) and/or flight path angle (FPA) in the CURRENT VNV PROFILE box.

Modifying the VS TGT and FPA:

1) Press the **FPL** Key to display the Active Flight Plan Page on the MFD.

2) Press the **VNV PROF** Softkey; or press the **MENU** Key, highlight 'Select VNV Profile Window', and press the **ENT** Key. The cursor is now located in the CURRENT VNV PROFILE box.

3) Turn the **FMS** Knobs as needed to edit the values.

4) Press the **FMS** Knob to remove the flashing cursor.

ALTITUDE CONSTRAINTS

The G900X system can use altitude constraints associated with lateral waypoints to give guidance for vertical navigation. These altitudes are, depending on the specific instance, manually entered or retrieved from the published altitudes in the navigation database. The navigation database only contains altitudes for procedures that call for "Cross at" altitudes. If the procedure states "Expect to cross at," then the altitude is not in the database. In this case the altitude may be entered manually.

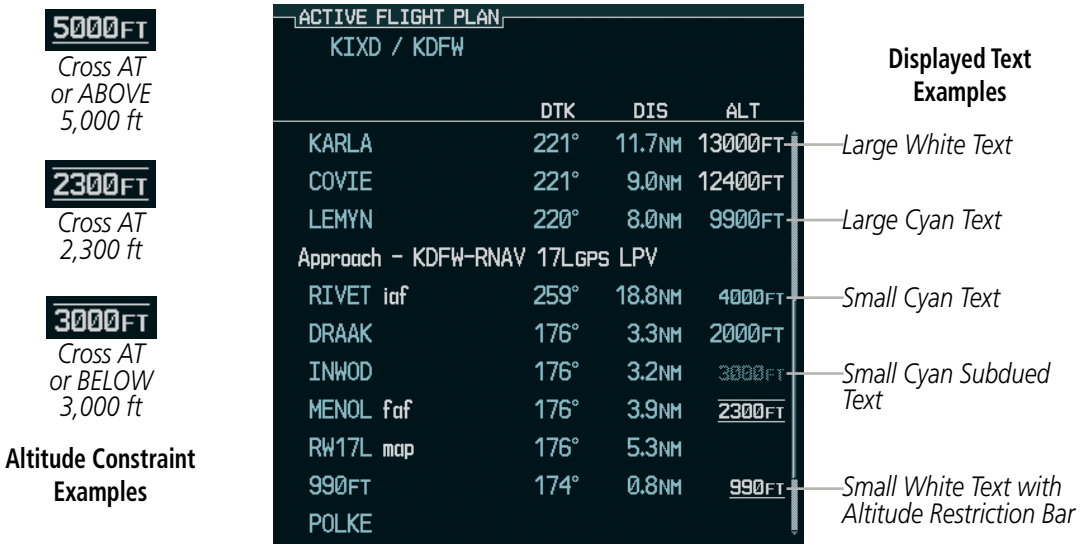


Figure 5-105 Waypoint Altitude Constraints

	White Text	Cyan Text	Cyan Subdued Text
Large Text	Altitude calculated by the system estimating the altitude of the aircraft as it passes over the navigation point. This altitude is provided as a reference and is not designated to be used in determining vertical speed and deviation guidance.	Altitude has been entered manually. Altitude is designated for use in giving vertical speed and deviation guidance. Altitude does not match the published altitude in navigation database or no published altitude exists.	The system cannot use this altitude in determining vertical speed and deviation guidance because of an invalid constraint condition.
Small Text	Altitude is not designated to be used in determining vertical speed and deviation guidance. Altitude has been retrieved from the navigation database and is provided as a reference.	Altitude is designated for use in giving vertical speed and deviation guidance. Altitude has been retrieved from the navigation database or has been entered manually and matches a published altitude in the navigation database.	The system cannot use this altitude in determining vertical speed and deviation guidance because of an invalid constraint condition.

Table 5-8 Altitude Constraint Size and Color Coding

Altitudes associated with approach procedures are "auto-designated". This means the system automatically uses the altitudes loaded with the approach for giving vertical speed and deviation guidance. Note that these altitudes are displayed as cyan text up to, but not including, the FAF. The FAF is always a "reference only" altitude and cannot be designated, unless the selected approach does not provide vertical guidance. In this case, the FAF altitude can be designated.

Altitudes that have been designated for use in vertical guidance can be "un-designated" using the **CLR** Key. The altitude is now displayed only as a reference. It is not used to give vertical guidance. Other displayed altitudes may change due to re-calculations or be rendered invalid as a result of manually changing an altitude to a non-designated altitude.

Designating a waypoint altitude to be used for vertical guidance:

1) Press the **FPL** Key to display the Active Flight Plan Page on the MFD.
2) Press the **FMS** Knob, and turn to highlight the desired waypoint altitude.
3) Turn the small **FMS** Knob to enter editing mode.
4) Press the **ENT** Key. The altitude is now shown in cyan, indicating it is usable for vertical guidance.

Designating a procedure waypoint altitude to be used for vertical guidance:

1) Press the **FPL** Key to display the Active Flight Plan Page on the MFD.
2) Press the **FMS** Knob, and turn to highlight the desired waypoint altitude.
3) Press the **ENT** Key. The altitude is now shown in cyan, indicating it is usable for vertical guidance.

Altitude constraints are displayed and entered in feet mean sea level (MSL) values to the nearest hundred. An altitude constraint in feet above ground level (AGL) format is supported for airports. When a database altitude restriction is displayed, the G900X allows entry of a different altitude when creating a waypoint, effectively overriding the database restriction (only before the FAF). When a database altitude restriction of type "AT or ABOVE" or "AT or BELOW" is activated, the system uses the "AT" portion of the restriction to define the vertical profile.

An altitude constraint is invalid if:

- Meeting the constraint requires the aircraft to climb
- Meeting the constraint requires the maximum flight path angle or maximum vertical speed to be exceeded
- The altitude constraint results in a TOD behind the aircraft present position
- The constraint is within a leg type for which altitude constraints are not supported
- The altitude constraint is added to the FAF of an approach that provides vertical guidance (i.e., ILS or GPS SBAS approach)
- The altitude constraint is added to a waypoint past the FAF.

Entering/modifiying an altitude constraint:

1) Press the **FPL** Key to display the Active Flight Plan Page on the MFD.
2) Press the **FMS** Knob, and turn to highlight the desired waypoint altitude constraint.
3) Enter an altitude constraint value using the **FMS** Knobs. To enter altitudes as a flight level, turn the small **FMS** Knob counter-clockwise past zero or clockwise past 9 on the first character, and the system automatically changes to show units of Flight Level. Turn the large **FMS** Knob clockwise to highlight the first zero and enter the three digit flight level.
4) Press the **ENT** Key to accept the altitude constraint; if the selected waypoint is an airport, an additional choice is displayed. Turn the small **FMS** Knob to choose 'MSL' or 'AGL', and press the **ENT** Key to accept the altitude.

Altitude constraints can be modified or deleted after having been added to the flight plan. In the event an altitude constraint is deleted and the navigation database contains an altitude restriction for the lateral waypoint, the G900X displays the altitude restriction from the database provided no predicted altitude can be provided. The G900X also provides a way to reinstate a published altitude constraint that has been edited.

Deleting an altitude constraint provided by the navigation database:

1) Press the **FPL** Key to display the Active Flight Plan Page on the MFD.
2) Press the **FMS** Knob, and turn to highlight the desired waypoint altitude constraint.
3) Press the **CLR** Key. A 'Remove VNV altitude constraint?' confirmation window is displayed.
4) Select 'OK' and press the **ENT** Key.

Deleting an altitude constraint that has been manually entered:

1) Press the **FPL** Key to display the Active Flight Plan Page on the MFD.
2) Press the **FMS** Knob, and turn to highlight the desired waypoint altitude constraint.
3) Press the **CLR** Key. A 'Remove or Revert to published VNV altitude of nnnnnFT?' confirmation window is displayed.
4) Select 'REMOVE' and press the **ENT** Key. The manually entered altitude is deleted (it is replaced by a system calculated altitude, if available).

Reverting a manually entered altitude constraint back to the navigation database value:

1) Press the **FPL** Key to display the Active Flight Plan Page on the MFD.
2) Press the **FMS** Knob, and turn to highlight the desired waypoint altitude constraint.
3) Press the **CLR** Key. A 'Remove or Revert to published VNV altitude of nnnnnFT?' confirmation window is displayed.
4) Select 'REVERT' and press the **ENT** Key. The altitude is changed to the navigation database value.
5) Press the **FMS** Knob to remove the flashing cursor.

Modifying a system calculated altitude constraint:

1) Press the **FPL** Key to display the Active Flight Plan Page on the MFD.
2) Press the **FMS** Knob, and turn to highlight the desired waypoint altitude constraint.
3) Press the **CLR** Key. An 'Edit or Revert to published VNV altitude of nnnnnFT?' confirmation window is displayed.
4) Select 'EDIT' and press the **ENT** Key.
5) Edit the value using the **FMS** Knobs, and press the **ENT** Key.
6) Press the **FMS** Knob to remove the flashing cursor.

5.8 PROCEDURES

The G900X can access the whole range of instrument procedures available. Departures (DPs), arrivals (STARs), and non-precision and precision approaches (APPRs) are stored within the database and can be loaded using the Procedures **(PROC)** Key.

The selected procedure for the departure or arrival airport is added to the active flight plan. No waypoints are required to be in the active flight plan to load procedures; however, if the departure and arrival airport are already loaded, the procedure loading window defaults to the appropriate airport, saving some time selecting the correct airport on the Procedure Loading Page. Whenever an approach is selected, the choice to either "load" or "activate" is given. "Loading" adds the approach to the end of the flight plan without immediately using it for navigation guidance. This allows continued navigation via the intermediate waypoints in the original flight plan, but keeps the procedure available on the Active Flight Plan Page for quick activation when needed. "Activating" also adds the procedure to the end of the flight plan but immediately begins to provide guidance to the first waypoint in the approach.

The system adds terminal procedures to the flight plan based on leg types coded within that procedure in the navigation database. If the terminal procedure in the flight plan contains an identifier like '6368FT', that indicates a leg that terminates when the specified altitude (6368 feet) has been exceeded. A heading leg in the flight plan displays 'hdg' preceding the DTK (e.g. 'hdg 008°'). A flight plan leg requiring the pilot to manually intitiate sequencing to the next leg displays 'MANSEQ' as the identifier.

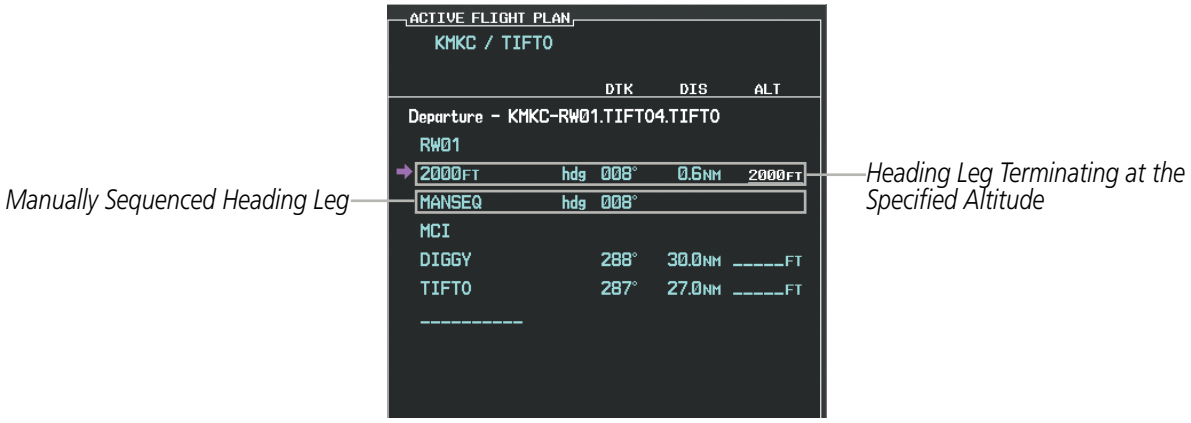


Figure 5-106 Procedure Leg Identifiers

DEPARTURES

A Departure Procedure (DP) is loaded at the departure airport in the flight plan. Only one departure can be loaded at a time in a flight plan. If a departure is loaded when another departure is already in the active flight plan, the new departure replaces the previous departure. The route is defined by selection of a departure, the transition waypoints, and a runway.

LOADING A DEPARTURE INTO THE ACTIVE FLIGHT PLAN

Loading a departure into the active flight plan using the PROC Key:

1) Press the **PROC** Key. The Procedures Window is displayed.
2) Highlight 'SELECT DEPARTURE'.

3) Press the **ENT** Key. The Departure Loading Page is displayed.
4) Use the **FMS** Knob to select an airport and press the **ENT** Key.
5) Select a departure from the list and press the **ENT** Key.
6) Select a runway (if required) and press the **ENT** Key.
7) Select a transition (if required) and press the **ENT** Key. 'LOAD?' is highlighted.
8) Press the **ENT** Key to load the departure procedure.

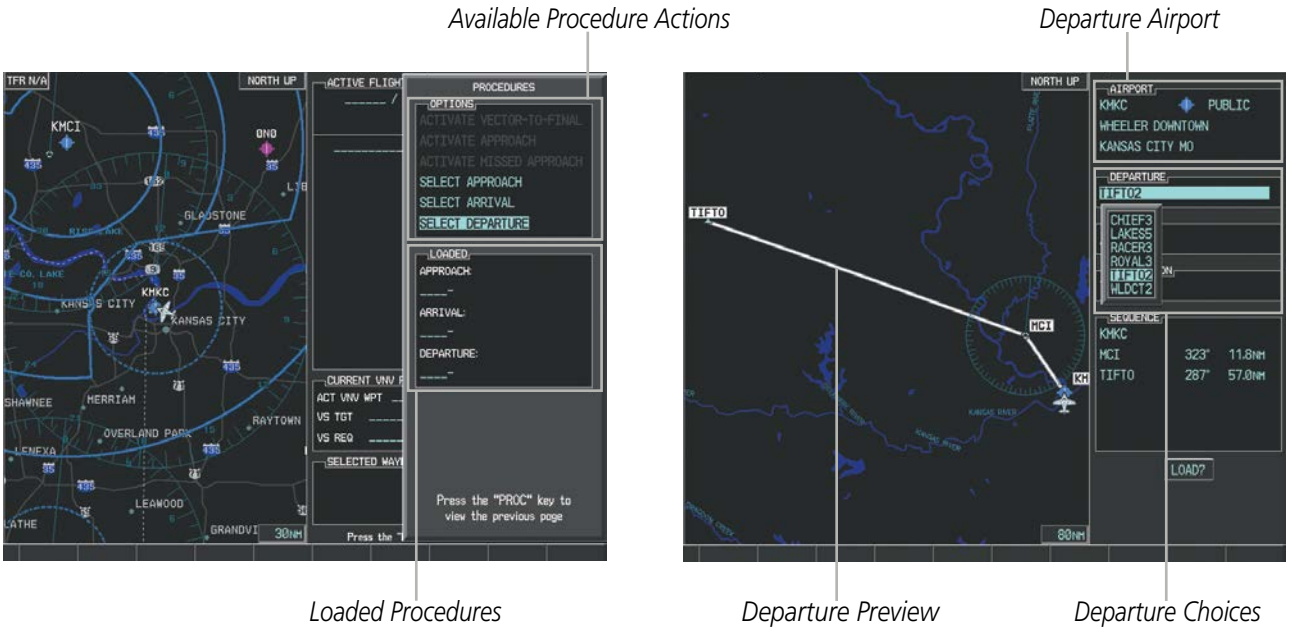


Figure 5-107 Departure Selection

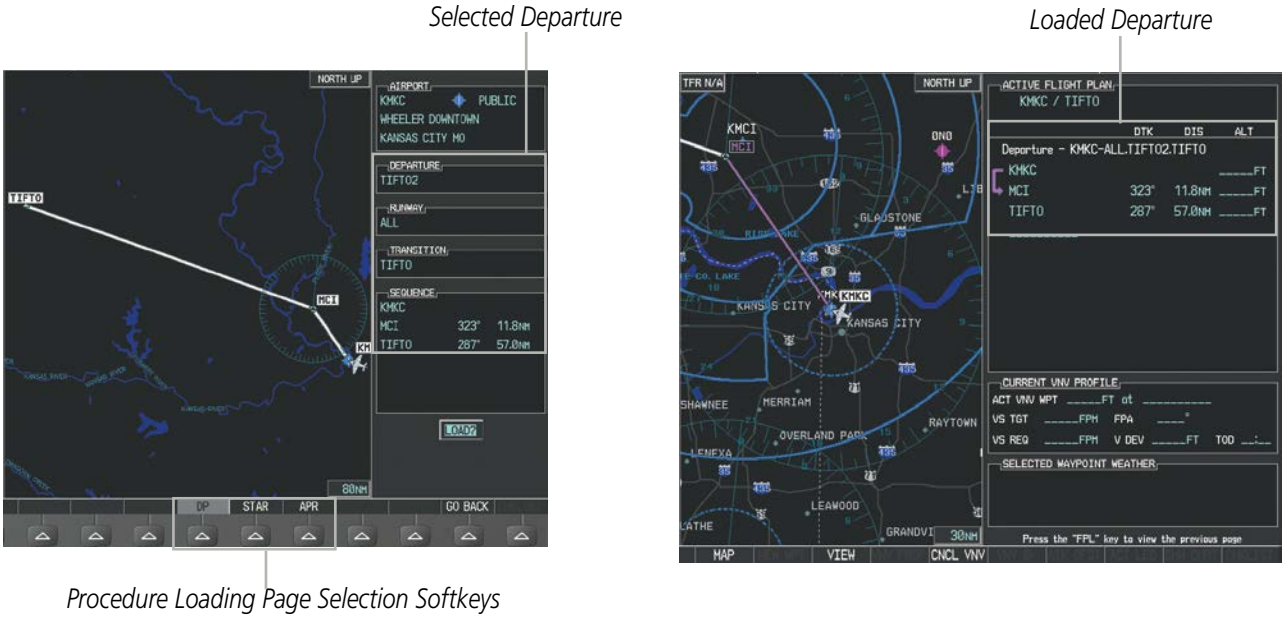


Figure 5-108 Departure Loading

Viewing available departures at an airport:

1) From the Airport Information Page (first page in the WPT group), press the **DP** Softkey. The Departure Information Page is displayed, defaulting to the airport displayed on the Airport information Page.
2) To select another airport, press the **FMS** Knob to activate the cursor, enter an identifier/facility name/city, and press the **ENT** Key.
3) Turn the large **FMS** Knob to highlight the Departure. The departure is previewed on the map.
4) Turn the small **FMS** Knob to view the available departures. Press the **ENT** Key to select the departure. The cursor moves to the Runway box. The departure is previewed on the map.
5) Turn the small **FMS** Knob to view the available runways. Press the **ENT** Key to select the runway. The cursor moves to the Transition box (only if there are available transitions). The departure is previewed on the map.
6) Turn the small **FMS** Knob to view the available transitions. Press the **ENT** Key to select the transition. The cursor moves to the Sequence box. The departure is previewed on the map.
7) Press the **INFO-1** or the **INFO-2** Softkey to return to the Airport Information Page.

REMOVING A DEPARTURE FROM THE ACTIVE FLIGHT PLAN

When plans change while flying IFR, departures can be easily removed from the Active Flight Plan.

Removing a departure procedure from the active flight plan:

1) Press the **FPL** Key to display the Active Flight Plan Page (MFD) or the Active Flight Plan Window (PFD).
2) Press the **MENU** Key, and highlight 'Remove Departure'.
3) Press the **ENT** Key. A confirmation window is displayed listing the departure procedure.
4) With 'OK' highlighted, press the **ENT** Key. To cancel the removal request, highlight 'CANCEL' and press the **ENT** Key.

Or:

1) Press the **FPL** Key to display the Active Flight Plan Page (MFD) or the Active Flight Plan Window (PFD).
2) Press the **FMS** Knob, and turn to highlight the departure header in the active flight plan.
3) Press the **CLR** Key. A confirmation window is displayed listing the departure procedure.
4) With 'OK' highlighted, press the **ENT** Key. To cancel the removal request, highlight 'CANCEL' and press the **ENT** Key.
5) Press the **FMS** Knob to remove the flashing cursor.

ARRIVALS

A Standard Terminal Arrival (STAR) can be loaded at any airport that has one available. Only one arrival can be loaded at a time in a flight plan. If an arrival is loaded when another arrival is already in the active flight plan, the new arrival replaces the previous arrival. The route is defined by selection of an arrival, the transition waypoints, and a runway.

LOADING AN ARRIVAL INTO THE ACTIVE FLIGHT PLAN

Loading an arrival into the active flight plan using the PROC Key:

1) Press the **PROC** Key. The Procedures Window is displayed.
2) Highlight 'SELECT ARRIVAL'.
3) Press the **ENT** Key. The Arrival Loading Page is displayed.
4) Use the **FMS** Knob to select an airport and press the **ENT** Key.
5) Select an arrival from the list and press the **ENT** Key.
6) Select a transition (if required) and press the **ENT** Key.
7) Select a runway (if required) and press the **ENT** Key. 'LOAD?' is highlighted.
8) Press the **ENT** Key to load the arrival procedure.

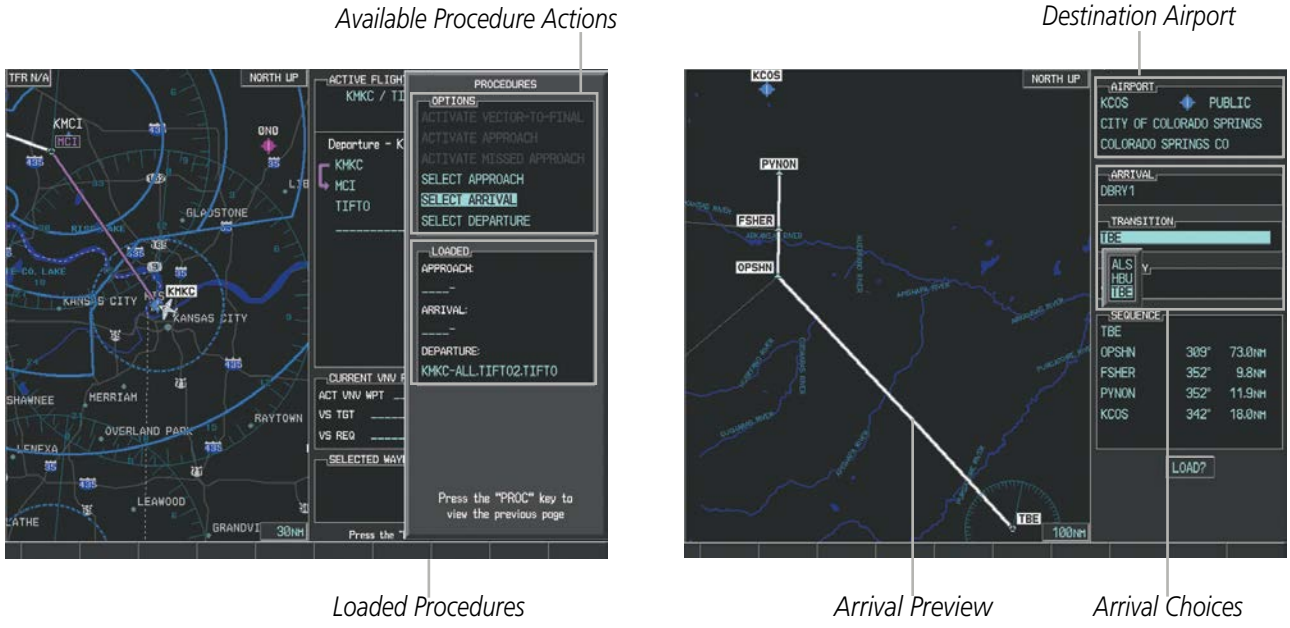


Figure 5-109 Arrival Selection

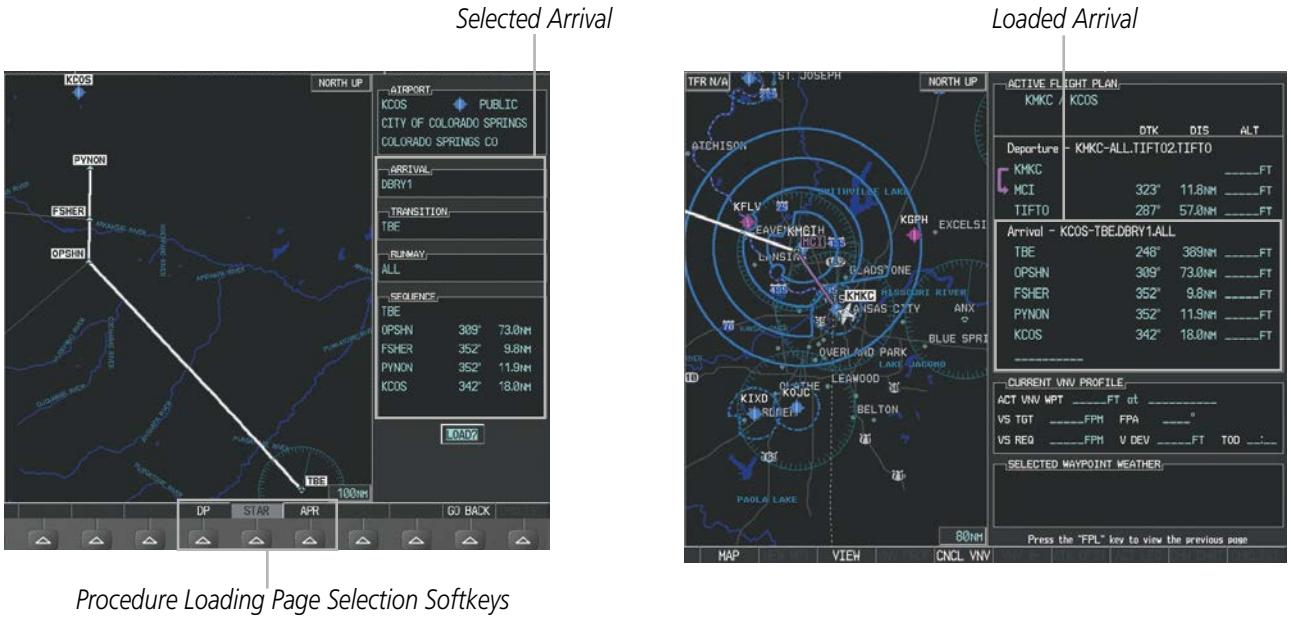


Figure 5-110 Arrival Loading

Viewing available arrivals at an airport:

1) From the Airport Information Page (first page in the WPT group), press the **STAR** Softkey. The Arrival Information Page is displayed, defaulting to the airport displayed on the Airport Information Page.
2) To select another airport, press the **FMS** Knob to activate the cursor, enter an identifier/facility name/city, and press the **ENT** Key.
3) Turn the large **FMS** Knob to highlight the Arrival. The arrival is previewed on the map.
4) Turn the small **FMS** Knob to view the available arrivals. Press the **ENT** Key to select the arrival. The cursor moves to the Transition box. The arrival is previewed on the map.
5) Turn the small **FMS** Knob to view the available transitions. Press the **ENT** Key to select the transition. The cursor moves to the Runway box. The arrival is previewed on the map.
6) Turn the small **FMS** Knob to view the available runways. Press the **ENT** Key to select the runway. The cursor moves to the Sequence box. The arrival is previewed on the map.
7) Press the **INFO-1** or the **INFO-2** Softkey to return to the Airport Information Page.

REMOVING AN ARRIVAL FROM THE ACTIVE FLIGHT PLAN

When plans change while flying IFR, arrivals can be easily removed from the Active Flight Plan.

Removing an arrival from the active flight plan:

1) Press the **FPL** Key to display the Active Flight Plan Page (MFD) or the Active Flight Plan Window (PFD).
2) Press the **MENU** Key, and highlight 'Remove Arrival'.
3) Press the **ENT** Key. A confirmation window is displayed listing the arrival procedure.

4) With 'OK' highlighted, press the **ENT** Key. To cancel the removal request, highlight 'CANCEL' and press the **ENT** Key.

Or:

1) Press the **FPL** Key to display the Active Flight Plan Page (MFD) or the Active Flight Plan Window (PFD).
2) Press the **FMS** Knob, and turn to highlight the arrival header in the active flight plan.
3) Press the **CLR** Key. A confirmation window is displayed listing the arrival procedure.
4) With 'OK' highlighted, press the **ENT** Key. To cancel the removal request, highlight 'CANCEL' and press the **ENT** Key.
5) Press the **FMS** Knob to remove the flashing cursor.

APPROACHES

NOTE: *If certain GPS parameters (SBAS, RAIM, etc.) are not available, some published approach procedures for the desired airport may not be displayed in the list of available approaches.*

An Approach Procedure (APPR) can be loaded at any airport that has one available, and provides guidance for non-precision and precision approaches to airports with published instrument approach procedures. Only one approach can be loaded at a time in a flight plan. If an approach is loaded when another approach is already in the active flight plan, the new approach replaces the previous approach. The route is defined by selection of an approach and the transition waypoints.

Whenever an approach is selected, the choice to either "load" or "activate" is given. "Loading" adds the approach to the end of the flight plan without immediately using it for navigation guidance. This allows continued navigation via the intermediate waypoints in the original flight plan, but keeps the procedure available on the Active Flight Plan Page for quick activation when needed. "Activating" also adds the procedure to the end of the flight plan but immediately begins to provide guidance to the first waypoint in the approach.

When selecting an approach, a "GPS" designation to the right of the procedure name indicates the procedure can be flown using the GPS receiver. Some procedures do not have this designation, meaning the GPS receiver can be used for supplemental navigation guidance only. If the GPS receiver cannot be used for primary guidance, the appropriate navigation receiver must be used for the selected approach (e.g., VOR or ILS). The final course segment of ILS approaches, for example, must be flown by tuning the NAV receiver to the proper frequency and selecting that NAV receiver on the CDI.

The G900X SBAS GPS allows for flying LNAV, LNAV+V, LNAV/VNAV, LP, LP+V, and LPV approach service levels according to the published chart. The '+V' designation adds advisory vertical guidance for assistance in maintaining a constant vertical glidepath similar to an ILS glideslope on approach. This guidance is displayed on the PFD in the same location as the ILS glideslope using a magenta diamond. In all cases where LNAV+V is indicated by the system during an approach, LNAV minima are used.

The active approach service level is annunciated on the HSI as shown in the following table:

HSI Annunciation	Description	Example on HSI
LNAV	RNAV GPS approach using published LNAV minima	
LNAV+V	RNAV GPS approach using published LNAV minima. Advisory vertical guidance is provided	
L/VNAV (available only if SBAS available)	RNAV GPS approach using published LNAV/VNAV minima (downgrades to LNAV if SBAS unavailable)	
LP (available only if SBAS available)	RNAV GPS approach using published LP minima (downgrades to LNAV if SBAS unavailable)	
LP+V (available only if SBAS available)	RNAV GPS approach using published LP minima Advisory vertical guidance is provided (downgrades to LNAV if SBAS unavailable)	
LPV (available only if SBAS available)	RNAV GPS approach using published LPV minima	

Approach Service Level
- LNAV, LNAV+V, L/VNAV, LP, LP+V, LPV

Table 5-9 Approach Types

LOADING AN APPROACH INTO THE ACTIVE FLIGHT PLAN

Loading an approach into the active flight plan using the PROC Key:

1) Press the **PROC** Key. The Procedures Window is displayed.

2) Highlight 'SELECT APPROACH', and press the **ENT** Key. The Approach Loading Page is displayed.

3) Select the airport and approach:

a) Use the **FMS** Knob to select an airport and press the **ENT** Key.

b) Select an approach from the list and press the **ENT** Key.

Or:

a) If necessary, push the **FMS** Knob to exit the approach list, and use the large **FMS** Knob to move the cursor to the APPROACH CHANNEL field.

b) Use the **FMS** Knob to enter the approach channel number, and press the **ENT** Key to accept the approach channel number. The airport and approach are selected.

4) Select a transition (if required) and press the **ENT** Key.

5) Minimums

a) To set 'MINIMUMS', turn the small **FMS** Knob to select 'BARO' or 'TEMP COMP', and press the **ENT** Key. Turn the small **FMS** Knob to select the altitude, and press the **ENT** Key.

b) If 'TEMP COMP' was selected, the cursor moves to the temperature field. Turn the small **FMS** Knob to select the temperature, and press the **ENT** Key.

Or:

To skip setting minimums, press the **ENT** Key.

6) Press the **ENT** Key with 'LOAD?' highlighted to load the approach procedure; or turn the large **FMS** Knob to highlight 'ACTIVATE' and press the **ENT** Key to load and activate the approach procedure.

NOTE: *When GPS is not approved for the selected final approach course, the message 'NOT APPROVED FOR GPS' is displayed. GPS provides guidance to the approach, but the HSI must to be switched to a NAV receiver to fly the final course of the approach.*

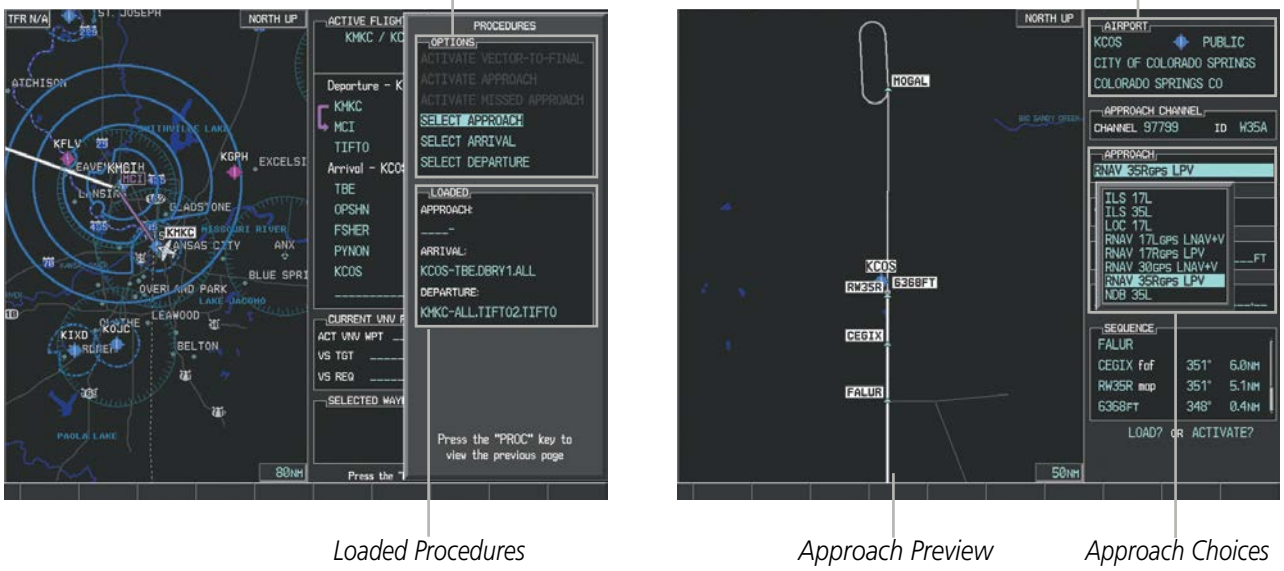


Figure 5-111 Approach Selection



Figure 5-112 Approach Loading

Viewing available approaches at an airport:

1) From the Airport Information Page (first page in the WPT group), press the **APR** Softkey. The Approach Information Page is displayed, defaulting to the airport displayed on the Airport information Page.
2) To select another airport, press the **FMS** Knob to activate the cursor, enter an identifier/facility name/city, and press the **ENT** Key.
3) Press the **FMS** Knob, then turn the large **FMS** Knob to highlight the Approach. The approach is previewed on the map.
4) Turn the small **FMS** Knob to view the available approaches. Press the **ENT** Key to select the approach. The cursor moves to the Transition box. The approach is previewed on the map.
5) Turn the small **FMS** Knob to view the available transitions. Press the **ENT** Key to select the transition. The cursor moves to the Minimums box. The approach is previewed on the map.
6) Turn the small **FMS** Knob to select minimums on or off. Press the **ENT** Key.
   a) When minimums are selected on, the cursor moves to the minimum altitude field . Use the small **FMS** Knob to select the altitude. Press the **ENT** Key.
   b) If temperature compensated minimums was selected, the cursor moves to the temperature field. Use the small **FMS** Knob to select the temperature. Press the **ENT** Key. The cursor moves to the Sequence box. The approach is previewed on the map.

      Or:

      When minimums are selected off, the cursor moves to the Sequence box. The approach is previewed on the map.
7) Press the **INFO-1** or the **INFO-2** Softkey to return to the Airport Information Page.

Loading an approach into the active flight plan from the Nearest Airport Page:

1) Select the Nearest Airports Page.
2) Press the **FMS** Knob, then turn the large **FMS** Knob to highlight the desired nearest airport. The airport is previewed on the map.
3) Press the **APR** Softkey; or press the **MENU** Key, highlight 'Select Approach Window', and press the **ENT** Key.
4) Turn the **FMS** Knob to highlight the desired approach.
5) Press the **LD APR** Softkey; or press the **MENU** Key, highlight 'Load Approach', and press the **ENT** Key. The Approach Loading Page is displayed with the transitions field highlighted.
6) Turn the **FMS** Knob to highlight the desired transition, and press the **ENT** Key.
7) Minimums
   a) To set 'MINIMUMS', turn the small **FMS** Knob to select 'BARO' or 'TEMP COMP', and press the **ENT** Key. Turn the small **FMS** Knob to select the altitude, and press the **ENT** Key.
   b) If 'TEMP COMP' was selected, the cursor moves to the temperature field. Turn the small **FMS** Knob to select the temperature, and press the **ENT** Key.

      Or:

      To skip setting minimums, press the **ENT** Key. The 'LOAD?' field is highlighted.

8) Press the **ENT** Key with 'LOAD?' highlighted to load the approach procedure; or turn the large **FMS** Knob to highlight 'ACTIVATE' and press the **ENT** Key to load and activate the approach procedure. The system continues navigating the current flight plan until the approach is activated. When GPS is not approved for the selected final approach course, the message 'NOT APPROVED FOR GPS' is displayed. GPS provides guidance to the approach, but the HSI must to be switched to a NAV receiver to fly the final course of the approach.

ACTIVATING AN APPROACH

A previously loaded approach can be activated from the Procedures Window.

Activating a previously loaded approach:

1) Press the **PROC** Key. The Procedures Window is displayed with 'Activate Approach' highlighted.
2) Press the **ENT** Key to activate the approach.

In many cases, it may be easiest to "load" the full approach while still some distance away, enroute to the destination airport. Later, if vectored to final, use the steps above to select 'Activate Vector-To-Final' — which makes the inbound course to the FAF waypoint active.

Activating a previously loaded approach with vectors to final:

1) Press the **PROC** Key to display the Procedures Window.
2) Highlight 'ACTIVATE VECTOR-TO-FINAL' and press the **ENT** Key.

Loading and activating an approach using the MENU Key:

1) From the Approach Loading Page, press the **MENU** Key. The page menu is displayed with 'Load & Activate Approach' highlighted.
2) Press the **ENT** Key. When GPS is not approved for the selected final approach course, the message 'NOT APPROVED FOR GPS' is displayed. GPS provides guidance to the approach, but the HSI must to be switched to a NAV receiver to fly the final course of the approach.

REMOVING AN APPROACH FROM THE ACTIVE FLIGHT PLAN

When plans change while flying IFR, approaches can be easily removed from the Active Flight Plan.

Removing an approach from the active flight plan:

1) Press the **FPL** Key to display the Active Flight Plan Page (MFD) or the Active Flight Plan Window (PFD).
2) Press the **MENU** Key, and highlight 'Remove Approach'.
3) Press the **ENT** Key. A confirmation window is displayed listing the approach procedure.
4) With 'OK' highlighted, press the **ENT** Key. To cancel the removal, highlight 'CANCEL' and press the **ENT** Key.

Or:

1) Press the **FPL** Key to display the Active Flight Plan Page (MFD) or the Active Flight Plan Window (PFD).
2) Press the **FMS** Knob, and turn to highlight the approach header in the active flight plan.
3) Press the **CLR** Key. A confirmation window is displayed listing the approach procedure.
4) With 'OK' highlighted, press the **ENT** Key. To cancel the removal, highlight 'CANCEL' and press the **ENT** Key.
5) Press the **FMS** Knob to remove the flashing cursor.

MISSED APPROACH

Activating a missed approach in the active flight plan:

1) Press the **PROC** Key.
2) Turn the **FMS** Knob to highlight 'ACTIVATE MISSED APPROACH'.
3) Press the **ENT** Key. The aircraft automatically sequences to the MAHP.

   Or:

   Press the Go-Around Button.

In this missed approach procedure, the altitude immediately following the MAP (in this case '6368FT') is not part of the published procedure. It is simply a Course to Altitude (CA) leg which guides the aircraft along the runway centerline until the altitude required to safely make the first turn toward the MAHP is exceeded. This altitude is provided by Jeppesen, and may be below, equal to, or above the published minimums for this approach. In this case, if the aircraft altitude is below the specified altitude (6,368 feet) after crossing the MAP, a direct-to is established to provide a course on runway heading until an altitude of 6,368 feet is reached. After reaching 6,368 feet, a direct-to is established to the published MAHP (in this case MOGAL). If the aircraft altitude is above the specified altitude after crossing the MAP, a direct-to is established to the published fix (MOGAL) to begin the missed approach procedure.

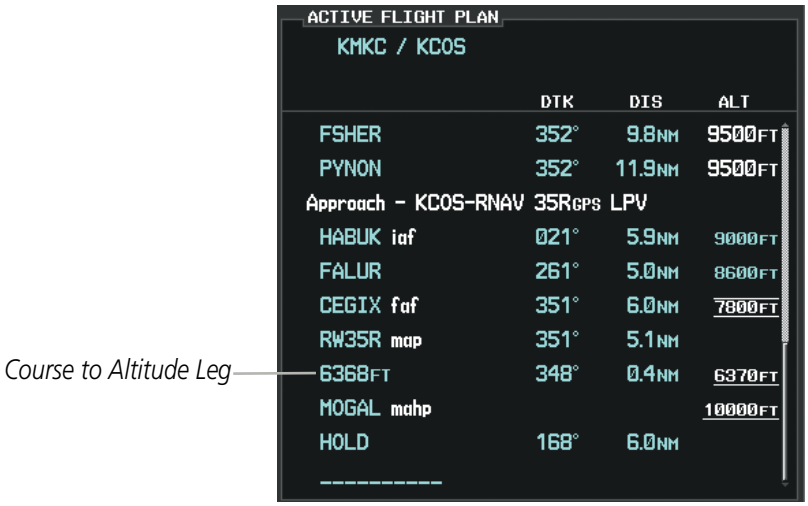


Figure 5-113 Course to Altitude

In some missed approach procedures this Course to Altitude leg may be part of the published procedure. For example, a procedure may dictate a climb to 5,500 feet, then turn left and proceed to the Missed Approach Hold Point (MAHP). In this case, the altitude would appear in the list of waypoints as '5500FT'. Again, if the aircraft altitude is lower than the prescribed altitude, a direct-to is established on a Course to Altitude leg when the missed approach procedure is activated.

TEMPERATURE COMPENSATED ALTITUDE

If desired, the system can compensate the loaded approach altitudes based on a pilot-supplied temperature at the destination. For example, if the pilot enters a destination temperature of -40° C, the system increases the approach altitudes accordingly. A temperature compensated altitude is displayed in slanted text.

Activating temperature compensated altitude:

1) From the Active Flight Plan Page, press the **MENU** Key. The Page Menu is displayed.
2) Turn the **FMS** Knob to highlight 'Temperature Compensation'.
3) Press the **ENT** Key. The TEMPERATURE COMPENSATION Window is displayed.
4) Use the small **FMS** Knob to select the temperature at the <airport>. The compensated altitude is computed as the temperature is selected.

NOTE: *The temperature at the destination can be entered in the TEMPERATURE COMPENSATION Window on the MFD, or in the REFERENCES Window on the PFD. There is only one compensation temperature for the system, therefore, changing the temperature will affect both the loaded approach altitudes and the minimums. Refer to the Flight Instruments section for information about applying temperature compensation to the MDA/DH.*

5) Press the **ENT** Key. 'ACTIVATE COMPENSATION?' is highlighted.
6) Press the **ENT** Key. The compensated altitudes for the approach are shown in the flight plan.

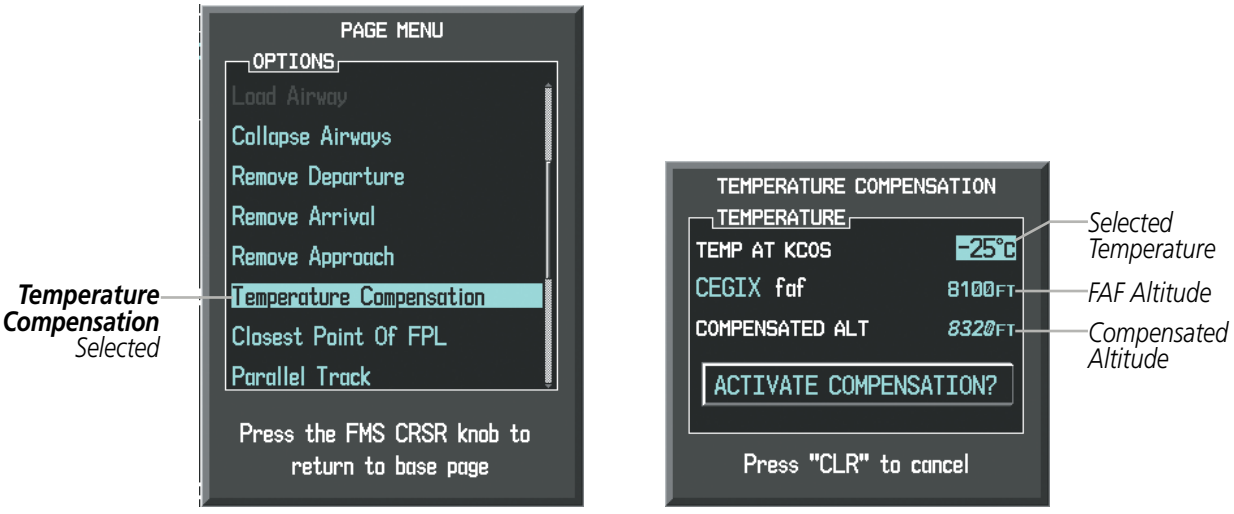


Figure 5-114 Temperature Compensation

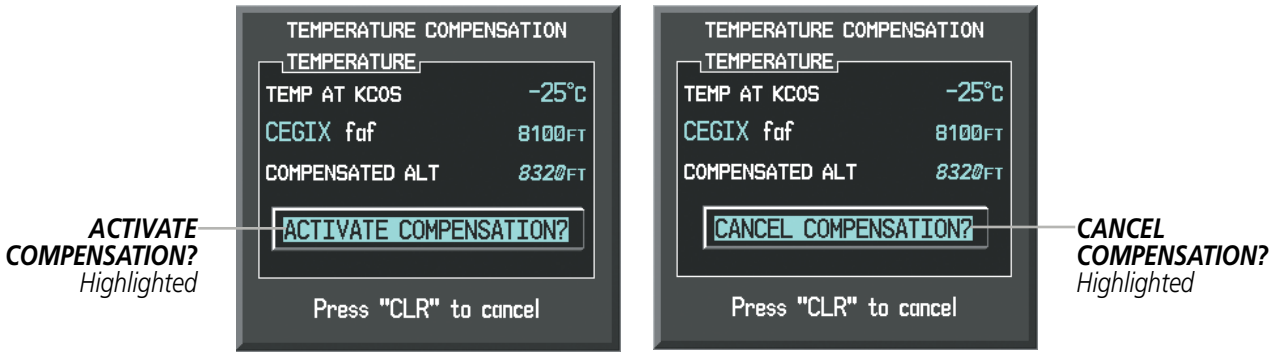


Figure 5-115 Activating/Cancelling Temperature Compensation

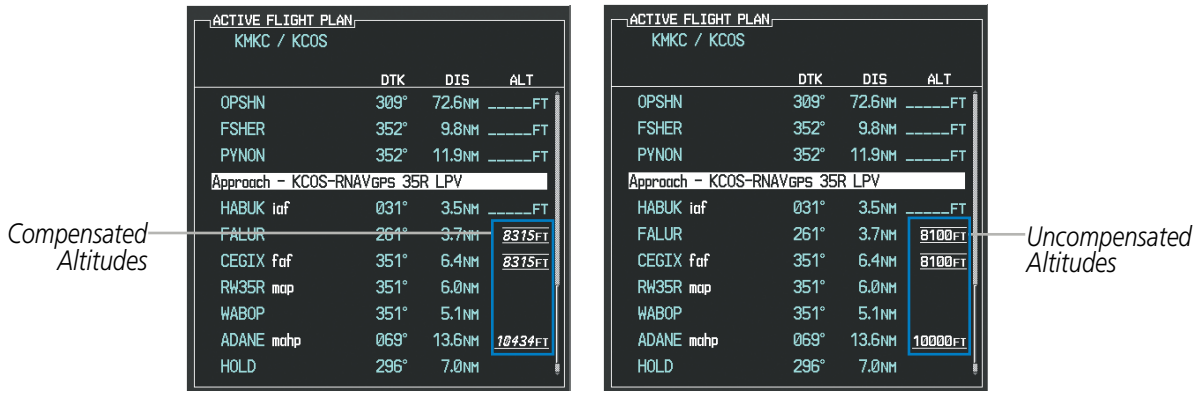


Figure 5-116 Temperature Compensation in the Active Flight Plan

Cancelling temperature compensated altitude:

1) From the Active Flight Plan Page, press the **MENU** Key. The Page Menu is displayed.
2) Turn the **FMS** Knob to highlight 'Temperature Compensation'.
3) Press the **ENT** Key. The TEMPERATURE COMPENSATION Window is displayed.
4) Press the **ENT** Key. 'CANCEL COMPENSATION?' is highlighted.
5) Press the **ENT** Key. The temperature compensated altitude at the FAF is cancelled.

NOTE: *Activating/cancelling temperature compensation for the loaded approach altitudes does not select/deselect temperature compensated minimums (MDA/DH), nor does selecting/deselecting temperature compensated minimums activate/cancel temperature compensated approach altitudes.*

5.9 TRIP PLANNING

The G900X allows the pilot to view trip planning information, fuel information, and other information for a specified flight plan or flight plan leg based on automatic data, or based on manually entered data. Weight planning is also available, based on fuel data and the active flight plan (to estimate remaining fuel).

TRIP PLANNING

All of the input of data needed for calculation and viewing of the statistics is done on the Trip Planning Page located in the AUX Page Group.

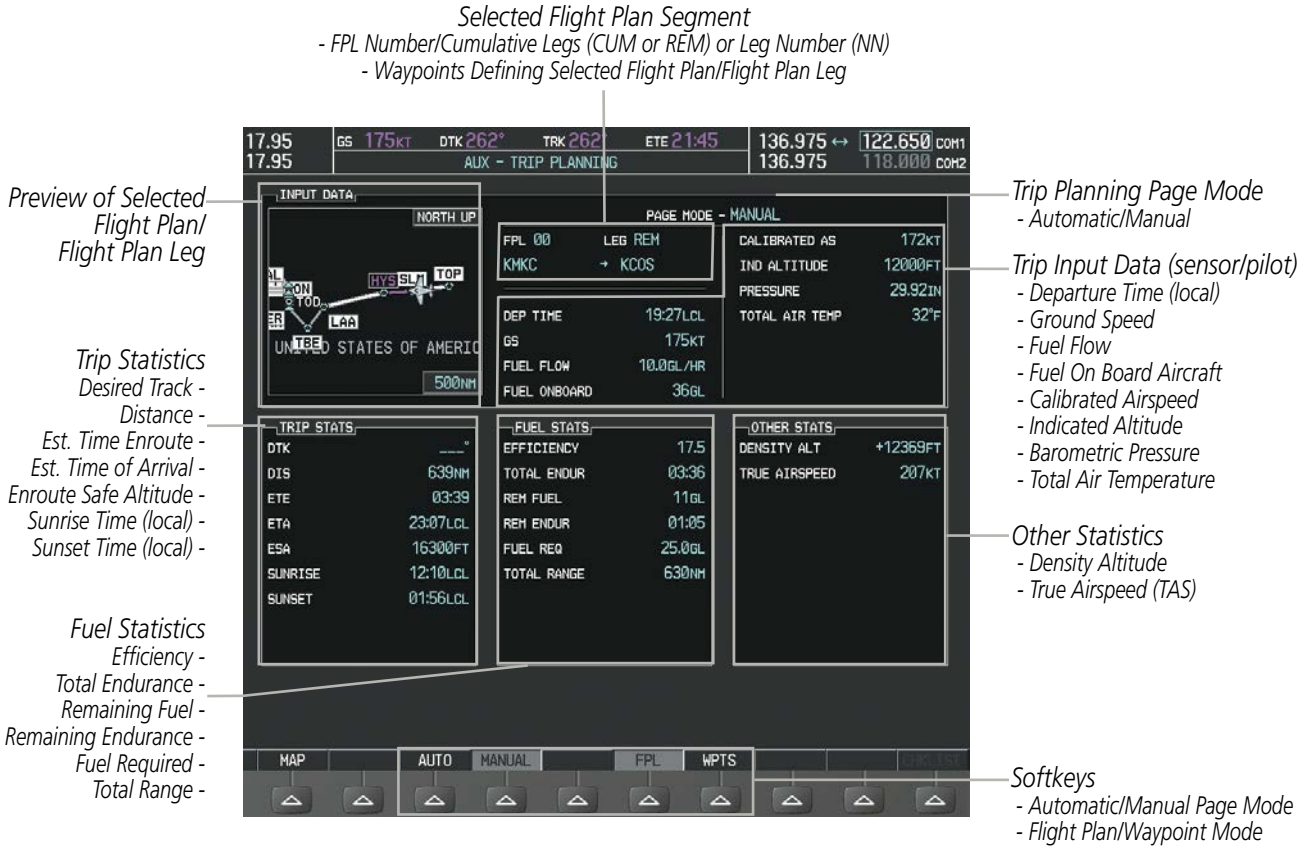


Figure 5-117 Trip Planning Page

The trip planning inputs are based on sensor inputs (automatic page mode) or on pilot inputs (manual page mode). Some additional explanation of the sources for some of the inputs is as follows:

- Departure time (DEP TIME) - This defaults to the current time in automatic page mode. The computations are from the aircraft present position, so the aircraft is always just departing.
- Calibrated airspeed (CALIBRATED AS) - The primary source is from the air data system, and the secondary source of information is GPS ground speed.
- Indicated altitude (IND ALTITUDE) - The primary source is the barometric altitude, and the secondary source of information is GPS altitude.

TRIP STATISTICS

The trip statistics are calculated based on the selected starting and ending waypoints and the trip planning inputs.

In flight plan mode (FPL) with a stored flight plan selected (NN), and the entire flight plan (CUM) selected, the waypoints are the starting and ending waypoints of the selected flight plan.

In flight plan mode (FPL) with a stored flight plan selected (NN), and a specific leg (NN) selected, the waypoints are the endpoints of the selected leg.

In flight plan mode (FPL) with the active flight plan selected (00), and the remaining flight plan (REM) selected, the 'from' waypoint is the present position of the aircraft and the 'to' waypoint is the endpoint of the active flight plan.

In flight plan mode (FPL) with the active flight plan selected (00), and a specific leg (NN) selected, the 'from' waypoint is the current aircraft position and the 'to' waypoint is the endpoint of the selected leg.

In waypoint (WPTS) mode these are manually selected waypoints (if there is an active flight plan, these default to the endpoints of the active leg).

Some of the calculated trip statistics are dashed when the selected leg of the active flight plan has already been flown.

- Desired Track (DTK) - DTK is shown as nnn° and is the desired track between the selected waypoints. It is dashed unless only a single leg is selected.
- Distance (DIS) - The distance is shown in tenths of units up to 99.9, and in whole units up to 9999.
- Estimated time enroute (ETE) - ETE is shown as hours:minutes until less than an hour, then it is shown as minutes:seconds.
- Estimated time of arrival (ETA) - ETA is shown as hours:minutes and is the local time at the destination.
  - If in waypoint mode then the ETA is the ETE added to the departure time.
  - If a flight plan other than the active flight plan is selected it shows the ETA by adding to the departure time all of the ETEs of the legs up to the selected leg. If the entire flight plan is selected, then the ETA is calculated as if the last leg of the flight plan was selected.
  - If the active flight plan is selected the ETA reflects the current position of the aircraft and the current leg being flown. The ETA is calculated by adding to the current time the ETEs of the current leg up to the selected leg. If the entire flight plan is selected, then the ETA is calculated as if the last leg of the flight plan was selected.
- Enroute safe altitude (ESA) - The ESA is shown as nnnnnFT
- Destination sunrise and sunset times (SUNRISE, SUNSET) - These times are shown as hours:minutes and are the local time at the destination.

FUEL STATISTICS

The fuel statistics are calculated based on the selected starting and ending waypoints and the trip planning inputs. Some of the calculated trip statistics are dashed when the selected leg of the active flight plan has already been flown.

- Fuel efficiency (EFFICIENCY) - This value is calculated by dividing the current ground speed by the current fuel flow.
- Time of fuel endurance (TOTAL ENDUR) - This time is shown as hours:minutes. This value is obtained by dividing the amount of fuel on board by the current fuel flow.
- Fuel on board upon reaching end of selected leg (REM FUEL) - This value is calculated by taking the amount of fuel onboard and subtracting the fuel required to reach the end of the selected leg.
- Fuel endurance remaining at end of selected leg (REM ENDUR) - This value is calculated by taking the time of fuel endurance and subtracting the estimated time enroute to the end of the selected leg.
- Fuel required for trip (FUEL REQ) - This value is calculated by multiplying the time to go by the fuel flow.
- Total range at entered fuel flow (TOTAL RANGE) - This value is calculated by multiplying the time of fuel endurance by the ground speed.

OTHER STATISTICS

These statistics are calculated based on the system sensor inputs or the manual trip planning inputs.

- Density altitude (DENSITY ALT)
- True airspeed (TRUE AIRSPEED)

The pilot may select automatic (AUTO) or manual (MANUAL) page mode, and flight plan (FPL) or waypoint (WPTS) mode. In automatic page mode, only the FPL, LEG, or waypoint IDs are editable (based on FPL/WPTS selection).

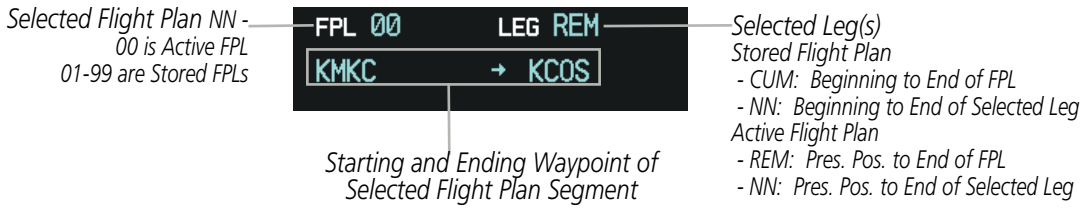


Figure 5-118 Trip Planning Page - Flight Plan Mode

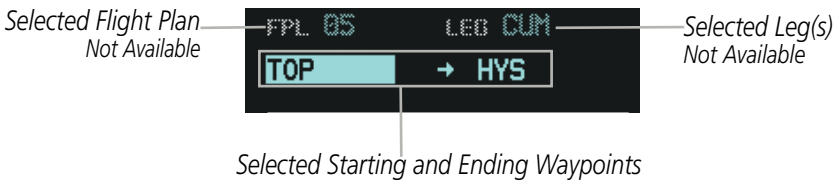


Figure 5-119 Trip Planning Page - Waypoint Mode

Selecting automatic or manual page mode:

Press the **AUTO** Softkey or the **MANUAL** Softkey; or press the **MENU** Key, highlight 'Auto Mode' or 'Manual Mode', and press the **ENT** Key.

Selecting flight plan or waypoint mode:

Press the **FPL** Softkey or the **WPTS** Softkey; or press the **MENU** Key, highlight 'Flight Plan Mode' or 'Waypoints Mode', and press the **ENT** Key.

Selecting a flight plan and leg for trip statistics:

1) Press the **FMS** Knob to activate the cursor in the flight plan number field.
2) Turn the small **FMS** Knob to select the desired flight plan number.
3) Turn the large **FMS** Knob to highlight 'CUM' or 'REM'. The statistics for each leg can be viewed by turning the small **FMS** Knob to select the desired leg. The Inset Map also displays the selected data.

Selecting waypoints for waypoint mode:

1) Press the **WPTS** Softkey; or press the **MENU** Key, highlight 'Waypoints Mode', and press the **ENT** Key. The cursor is positioned in the waypoint field directly below the FPL field.
2) Turn the **FMS** knobs to select the desired waypoint (or select from the Page Menu 'Set WPT to Present Position' if that is what is desired), and press the **ENT** Key. The cursor moves to the second waypoint field.
3) Turn the **FMS** knobs to select the desired waypoint, and press the **ENT** Key. The statistics for the selected leg are displayed.

In manual page mode, the other eight trip input data fields must be entered by the pilot, in addition to flight plan and leg selection.

Entering manual data for trip statistics calculations:

1) Press the **MANUAL** Softkey or select 'Manual Mode' from the Page Menu, and press the **ENT** Key. The cursor may now be positioned in any field in the top right two boxes.
2) Turn the **FMS** Knobs to move the cursor onto the DEP TIME field and enter the desired value. Press the **ENT** Key. The statistics are calculated using the new value and the cursor moves to the next entry field. Repeat until all desired values have been entered.

5.10 RAIM PREDICTION

RAIM (Receiver Autonomous Integrity Monitoring) is a GPS receiver function that performs a consistency check on all tracked satellites. RAIM ensures that the available satellite geometry allows the receiver to calculate a position within a specified RAIM protection limit (2.0 nm for oceanic, 2.0 nm for enroute, 1.0 nm for terminal, and 0.3 nm for non-precision approaches). During oceanic, enroute, and terminal phases of flight, RAIM is available nearly 100% of the time. The RAIM prediction function also indicates whether RAIM is available at a specified date and time. RAIM computations predict satellite coverage within ±15 min of the specified arrival date and time. Because of the tighter protection limit on approaches, there may be times when RAIM is not available. RAIM prediction must be initiated manually if there is concern over SBAS coverage at the destination or some other reason that compromises navigation precision. If RAIM is not predicted to be available for the final approach course, the approach does not become active. If RAIM is not available when crossing the FAF, the missed approach procedure must be flown.

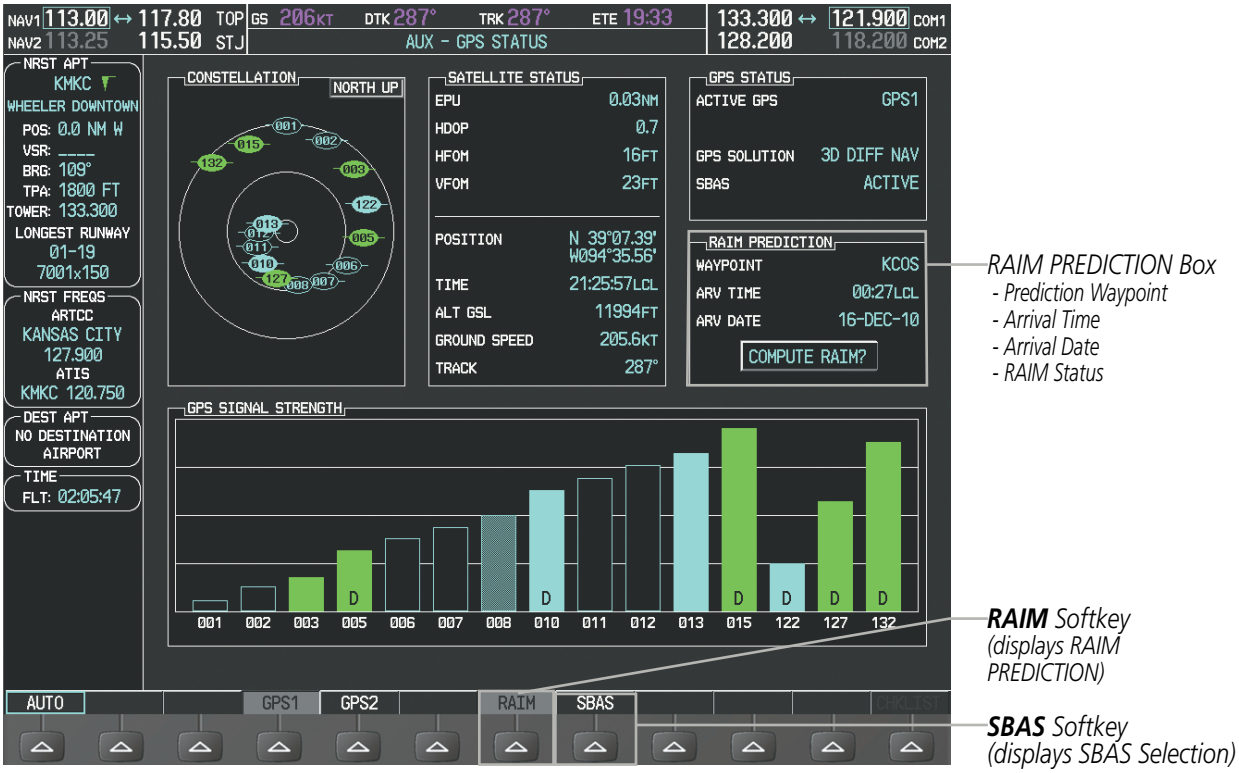


Figure 5-120 RAIM Prediction

Predicting RAIM availability at a selected waypoint:

1) Select the AUX-GPS Status Page.
2) Press the **FMS** Knob. The RAIM Prediction 'WAYPOINT' field is highlighted.
3) Turn the small **FMS** Knob to display the Waypoint Information Window. (Turning it clockwise displays a blank Waypoint Information Window, turning it counter-clockwise displays the Waypoint Information Window with a waypoint selection submenu allowing selection of active flight plan, nearest, recent, user, or airway waypoints).
4) Enter the identifier, facility, or city name of the departure waypoint; or select a waypoint from the submenu of waypoints and press the **ENT** Key to accept the waypoint entry.
5) Turn the FMS Knobs to enter an arrival time and press the **ENT** Key.
6) Turn the FMS Knobs to enter an arrival date and press the **ENT** Key.
7) Press the **ENT** Key with 'COMPUTE RAIM?' highlighted to begin the computation.

Predicting RAIM availability at the aircraft present position:

1) Select the AUX-GPS Status Page.
2) Press the **FMS** Knob. The RAIM Prediction 'WAYPOINT' field is highlighted.
3) Press the **MENU** Key, highlight 'Set WPT to Present Position', and press the **ENT** Key.
4) Press the **ENT** Key to accept the waypoint entry.
5) Turn the FMS Knobs to enter an arrival time and press the **ENT** Key.
6) Turn the FMS Knobs to enter an arrival date and press the **ENT** Key.
7) Press the **ENT** Key with 'COMPUTE RAIM?' highlighted to begin the computation.

Status of the RAIM computation for the selected waypoint, time, and date is displayed at the bottom of the RAIM PREDICTION Box as follows:

- 'COMPUTE RAIM?' - RAIM has not been computed.
- 'COMPUTING AVAILABILITY' - RAIM calculation is in progress.
- 'RAIM AVAILABLE' - RAIM is predicted to be available.
- 'RAIM NOT AVAILABLE' - RAIM is predicted to be unavailable.

The Satellite Based Augmentation System (SBAS) provides increased navigation accuracy when available. SBAS can be enabled or disabled manually on the GPS Status Page.

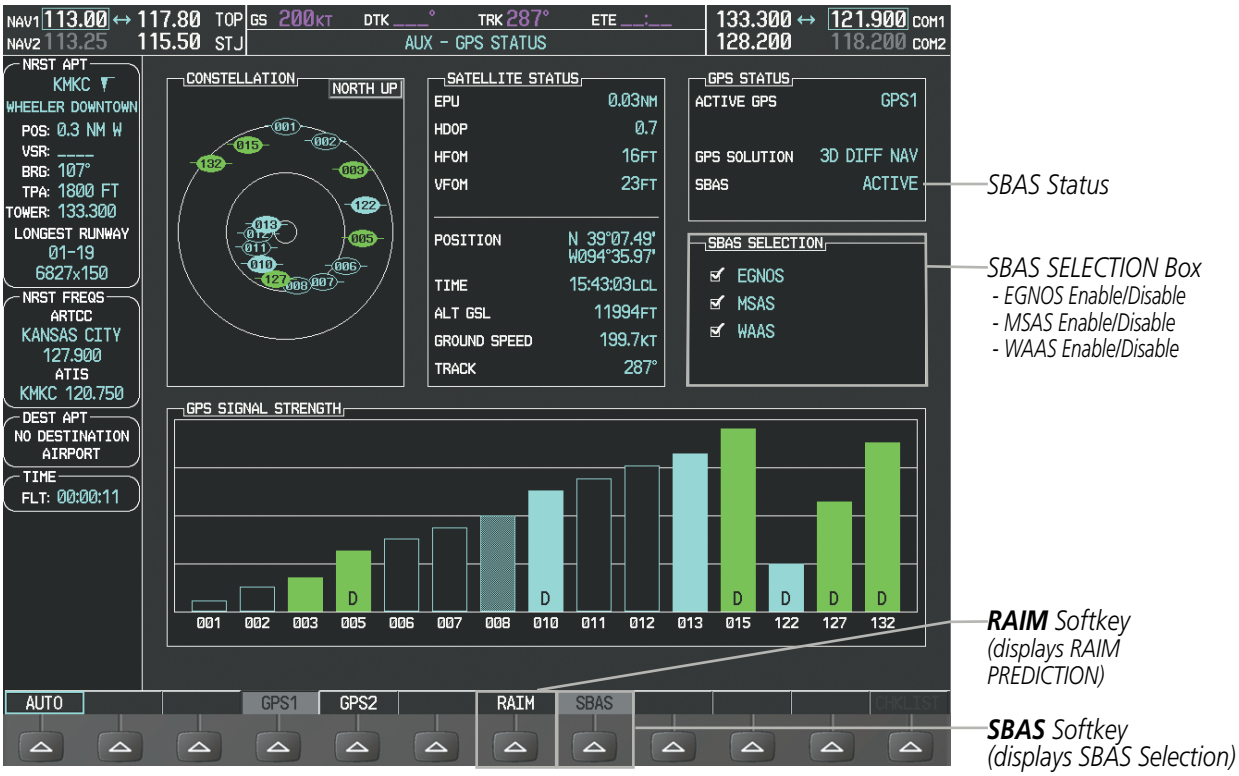


Figure 5-121 SBAS Display - Active

Enabling/Disabling SBAS:

1) Select the AUX-GPS Status Page.
2) Press the **SBAS** softkey.
3) Press the **FMS** Knob, and turn the large FMS Knob to highlight 'EGNOS', 'MSAS' or 'WAAS'.
4) Press the **ENT** Key to disable SBAS. Press the **ENT** Key again to enable SBAS.

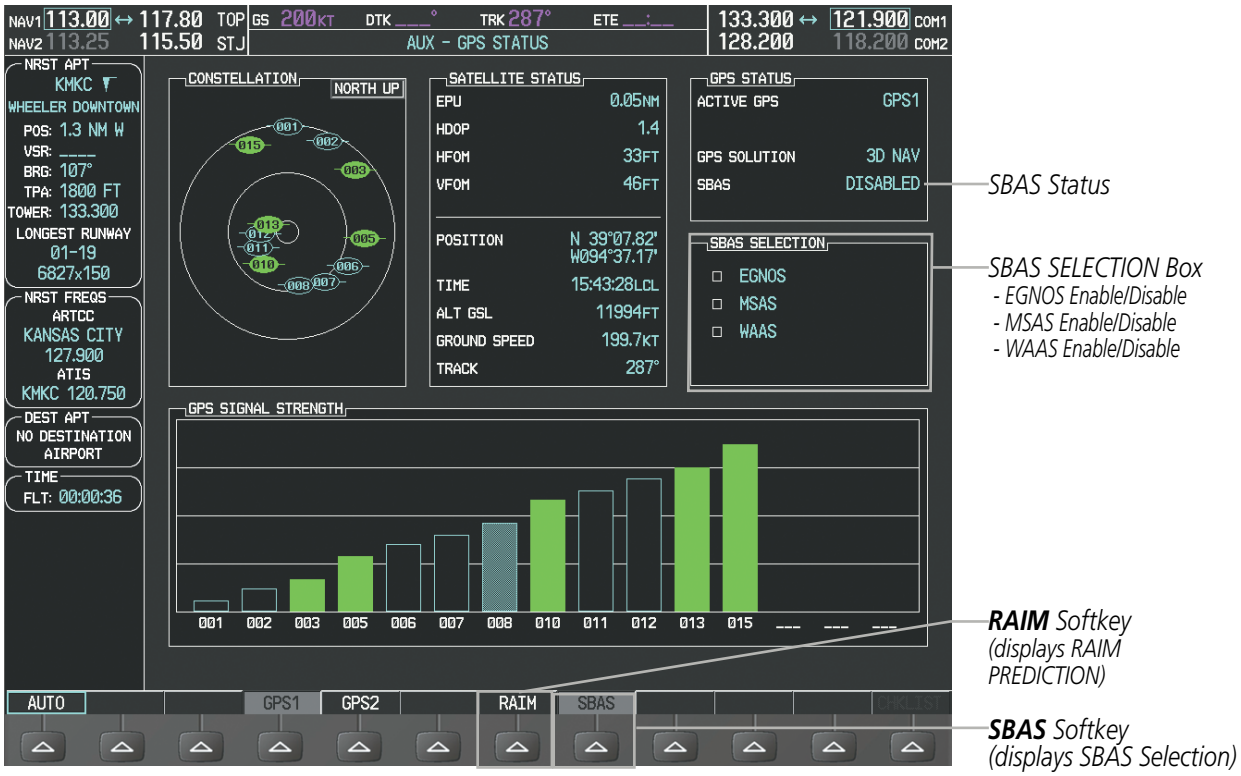


Figure 5-122 SBAS Display - Inactive

5.11 NAVIGATING A FLIGHT PLAN

The following discussion is an example of navigating a flight plan with the SBAS capable GPS system while the G900X provides vertical guidance through descents. A lateral flight plan (LNAV) would be navigated in much the same way, but would not include vertical guidance when the final approach course is active.

NOTE: *The following example flight plan is for instructional purposes only. All database information depicted should be considered not current.*

The example is a flight plan from KMKC to KCOS filed using the TIFTO2 departure, various Victor Airways, and the DBRY1 arrival with the transition at TBE. The flight plan includes an enroute altitude of 12,000 feet, an LPV (WAAS) approach selected for runway 35R, and a missed approach executed at the Missed Approach Point (MAP). A few enroute changes are demonstrated.

1) Prior to departure, the TIFTO2 departure, the airways, and the DBRY1 arrival at KCOS are loaded. See the Procedures section for loading departures and arrivals. Note the magenta arrow in Figure 5-123 indicating the active departure leg.

After takeoff, ATC assigns a heading of 240°.

2) Figure 5-123 shows the aircraft on the assigned heading of 240°. 'TERM' (Terminal) is the current CDI flight phase displayed on the HSI indicating 1.0 nm CDI scaling.



Figure 5-123 Assigned Heading of 240°

3) ATC now assigns routing to join V4. A heading of 290° is assigned to intercept V4. The aircraft turns to heading 290° as seen in Figure 5-124.

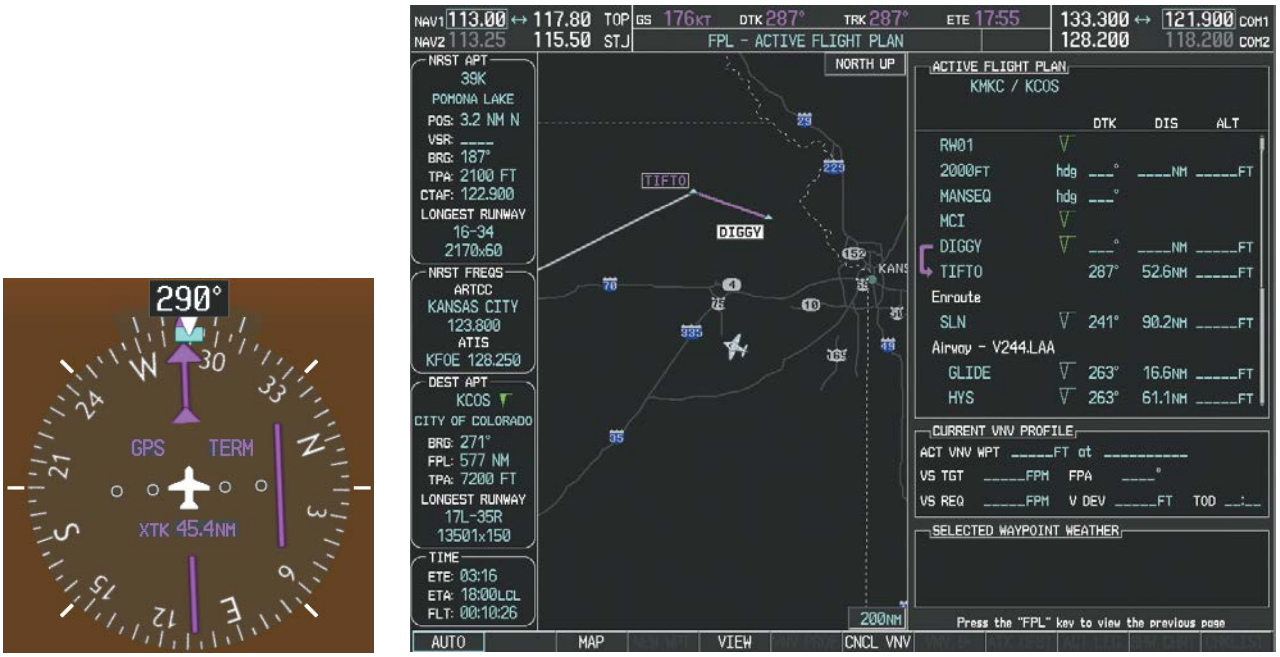


Figure 5-124 Assigned Heading of 290°

4) Enter V4 into the flight plan.

a) Press the **FMS** Knob to activate the cursor.

b) The desired entry point for V4 (TOP) must be entered. Turn the large **FMS** Knob to highlight the desired flight plan insertion point (SLN) as shown in Figure 5-125. When the V4 entry point (TOP) is inserted, it is placed immediately above the highlighted waypoint (SLN).

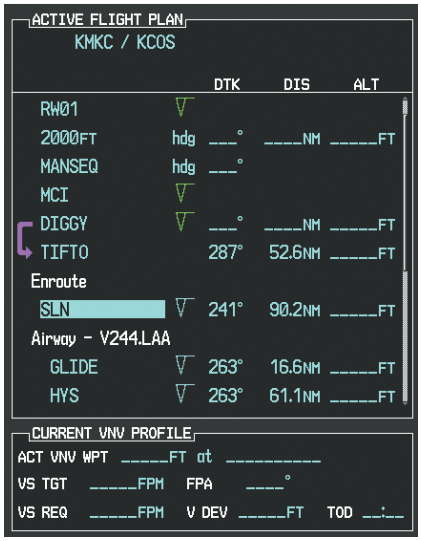


Figure 5-125 Begin Adding V4 to the Flight Plan

c) Turn the small **FMS** Knob to display the Waypoint Information Window. Enter the desired entry point for V4, Topeka VOR (TOP), as shown in Figure 5-126.

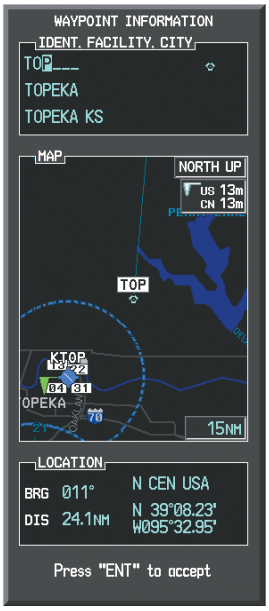


Figure 5-126 Entering V4 Entry Point

d) Press the **ENT** Key. TOP is inserted into the flight plan as in Figure 5-127.

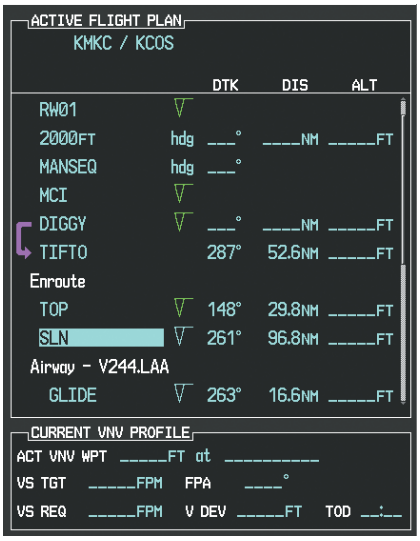


Figure 5-127 TOP Inserted into the Flight Plan

e) With SLN still highlighted as in Figure 5-127, turn the small **FMS** Knob clockwise. The Waypoint Information Page is displayed and the **LD AIRWY** Softkey is now available.

f) Press the **LD AIRWY** Softkey to display the list of available airways for TOP as seen in Figure 5-128.

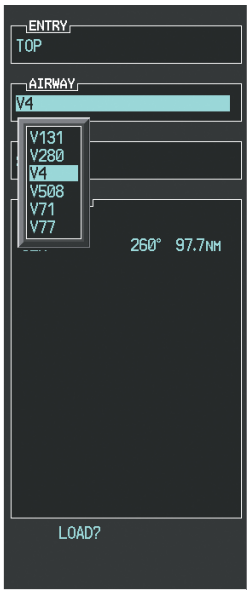


Figure 5-128 List of Available Airways for TOP

g) Turn either **FMS** Knob to highlight V4 in the list as seen in Figure 5-128.

h) Press the **ENT** Key. The list of available exits for V4 is now displayed as in Figure 5-129.

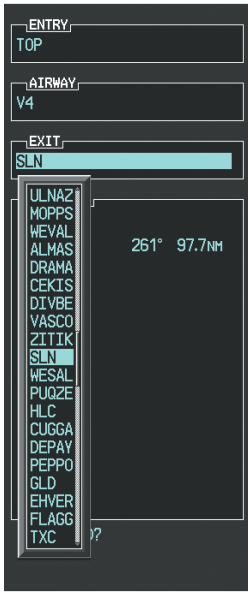


Figure 5-129 List of Available Exits for V4

i) If necessary, turn either **FMS** Knob to select the desired exit. In this case Salina VOR (SLN) is selected as in Figure 5-129.

j) Press the **ENT** Key. The selected airway and exit are displayed, and the prompt "LOAD?" highlighted as in Figure 5-130.

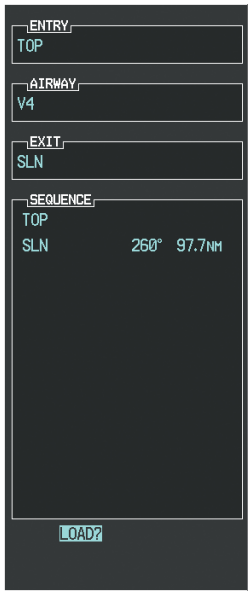


Figure 5-130 Ready to Load V4

k) Press the **ENT** Key.

l) V4 is now loaded into the flight plan as shown in Figure 5-131.



Figure 5-131 V4 is Loaded in the Flight Plan

5) Making V4 the active leg of the flight plan.

a) Press the **FMS** Knob to activate the cursor.

b) Turn the large **FMS** Knob to highlight SLN. The TO waypoint of the leg is selected in order to activate the leg.

c) Press the **ACT LEG** Softkey. The confirmation window is now displayed as in Figure 5-132. Note the TOP to SLN leg is actually part of V4.



Figure 5-132 Comfirm Active Leg

d) Verify the displayed leg is the desired leg and press the **ENT** Key. Note in Figure 5-133, the magenta arrow in the flight plan window and magenta line on the map indicating V4 is now the active flight plan leg. Note the phase of flight remained in Terminal (TERM) mode up to this point because a departure leg was active. Since a leg after the departure is now active, the current CDI flight phase is ENR (Enroute) and CDI scaling has changed to 2.0 nm.



Figure 5-133 V4 Now Active Leg

6) The aircraft continues on heading 290°. When crosstrack distance is less than 2.0 nm, the XTK disappears from the HSI and the CDI is positioned on the last dot indicating a 2.0 nm distance from the centerline of the next course.

7) As the CDI approaches center, the aircraft turns onto the active leg as seen in Figure 5-134.

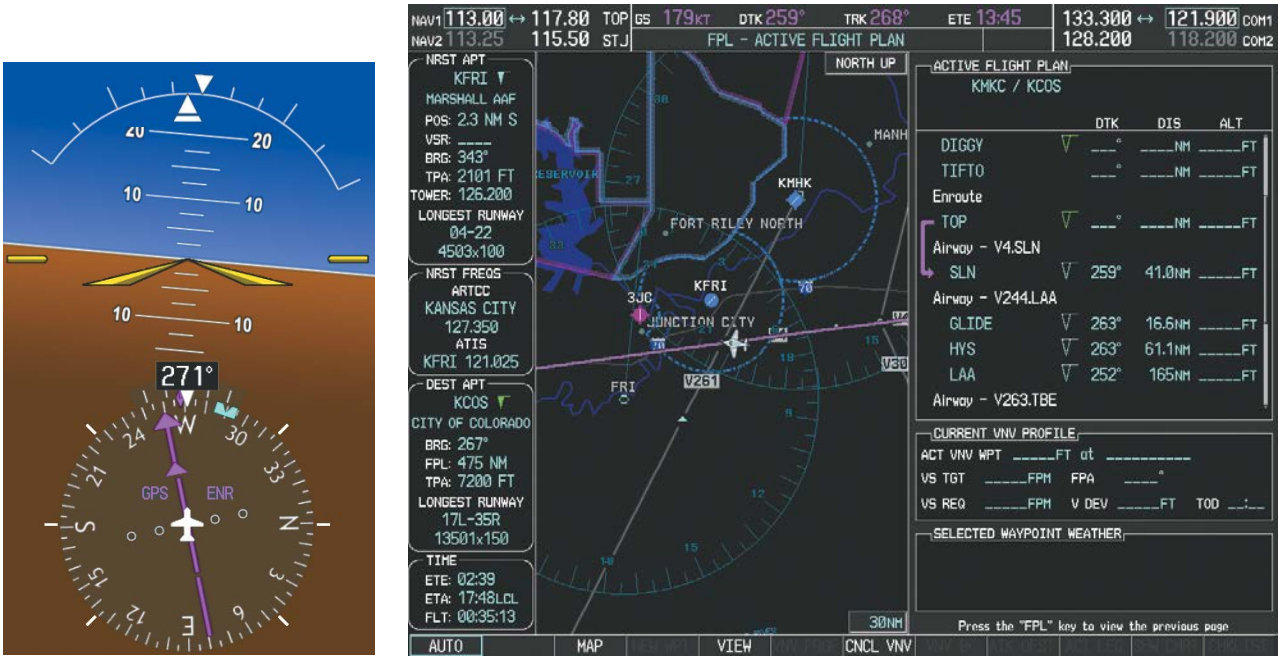


Figure 5-134 Turn on to Active Leg

8) At SLN, Victor Airway 244 (V244) is intercepted. Turn prompts are displayed in the PFD Navigation Status Box as seen in Figure 5-135.

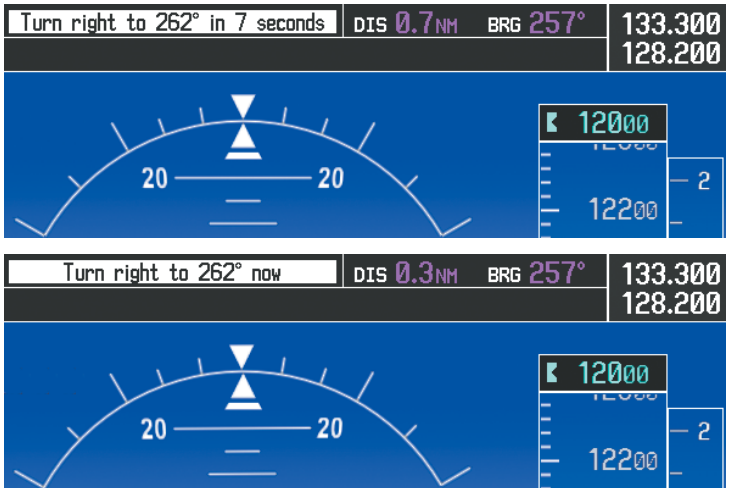


Figure 5-135 Turn to Intercept V244

9) As seen in Figure 5-136, V244 is now the active flight plan leg.

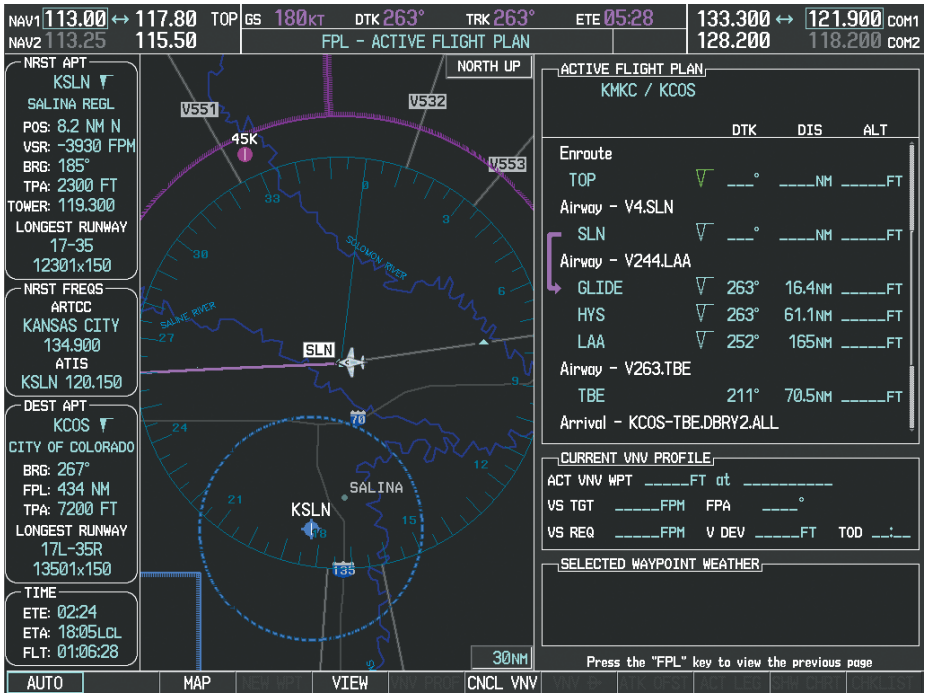


Figure 5-136 V244 Now Active Leg

10) At Lamar VOR (LAA) V263 is intercepted. See Figure 5-137.



Figure 5-137 HYS to LAA Leg Active

11) ATC grants clearance to proceed direct to the OPSHN intersection to begin the arrival procedure. ATC advises to expect an altitude of 10,000 feet at OPSHN.

a) Press the **FMS** Knob to activate the cursor.

b) Turn the large **FMS** Knob to select OPSHN in the flight plan list.

c) Press the **Direct-to (D▸)** Key. The Direct-to Window is now displayed as shown in Figure 5-138.

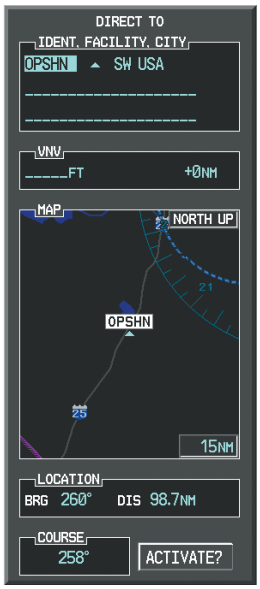


Figure 5-138 Direct To OPSHN

d) Turn the large **FMS** Knob to place the cursor in the VNV altitude field as shown in Figure 5-139.



Figure 5-139 Enter VNV Altitude

e) An altitude of 10,000 feet is entered as requested by ATC.

f) Press the **ENT** Key. The cursor is now displayed in the VNV offset field as shown in Figure 5-140.



Figure 5-140 Enter VNV Offset Distance

g) Enter the offset, or distance from the waypoint at which to reach the selected altitude. In this case, three miles prior to OPSHN is entered. In other words, the G900X gives vertical guidance so the aircraft arrives at an altitude of 10,000 feet three miles prior to OPSHN.

h) Press the **ENT** Key twice to activate the direct-to. Note, in Figure 5-141, the magenta arrow indicating the direct-to OPSHN after the offset waypoint for OPSHN. The preceding offset waypoint indicates the offset distance and altitude that were previously entered. The remaining waypoints in the loaded arrival procedure have no database specified altitudes, therefore, dashes are displayed. Keep the CDI centered and maintain a track along the magenta line to OPSHN.

Note the Direct-to waypoint is within the loaded arrival procedure, therefore, phase of flight scaling for the CDI changes to Terminal Mode and is annunciated by displaying 'TERM' on the HSI.

NOTE: *If the loaded arrival procedure has waypoints with altitude constraints retrieved from the database that will be used as is, the altitude must be manually accepted by placing the cursor over the desired altitude, then pressing the ENT Key. The altitude is now displayed as cyan meaning it will be used by the system to determine vertical speed and deviation guidance.*



Figure 5-141 Direct-to Active

12) The aircraft is proceeding to OPSHN. The expected approach is the RNAV LPV approach to runway 35R, so it is selected.

a) Press the **PROC** Key to display the Procedures Window.

b) 'SELECT APPROACH' should be highlighted as shown in Figure 5-142.



Figure 5-142 Procedures Window

c) Press the **ENT** Key. A list of available approaches for the destination airport is displayed as in Figure 5-143.



Figure 5-143 List of Available Approaches

d) Turn either **FMS** Knob to select the LPV approach for 35R as shown in Figure 5-143.

e) Press the **ENT** Key. A list of available transitions for the selected approach is displayed as in Figure 5-144.



Figure 5-144 List of Available Transitions

f) Turn either **FMS** Knob to select the desired transition. In this case, the Initial Approach Fix (IAF) at HABUK is used.

g) Press the **ENT** Key.

h) Barometric Minimums (Figure 5-145)

To set 'MINIMUMS', turn the small **FMS** Knob to select 'BARO', and press the **ENT** Key. Turn the small **FMS** Knob to select the altitude, and press the **ENT** Key.

Or:

To skip setting minimums, press the **ENT** Key.



Figure 5-145 Barometric Minimums Set

i) With 'LOAD?' highlighted, again press the **ENT** Key. The selected approach is added to the flight plan as seen in Figure 5-146.



Figure 5-146 Loaded Approach

13) Note the altitude constraints associated with each of the approach waypoints as seen in Figure 5-147. These altitudes are loaded from the database and are displayed as cyan text, indicating these values are "designated" for use in computing vertical deviation guidance.

Note: To no longer use the displayed altitude for calculating vertical deviation guidance, perform the following:

a) Press the **FMS** Knob to activate the cursor.

b) Turn the small **FMS** Knob to highlight the desired altitude.

c) Press the **CLR** Key.

d) Press the **FMS** Knob to deactivate the cursor.

After making the altitude "non-designated", it is displayed as white text.

Altitude constraint values associated with the Final Approach Fix (FAF) and waypoints beyond the FAF cannot be designated for vertical guidance. These altitude values are always displayed as white text, as in Figure 5-147. Vertical guidance from the FAF and on to the Missed Approach Point (MAP) is given using the WAAS GPS altitude source, therefore, the displayed altitude values are for reference only.

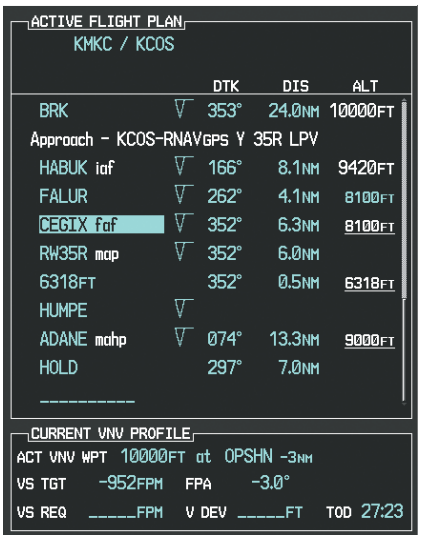


Figure 5-147 Vertical Guidance is Active to the FAF

14) As the aircraft approaches OPSHN, it may be desirable to adjust the speed, or steepness of the upcoming descent. The default Flight Path Angle (FPA) is -3.0 degrees and a required vertical speed is computed to maintain the -3.0 FPA. To change the vertical flight path, perform the following steps.

a) Press the **VNV PROF** Softkey to place the cursor in the target vertical speed field (VS TGT) as shown in Figure 5-148.

b) At this point, the descent vertical speed can be selected, or the FPA can be selected. Turn the large **FMS** Knob to select the desired selection field, then turn the small **FMS** Knob to enter the desired value.

Note the information now displayed in the 'CURRENT VNV PROFILE' box. Also, note the offset waypoint (orange box) and gray circle are now displayed on the map. The gray circle marks the Top of Descent (TOD). In this example, vertical guidance is provided at the TOD that results in a -3.0 degree FPA descent to an altitude of 10,000 feet upon reaching the offset waypoint.

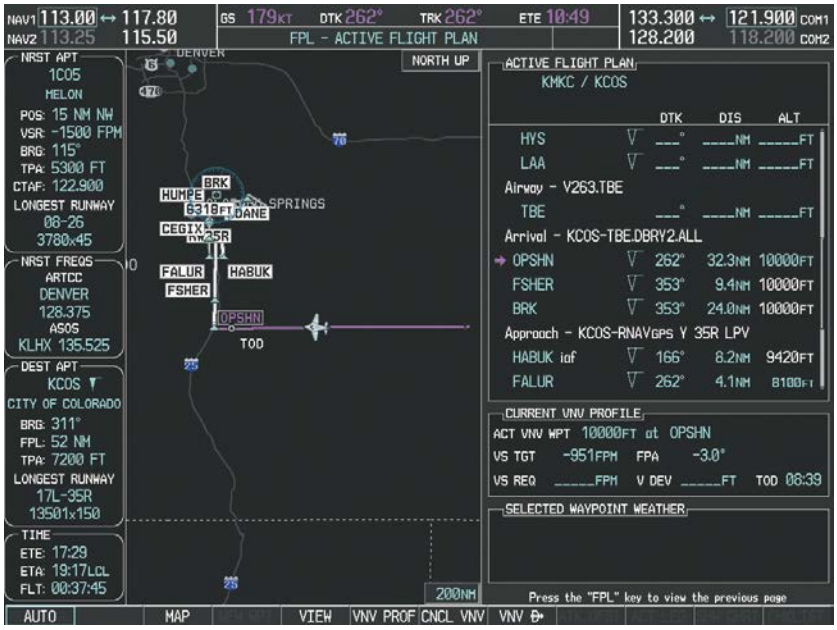


Figure 5-148 Adjusting the Descent

c) Press the **ENT** Key.

15) As seen in Figure 5-149, the aircraft is approaching TOD. Note the target vertical speed required to reach the selected altitude. The Vertical Deviation Indicator (VDI) and the Required Vertical Speed Indicator (RVSI) are now displayed on the PFD as shown in Figure 5-147. When the aircraft is within one minute of the TOD, it is annunciated as shown in Figure 5-150, and an aural alert 'Vertical track' will be heard.



Figure 5-149 Approaching Top of Descent (TOD)

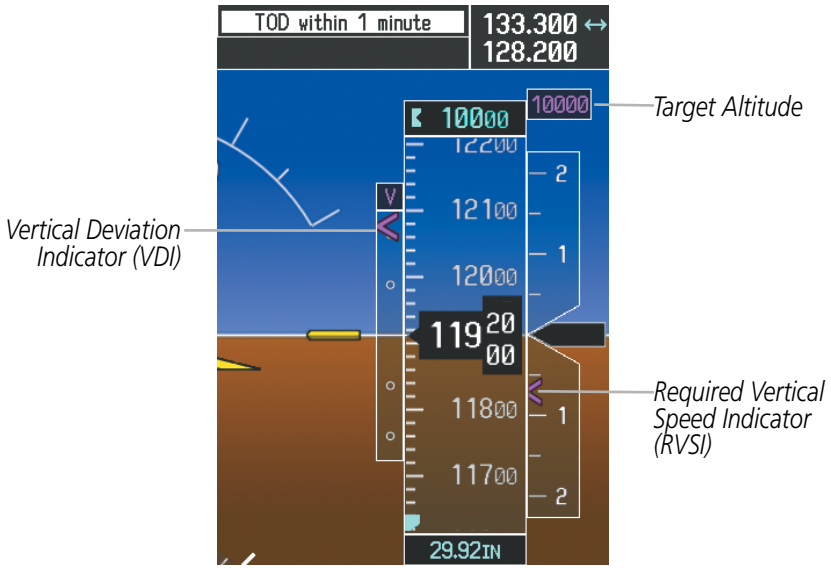


Figure 5-150 VDI & RVSI Upon Reaching Top of Descent (TOD)

16) Upon reaching TOD, a descent vertical speed is established by placing the VSI pointer in line with the RVSI as shown in Figure 5-151.

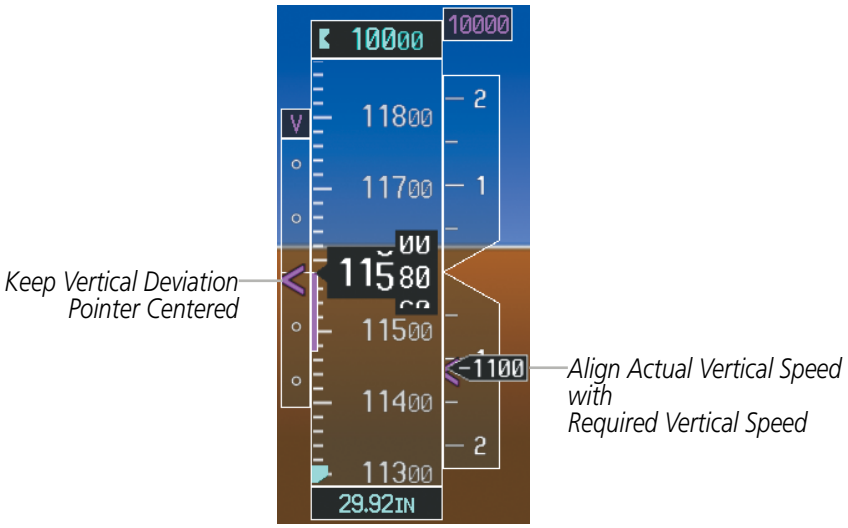


Figure 5-151 VDI & RVSI Showing Correctly Established Descent

17) When the aircraft is one minute from the bottom of descent (BOD) it is annunciated as shown in Figure 5-152. Upon reaching the offset waypoint for OPSHN, the aircraft is at 10,000 feet.

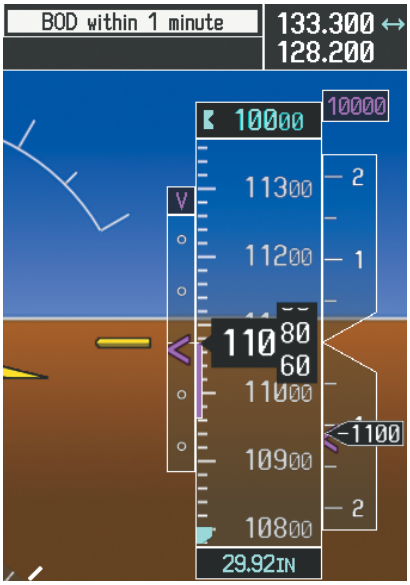


Figure 5-152 Approaching Bottom of Descent (BOD) at OPSHN Offset Waypoint

18) The aircraft is approaching OPSHN. The upcoming turn and next heading are annunciated at the top left of the PFD as seen in Figure 5-153. Initiate the turn and maneuver the aircraft on a track through the turn radius to intercept the magenta line for the OPSHN to FSHER leg and center the CDI.



Figure 5-153 Turn to intercept OPSHN to FSHER Leg

19) After passing OPSHN, the next leg of the arrival turns magenta as shown in Figure 5-154. The magenta arrow in the flight plan list now indicates the OPSHN to FSHER leg of the arrival procedure is now active.



Figure 5-154 Tracking the OPSHN to FSHER Leg

20) The flight continues through the arrival procedure to FSHER. At a point 31 nm from the destination airport, the phase of flight scaling for the CDI changes to Terminal Mode and is annunciated by displaying 'TERM' on the HSI.

Annunciations for the upcoming turn and descent, as well as the VDI and RVSI, appear on the PFD as the flight progresses.

21) The approach may be activated at any point to proceed directly to the IAF. After FSHER, manually activate the approach procedure:

a) Press the **PROC** Key.

b) Turn the large **FMS** Knob to highlight 'ACTIVATE APPROACH' as shown in Figure 5-155.

c) Press the **ENT** Key to activate the approach.

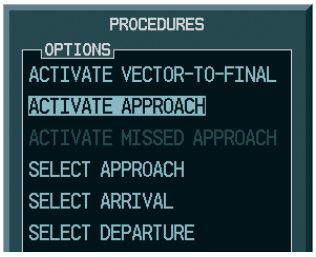


Figure 5-155 Manually Activate Approach

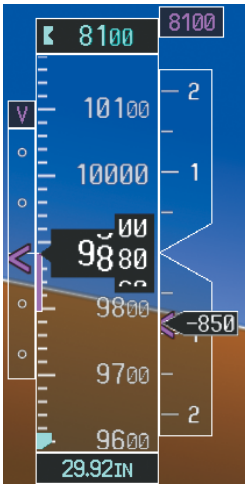
22) The active leg is now the course direct to HABUK iaf (see Figure 5-156).



Figure 5-156 Approach is Now Active

22) The IAF is the next waypoint. At the TOD, establish a descent vertical speed as previously discussed in Step 16. The aircraft altitude is about 9,420 feet upon reaching HABUK.

The descent continues using the Glidepath Indicator, as one would use a glideslope indicator, to obtain an altitude of 8,100 feet at FALUR (Figure 5-157).



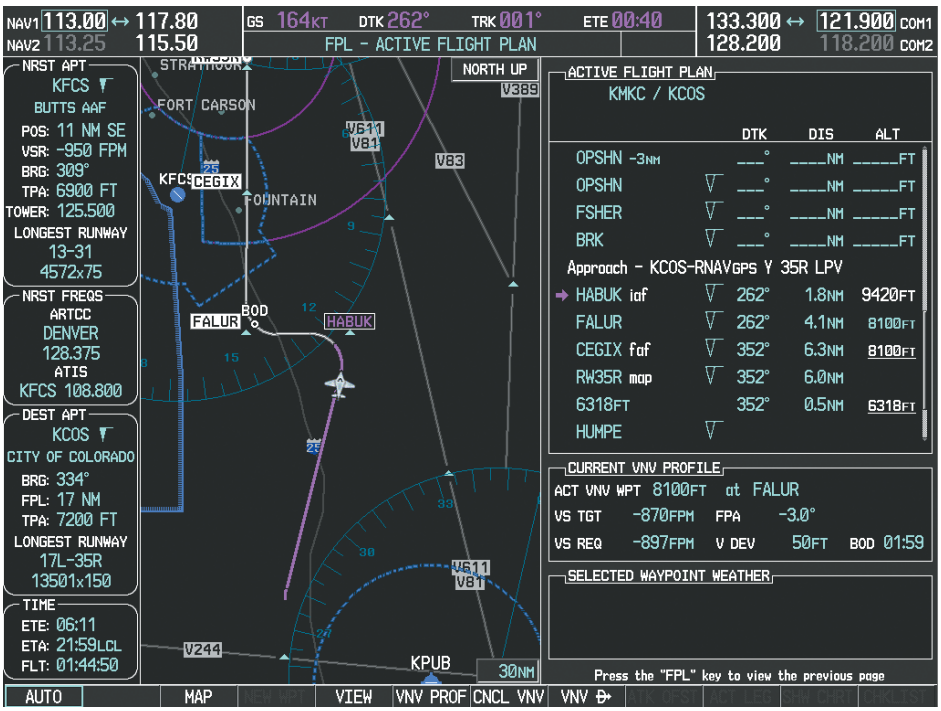


Figure 5-157 Descending Turn to the Initial Approach Fix (IAF)

23) After crossing FALUR the next waypoint is the FAF. The flight phase changes to LPV on the HSI indicating the current phase of flight is in Approach Mode and the approach type is LPV. CDI scaling changes accordingly and is used much like a localizer when flying an ILS approach. The RVSI is no longer displayed and the VDI changes to the Glidepath Indicator (as shown in Figure 5-158) when the final approach course becomes active.

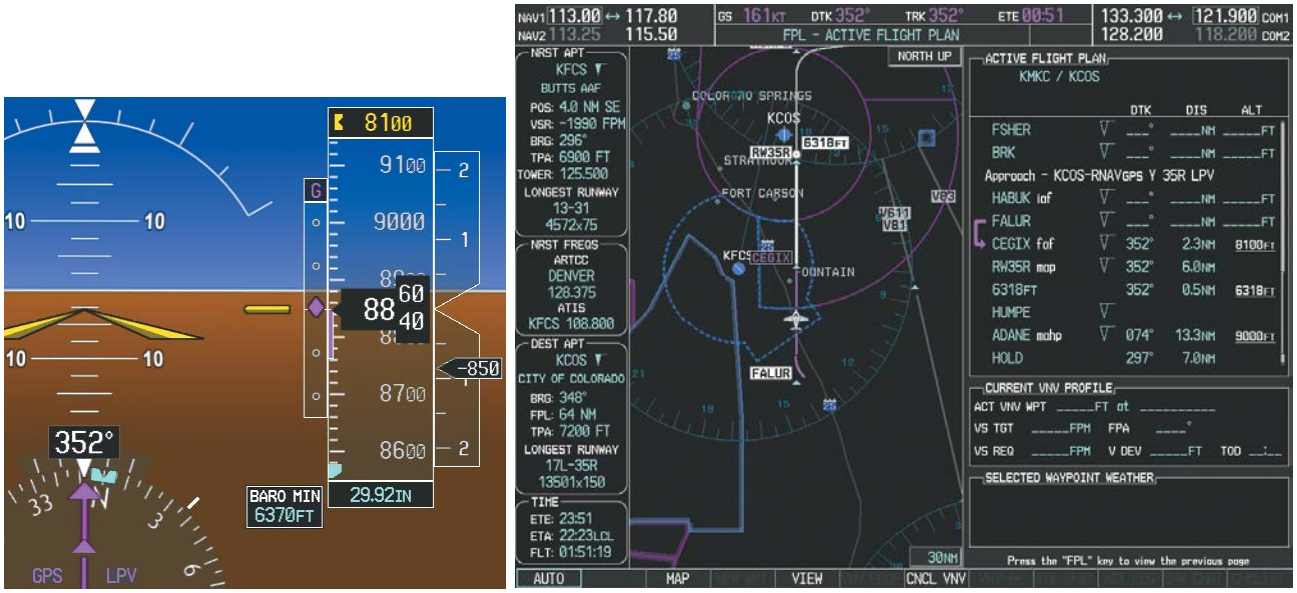


Figure 5-158 Descending to the FAF

Maintain an altitude "AT OR ABOVE" 8,100 feet at CEGIX Note the altitude restriction lines under (At or Above) the altitude in the 'ALT' field in Figure 5-158.

24) After crossing CEGIX, the aircraft continues following the glidepath to maintain the descent to "AT or ABOVE" 6,318 feet at the Missed Approach Point (MAP) (RW35R) as seen in Figure 5-159.

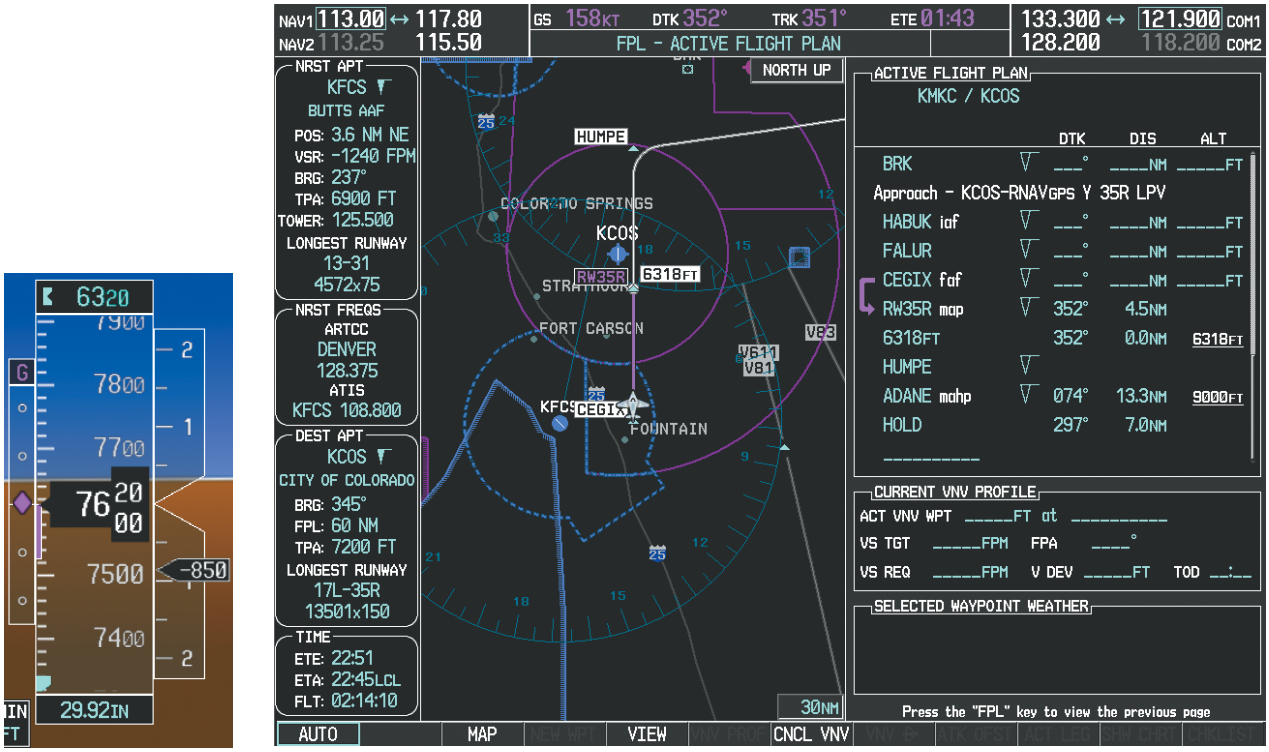


Figure 5-159 Descending to the Missed Approach Point

25) Upon reaching the MAP, it is decided to execute a missed approach. Automatic waypoint sequencing is suspended past the MAP. Press the TO/GA button, or the **SUSP** Softkey on the PFD, to resume automatic waypoint sequencing through the missed approach procedure.

A direct-to is initiated to HUMPE. The aircraft is climbing to reach 9,000 feet at the Missed Approach Hold Point (MAHP). The CDI flight phase now changes from LPV to MAPR as seen on the HSI.

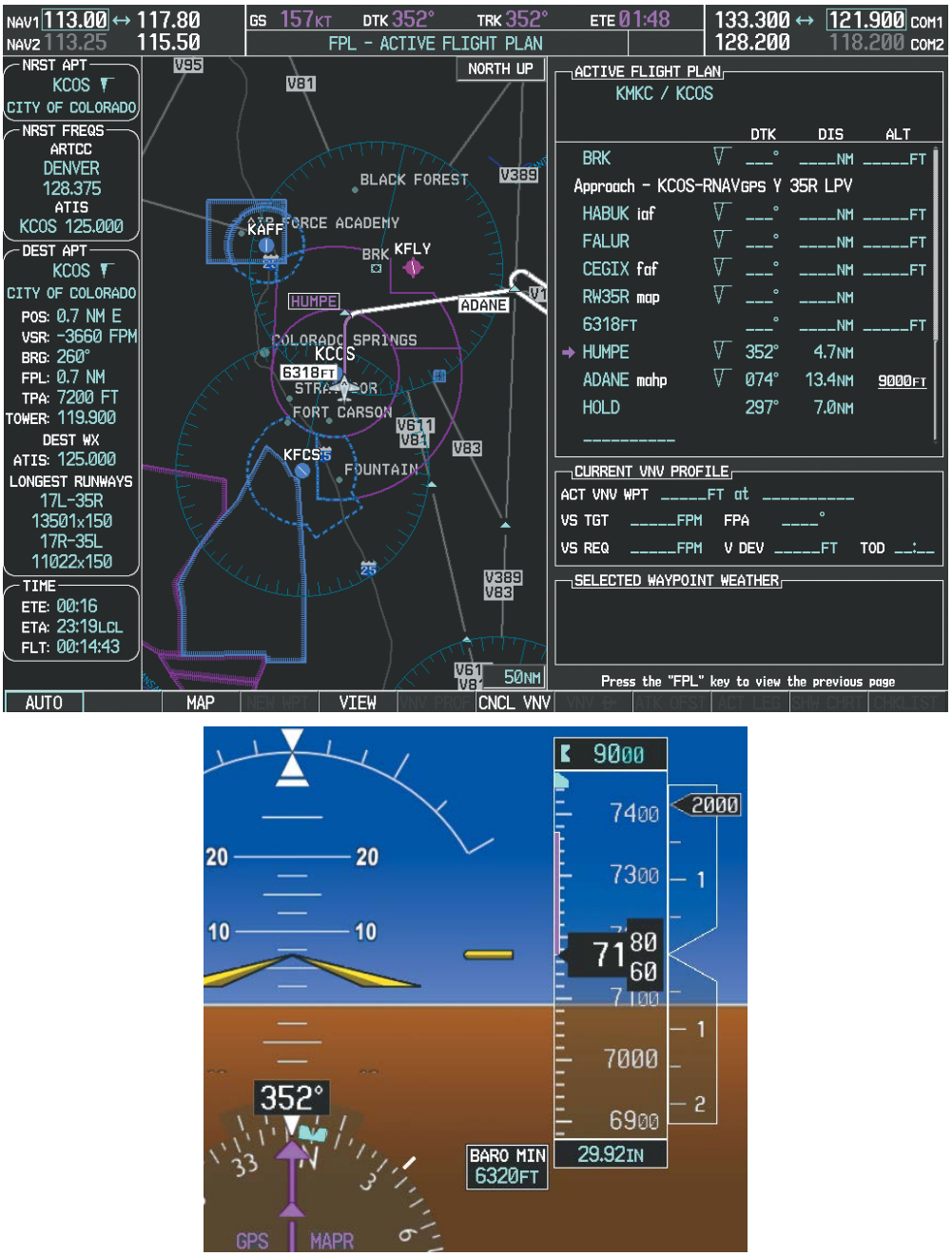


Figure 5-160 Missed Approach Active

26) The aircraft continues climbing to "AT or ABOVE" 9,000 feet at ADANE. A holding pattern is established at the MAHP (ADANE) as shown in Figure 5-161.

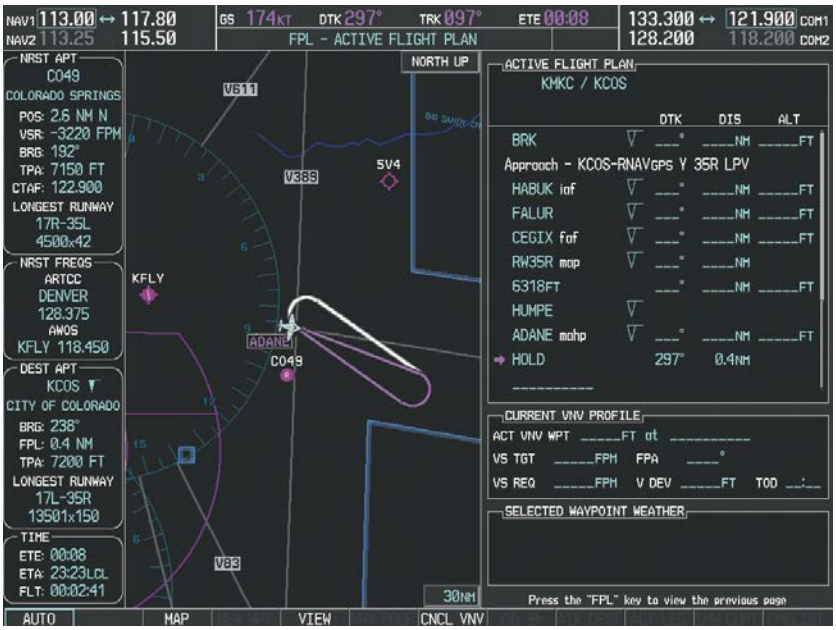


Figure 5-161 Establishing the Holding Pattern

27) The aircraft maintains 9,000 feet while following the magenta line through the hold as in Figure 5-162.



Figure 5-162 Hold Established

5.12 ABNORMAL OPERATION

This section discusses the Dead Reckoning mode of operation and the subsequent indications.

NOTE: *Dead Reckoning Mode only functions in Enroute (ENR) or Oceanic (OCN) phase of flight. In all other phases, an invalid GPS solution produces a "NO GPS POSITION" annunciation on the map and the G900X stops using GPS.*

While in Enroute or Oceanic phase of flight, if the G900X detects an invalid GPS solution or is unable to calculate a GPS position, the system automatically reverts to Dead Reckoning (DR) Mode. In DR Mode, the G900X uses its last-known position combined with continuously updated airspeed and heading data (when available) to calculate and display the aircraft's current estimated position.

It is important to note that estimated navigation data supplied by the G900X in DR Mode may become increasingly unreliable and must not be used as a sole means of navigation. If while in DR Mode airspeed and/or heading data is also lost or not available, the DR function may not be capable of accurately tracking estimated position and, consequently, the system may display a path that is different than the actual movement of the aircraft. Estimated position information displayed by the G900X through DR while there is no heading and/or airspeed data available should not be used for navigation.

DR Mode is inherently less accurate than the standard GPS/SBAS Mode due to the lack of satellite measurements needed to determine a position. Changes in wind speed and/or wind direction compound the relative inaccuracy of DR Mode. Because of this degraded accuracy, other navigation equipment must be relied upon for position awareness until GPS-derived position data is restored.

DR Mode is indicated on the G900X by the appearance of the letters 'DR' superimposed in amber over the 'own aircraft' symbol as shown in Figure 5-163. In addition, 'DR' is prominently displayed in amber on the HSI slightly above and to the right of the aircraft symbol on the CDI as shown in Figure 5-163. The CDI deviation bar remains, but is removed from the display after 20 minutes in DR Mode. The autopilot will remain coupled in DR mode as long as the deviation info is available (20 min.) Lastly, but at the same time, a 'GPS NAV LOST' alert message appears on the PFD. Normal navigation using GPS/SBAS source data resumes automatically once a valid GPS solution is restored.

As a result of operating in DR Mode, all GPS-derived data is computed based upon an estimated position and is displayed as amber text on the display to denote degraded navigation source information as shown in Figure 5-163.

Also, while the G900X is in DR Mode, both TAWS and Terrain Proximity are disabled. Additionally, the accuracy of all nearest information (airports, airspaces, and waypoints) is questionable. Finally, airspace alerts continue to function, but with degraded accuracy.

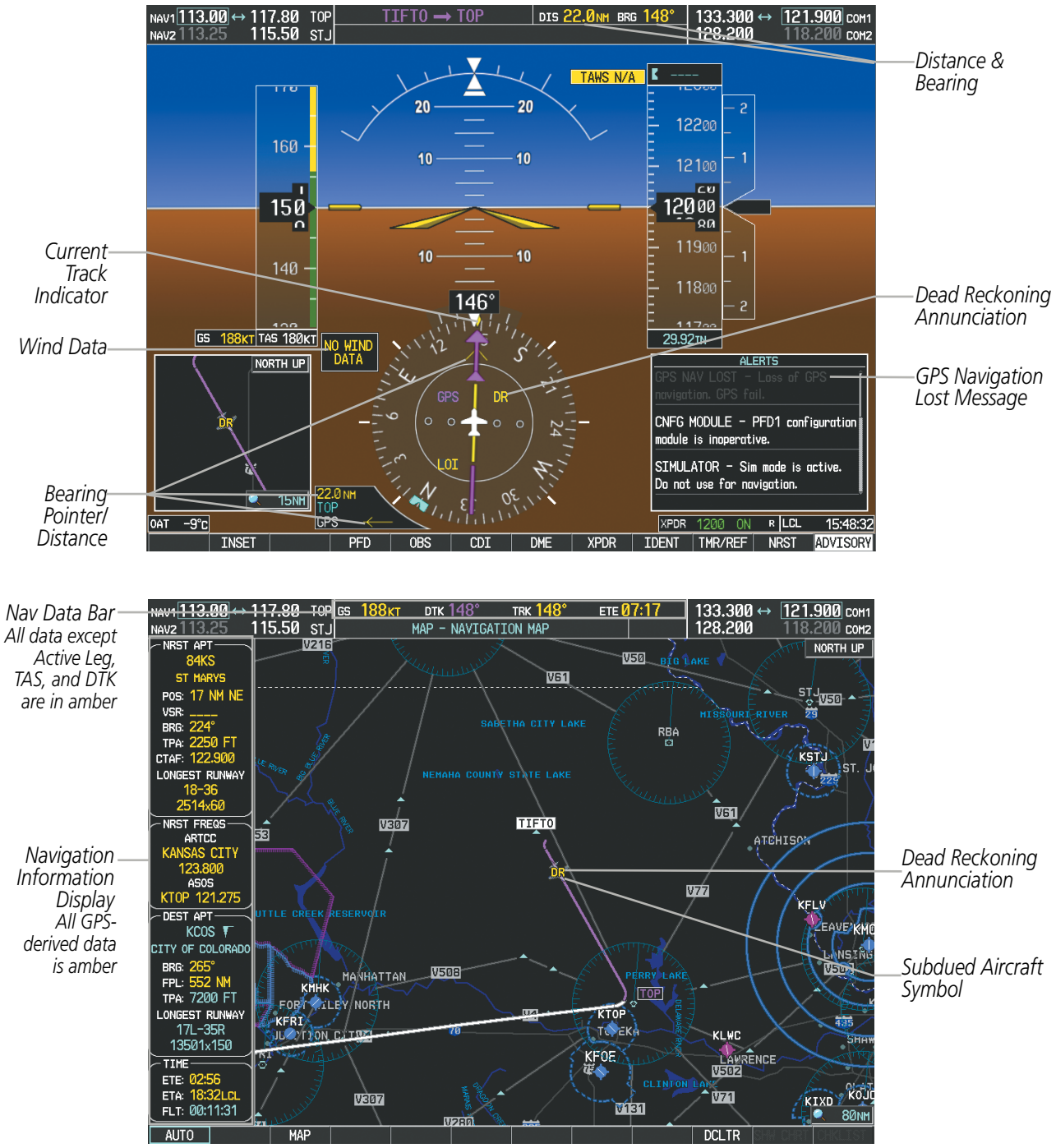


Figure 5-163 Dead Reckoning Mode - GPS Derived Data Shown in Amber

NOTE: *The Inset Map is removed from the PFD any time aircraft pitch is greater than +30° or less than –20°, or when a 65° bank angle is reached.*

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SECTION 6 HAZARD AVOIDANCE

Hazard avoidance features available for the G900X are designed to aid situational awareness and provide advisory information with regard to potential hazards to flight safety associated with weather, terrain, and air traffic.

Weather

- GDL 69/69A or GDL 69/69A SXM SiriusXM Weather (Optional)
- GSR 56 Garmin Connext Weather (Optional)
- GDL 88 Flight Information Services-Broadcast (FIS-B) Weather (Optional)
- GWX 68 Airborne Weather Radar (Optional)
- L-3 WX-500 Stormscope® Lightning Detection System (Optional)

Terrain Avoidance

- Terrain Proximity
- Terrain-SVS (Standard with SVT Option)
- Terrain Awareness and Warning System - Class B (TAWS-B) (Optional)

Traffic

- Garmin GTS 800/825 Traffic Advisory System (TAS) (Optional)
- Garmin GDL 88 Automatic Dependent Surveillance-Broadcast (ADS-B) Traffic
- Avidyne TAS600® Series TAS (Optional)

6.1 SIRIUSXM WEATHER

WARNING: *Do not use data link weather information for maneuvering in, near, or around areas of hazardous weather. Information contained within data link weather products may not accurately depict current weather conditions.*

WARNING: *Do not use the indicated data link weather product age to determine the age of the weather information shown by the data link weather product. Due to time delays inherent in gathering and processing weather data for data link transmission, the weather information shown by the data link weather product may be significantly older than the indicated weather product age.*

The optional GDL 69/69A or GDL69/69A SXM is a remote-mounted data link satellite receiver. Differences in the receiver models, where applicable, are discussed throughout this section; refer to appropriate aircraft documentation to determine the receiver model installed in this aircraft. Received graphical weather information and associated text is displayed on the Multi Function Display (MFD) and the Primary Flight Display (PFD) Inset Map. The GDL 69A and GDL 69A SXM can also receive SiriusXM Satellite Radio entertainment services. Both weather data and audio entertainment programming operate in the S-band frequency range to provide continuous reception capabilities at any altitude throughout North America.

Services from SiriusXM are subscription-based. For more information on specific service packages, visit www.siriusxm.com.

ACTIVATING SERVICES

Before SiriusXM Weather and SiriusXM Satellite Radio can be used, the service must be activated. Service is activated by providing coded IDs unique to the installed receiver. SiriusXM Satellite Radio (audio) and SiriusXM Weather (data) services each have coded IDs. The Data and Audio Radio IDs must be provided to activate the weather service and entertainment subscriptions, respectively. These IDs are located on:

- The XM Information Page on the MFD (Figure 6-1)
- The XM Satellite Radio Activation Instructions included with the unit
- The label on the back of the Data Link Receiver

Contact the installer if the Audio and Data Radio IDs cannot be located.

SiriusXM uses the coded IDs to send an activation signal that allows the system to provide weather data and/or entertainment programming provided through the receiver.

Establishing an account for SiriusXM services:

1) Select the XM Page in the AUX Page Group.
2) Select the **INFO** Softkey to display the AUX - XM Information Page.
3) Note the Data Radio ID (for SiriusXM Weather) and the Audio Radio ID (for SiriusXM Satellite Radio).
4) Contact SiriusXM Customer Service using the phone number listed on its website, www.siriusxm.com.
5) Provide SiriusXM Customer Service the Audio and/or Data Radio IDs, payment information, and the desired weather product subscription package.

Activating the SiriusXM Weather service:

1) Once a SiriusXM Weather account has been established, select the XM Page in the Auxiliary Page Group.
2) Press the **INFO** Softkey to display the XM Information Page.
3) View the list of supported Weather Products. A white empty box appears next to an unavailable weather product; a green filled box appears next to an available weather product. During activation, it may take several minutes for supported weather products in the selected subscription Service Class to become available.
4) When the available weather products displayed match the weather products offered in the selected SiriusXM Weather product subscription Service Class, press the **LOCK** Softkey.
5) Turn the large **FMS** Knob to highlight 'YES'.
6) To complete activation, press the **ENT** Key.



Figure 6-1 XM Information Page

USING SIRIUSXM WEATHER PRODUCTS

The principal map for viewing SiriusXM Weather information is the Weather Data Link (XM) Page in the Map Page Group. This is the only map display capable of showing information for all available SiriusXM Weather products.

Viewing the Weather Data Link (XM) Page:

1) Turn the large **FMS** Knob to select the Map Page Group.
2) Turn the small **FMS** Knob to select the Weather Data Link (XM or CNXT) Page.

If the name of another weather service provider is listed in the page title (such as 'CNXT'), proceed to the following steps in order to change the weather data link source to display SiriusXM Weather.

Changing the data link weather source to SiriusXM:

1) If necessary, follow the previous procedure to select the Weather Data Link (CNXT) Page.
2) Press the **MENU** Key.
3) Turn the large **FMS** Knob to select 'Display XM Weather' and press the **ENT** Key. The page title changes to 'Weather Data Link (XM)' to indicate SiriusXM Weather is the selected weather data link source.

The available softkeys and displayed data link weather information on the navigation maps correspond to the selected data link weather source.

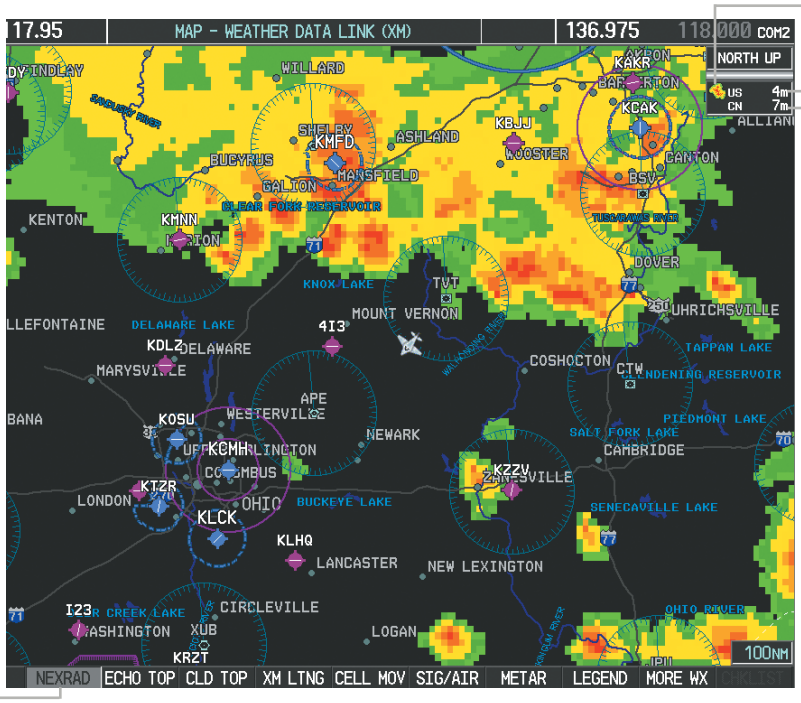


Figure 6-2 Weather Data Link (XM) Page

For each enabled SiriusXM Weather product, the system displays a weather product icon and product age. The product age is the elapsed time (in minutes) since the weather data provider compiled the weather product. The product age display does not indicate the age of the information contained within the weather product, which can be significantly older than the displayed weather product age.

The SiriusXM Weather service broadcasts weather products at specific intervals (defined in the **Broadcast Rate** column in Table 6-1). If for any reason, a product is not broadcast within the **Expiration Time** intervals (see Table 6-1), the system removes the expired data from the display, and shows dashes instead of the product age. This ensures the displayed information is consistent with what is currently being transmitted by the SiriusXM Weather service. If more than half of the expiration time has elapsed, the color of the product age changes to amber. If data for a weather product is not available (i.e., has not been received), the system displays 'N/A' next to the weather product symbol instead of the product age.

Table 6-1 shows the weather product symbols, the expiration times and the broadcast rates. The broadcast rate represents the interval at which the SiriusXM Weather service transmits new signals that may or may not contain updated weather products. It does not represent the rate at which the weather information is updated or when the Data Link Receiver receives new data. SiriusXM and its weather data suppliers define and control the data update intervals, which are subject to change.

SiriusXM Weather Product	Symbol	Expiration Time (Minutes)	Broadcast Rate (Minutes)
Next-generation Radar (NEXRAD)		30	5 (U.S.) 10 (Canada)
Cloud Top (CLD TOP)		60	15 (69/69A) 30 (69/69A SXM)
Echo Top (ECHO TOP)		30	7.5
SiriusXM Lightning (LTNG)		30	5
Cell Movement (CELL MOV)		30	12
SIGMETs/AIRMETs (SIG/AIR)		60	12
Meteorological Aerodrome Report (METARs)		90	12
City Forecast (CITY)		90	12
Surface Analysis (SFC)		60	12
Freezing Levels (FRZ LVL)		120	12
Winds Aloft (WIND)		90	12
County Warnings (COUNTY)		60	5
Cyclone Warnings (CYCLONE)		60	12
Icing Potential (CIP and SLD) (ICNG)		90	22
Pilot Weather Report (PIREPs)		90	12
Air Report (AIREPs)		90	12
Turbulence (TURB)		180	12
Radar Coverage (RADAR CVRG)	no product image	30	5
Temporary Flight Restrictions (TFRs)	no product image	60	12
Terminal Aerodrome Reports (TAFs)	no product image	60	12

Table 6-1 SiriusXM Weather Product Symbols and Data Timing

Table 6-2 shows which SiriusXM Weather products can be displayed (indicated with a '+' symbol) on specific maps.

SiriusXM Weather Product	PFD Inset Map	Navigation Map Page	Weather Data Link (XM) Page	Weather Information Page	AUX - Trip Planning Page	AUX - Video Page	Nearest Page Group	Flight Plan Pages
NEXRAD and No Radar Coverage	+	+	+		+	+	+	+
Cloud Top (CLD TOP)			+					
Echo Top (ECHO TOP)			+					
SiriusXM Lightning (XM LTNG)	+	+	+		+	+	+	+
Cell Movement (CELL MOV)	+	+	+		+	+	+	+
SIGMETs/AIRMETs (SIG/AIR)			+					
METARs	+	+	+	+	+	+	+	+
City Forecast (CITY)			+					
Surface Analysis (SFC)			+					
Freezing Levels (FRZ LVL)			+					
Winds Aloft (WIND)		+*	+					
County Warnings (COUNTY)			+					
Cyclone Warnings (CYCLONE)			+					
Icing Potential (ICNG)			+					
PIREPs			+	+				
AIREPs			+	+				
Turbulence (TURB)			+					
TFRs	+	+	+	+	+	+	+	+
TAFs				+				

** Winds Aloft Data displayed inside Profile View on the Navigation Map Page.*

Table 6-2 SiriusXM Weather Product Display Maps

Softkeys control the display of weather information on most MFD pages and the PFD Inset Map (Figure 6-3) shows the weather product softkeys for the Weather Data Link (XM) Page). When a weather product is selected for display, the corresponding softkey label changes to gray to indicate the product is enabled.

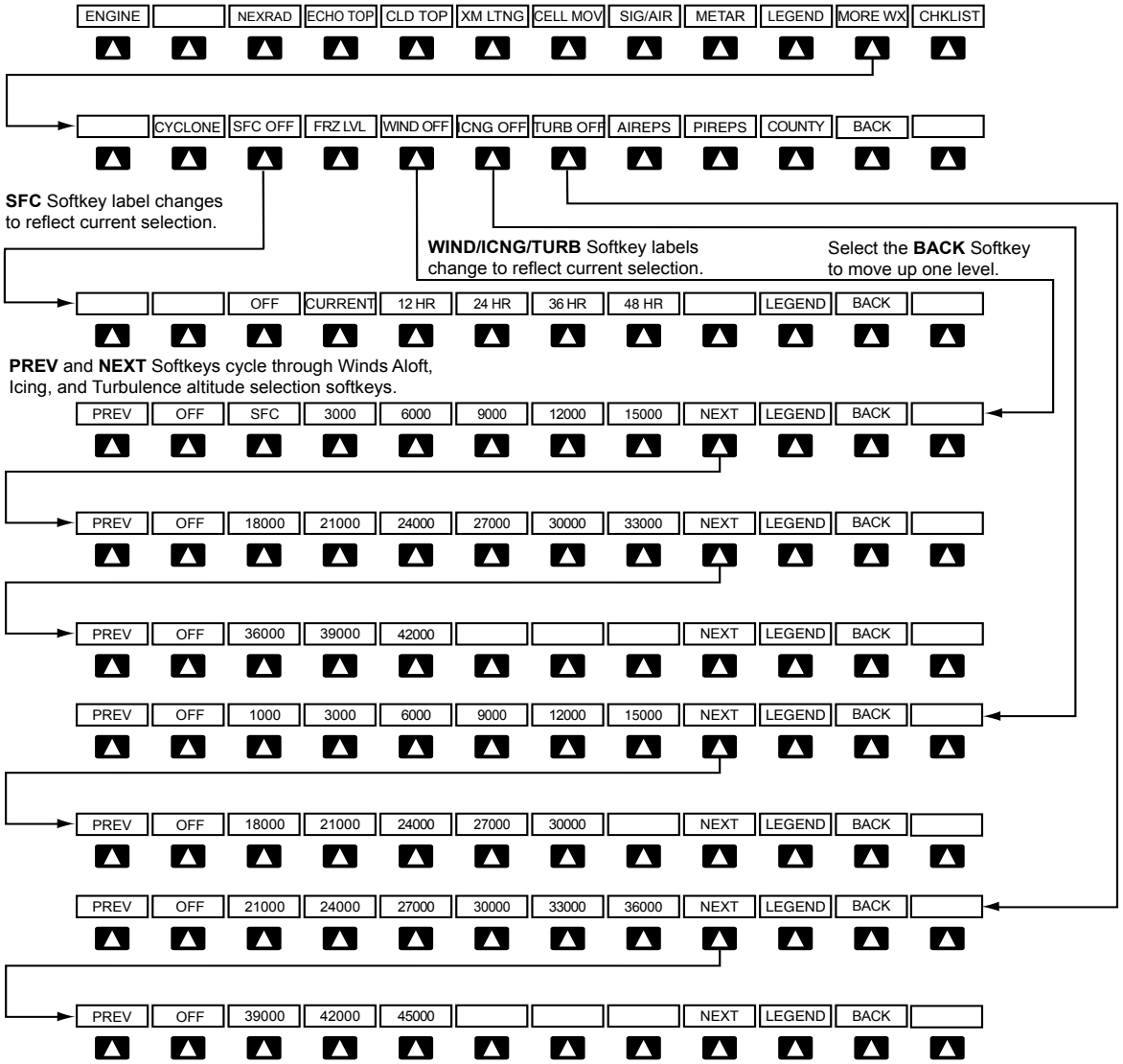


Figure 6-3 Weather Data Link (XM) Page Weather Product Softkeys

The setup menus for the Navigation Map Page and the Weather Data Link (XM) Page control the map range settings above which weather products data are decluttered from the display. If a map range larger than the weather product map range setting is selected, the weather product data is removed from the map. The menus also provide a means in addition to the softkeys for enabling/disabling display of weather products.

Setting up and customizing the Weather Data Link (XM) Page:

1) Select the Weather Data Link (XM) Page.
2) Press the **MENU** Key.
3) With 'Weather Setup' highlighted, press the **ENT** Key (Figure 6-4).
4) Turn the small **FMS** Knob to select 'PRODUCT GROUP 1' or 'PRODUCT GROUP 2', and press the **ENT** Key (Figure 6-5).
5) Turn the large **FMS** Knob or press the **ENT** Key to scroll through product selections.
6) Turn the small **FMS** Knob to scroll through options for each product (ON/OFF, range settings, etc.).
7) Press the **ENT** Key to select an option.
8) Press the **FMS** Knob or **CLR** Key to return to the Weather Data Link (XM) Page with the changed settings.

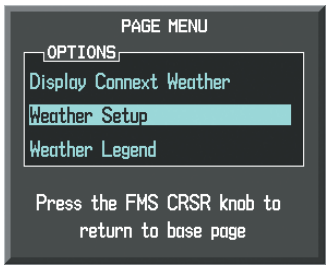


Figure 6-4 Weather Data Link (XM) Page Menu

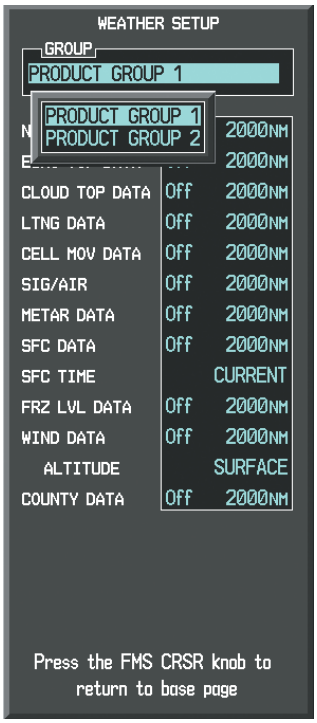


Figure 6-5 Weather Data Link (XM) Page Setup Menu

Restoring default Weather Data Link (XM) Page settings:

1) Select the Weather Data Link (XM) Page.
2) Press the **MENU** Key.
3) With 'Weather Setup' highlighted, press the **ENT** Key.
4) Press the **MENU** Key.
5) Highlight the desired default(s) to restore (all or for selection) and press **ENT** Key.

Maps besides the Weather Data Link (XM) Page use settings based on those selected for the Navigation Map Page.

Setting up and customizing weather data for the Navigation Map Page:

1) Select the Navigation Map Page.
2) Press the **MENU** Key.
3) With 'Map Setup' highlighted, press the **ENT** Key (Figure 6-6).
4) Turn the small **FMS** Knob to select the 'Weather' Group and press the **ENT** Key (Figure 6-7).
5) Turn the large **FMS** Knob or press the **ENT** Key to scroll through product selections (Figure 6-8).
6) Turn the small **FMS** Knob to scroll through options for each product (ON/OFF, range settings).
7) Press the **ENT** Key to select an option.
8) Press the **FMS** Knob or **CLR** Key to return to the Navigation Map Page with the changed settings.

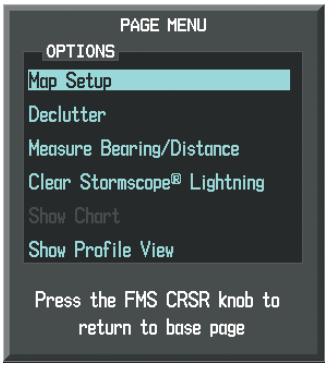


Figure 6-6 Navigation Map Page Menu



Figure 6-7 Navigation Map Page Setup Menu

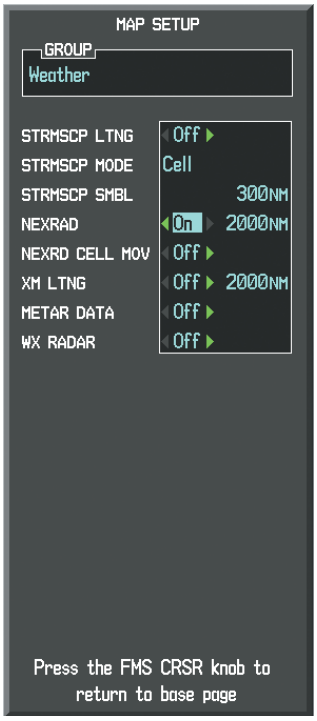


Figure 6-8 Navigation Map Page Setup Menu, Weather Group

When a SiriusXM Weather product is enabled for display on the PFD Inset Map, the weather product information box (with the product icon and age) can be displayed inside the PFD Inset Map.

Displaying/removing the weather product information box on the PFD Inset Map:

1) On the PFD, press the **INSET** Softkey.
2) Press the **WX LGND** Softkey.
3) To remove the weather product information box, press the **WX LGND** Softkey again.

Each active weather product has an associated legend which can be displayed on the Weather Data Link (XM) Page. A weather product legend can also be displayed on the Navigation Map Page for active SiriusXM Weather products displayed on that page.

Viewing legends for displayed weather products (on the Weather Data Link (XM) Page):

1) Select the Weather Data Link (XM) Page.
2) Press the **LEGEND** Softkey to display the legends for the displayed weather products.

   Or:

   a) Press the **MENU** Key.

   b) Select 'Weather Legend' and press the **ENT** Key.
3) Turn the **FMS** Knob to scroll through the legends if more are available than fit in the window.
4) To remove the Legend Window, press the **LEGEND** Softkey, the **ENT** or the **CLR** Key, or press the **FMS** Knob.

Viewing legends for displayed weather products (on the Navigation Map Page):

1) Select the Navigation Map Page.
2) Press the **MAP** Softkey.
3) Press the **LEGEND** Softkey (available if one or more XM weather products are enabled for display).
4) To remove the Legend Window, press the **LEGEND** Softkey, the **ENT** or the **CLR** Key, or press the **FMS** Knob.

Additional information about the following can be displayed by panning over the display on the map:

- Echo Tops
- Cloud Tops
- Cell Movement
- SIGMETs
- AIRMETs
- METARs
- County Warnings
- TFRs
- AIREPs
- PIREPs

The map panning feature is enabled by pressing the **Joystick**. The map range is adjusted by turning the **Joystick**. If the map range is adjusted while panning is enabled, the map is re-centered on the Map Pointer.

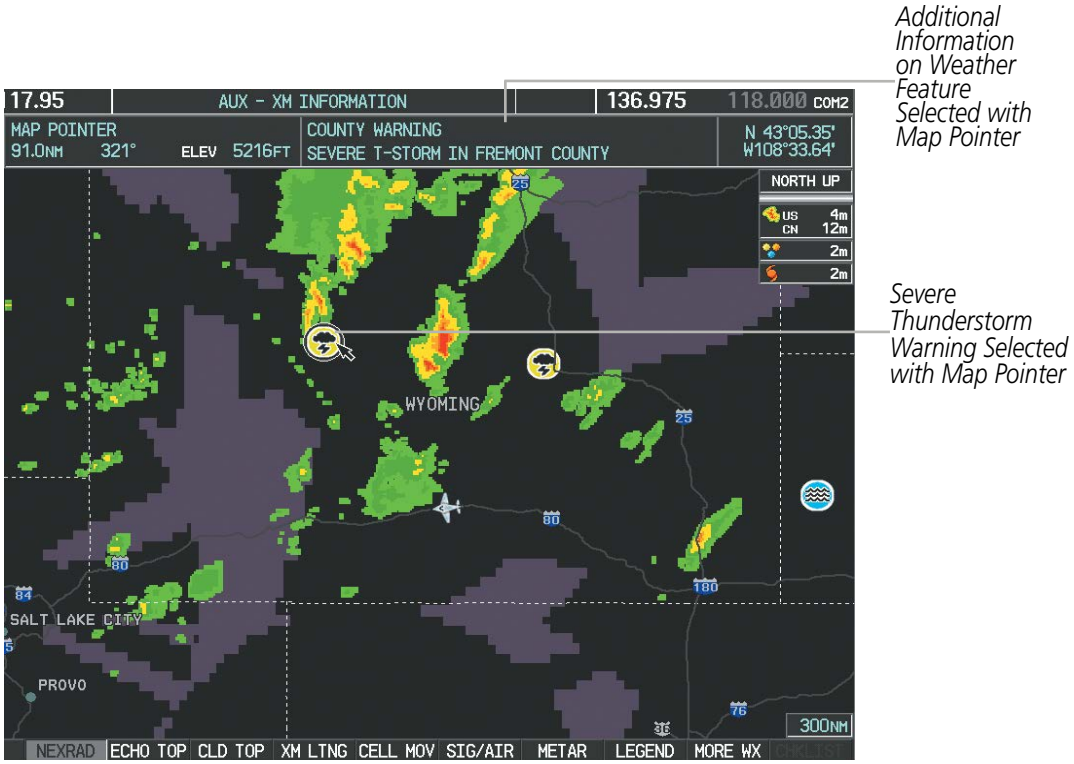


Figure 6-9 Panning on the Weather Data Link (XM) Page

NEXRAD

NOTE: *The NEXRAD weather product cannot be displayed at the same time as terrain, echo tops, turbulence, icing data is displayed.*

The National Weather Service (NWS) operates the WSR-88D, or NEXRAD (NEXt-generation RADar) system, an extensive network of 156 high-resolution Doppler radar systems. The NEXRAD network provides centralized meteorological information for the continental United States and selected overseas locations. The maximum range of a single NEXRAD site is 250 nm. In addition to a wide array of services, the NEXRAD network provides important information about severe weather and air traffic safety.

Individual NEXRAD sites supply the network with radar images, and the images from each radar site may arrive at the network at different rates and times. Periodically, the weather data provider compiles the available individual site images from the network to form a composite image, and assigns a single time to indicate when it created the image. This image becomes the NEXRAD weather product. Individual images--gathered from each NEXRAD site--differ in age, and are always older than the displayed NEXRAD weather product age. The data provider then sends the NEXRAD data to the SiriusXM Weather service, whose satellites transmit this information during the next designated refresh time for the NEXRAD weather product.

Because of the time required to detect, assemble, and distribute the NEXRAD weather product, the displayed weather information contained within the product may be significantly older than the current radar synopsis and may not depict the current weather conditions. The NEXRAD weather product should never be used as a basis for maneuvering in, near, or around areas of hazardous weather regardless of the information it contains.

For radar sites in the United States, the NEXRAD weather product shows a composite reflectivity image. This shows the *highest* radar energy received from multiple antenna tilt angles at various altitudes. For radar sites based in Canada, the NEXRAD weather product shows radar returns from the lowest antenna tilt angle, known as base reflectivity. The display of the information is color-coded to indicate the intensity of the echoes and the type of precipitation, if known.

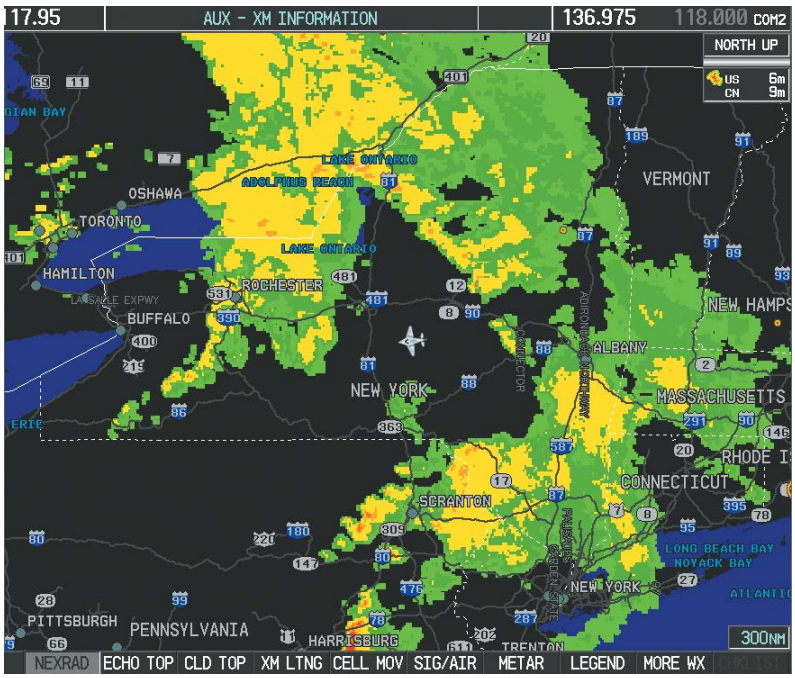


Figure 6-10 NEXRAD Data on the Weather Data Link (XM) Page

Displaying NEXRAD weather information:

1) Press the **MAP** Softkey (for the PFD Inset Map, press the **INSET** Softkey). This step is not necessary on the Weather Data Link (XM) Page.
2) Press the **NEXRAD** Softkey.

A mosaic of data from all the available NEXRAD radar sites is shown. This data is composed of the maximum reflectivity from the individual radar sweeps. The display of the information is color-coded to indicate the weather severity level. All weather product legends can be viewed on the Weather Data Link (XM) Page. For the NEXRAD legend (Figure 6-11), press the **LEGEND** Softkey when NEXRAD is selected for display.

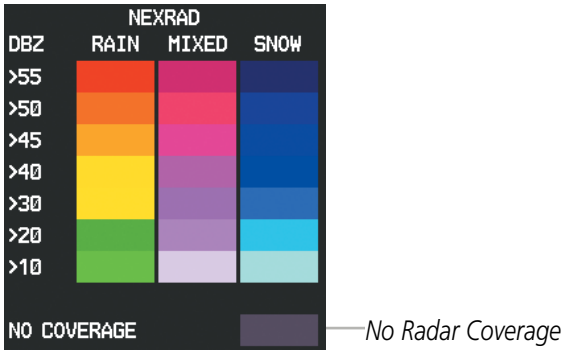


Figure 6-11 NEXRAD Reflectivity Legend

The display of No Radar Coverage is always active when either NEXRAD or ECHO TOPS is selected. Areas where NEXRAD radar coverage and Echo Tops information is not currently available or is not being collected are indicated in a gray shade of purple.

Reflectivity

Reflectivity is the amount of transmitted power returned to the radar receiver. Colors on the NEXRAD display are directly correlative to the level of detected reflectivity. Reflectivity as it relates to hazardous weather can be very complex.

The role of radar is essentially to detect moisture in the atmosphere. Simply put, certain types of weather reflect radar better than others. The intensity of a radar reflection is not necessarily an indication of the weather hazard level. For instance, wet hail returns a strong radar reflection, while dry hail does not. Both wet and dry hail can be extremely hazardous.

The different NEXRAD echo intensities are measured in decibels (dB) relative to reflectivity (Z). NEXRAD measures the radar reflectivity ratio, or the energy reflected *back to* the radar receiver (designated by the letter Z). The value of Z increases as the returned signal strength increases.

NEXRAD Limitations

NEXRAD radar images may have certain limitations:

- Undetermined precipitation types may be displayed as mixed.
- An individual NEXRAD site cannot depict high altitude storms at close ranges. It has no information about storms directly over the site.
- Precipitation may be occurring below the lowest antenna tilt angle (0.5°), and therefore the radar beam overshoots the precipitation. For example, at a distance of 124 miles from the radar site, the radar beam is approximately 18,000 feet above the radar site. The radar cannot detect any precipitation occurring below the beam at this distance and altitude.
- When zoomed in to a range of 30 nm, each square block on the display represents an area of four square kilometers. The intensity level reflected by each square represents the *highest* level of NEXRAD data sampled within the area (Figure 6-12).
- Unknown precipitation below 52°N is displayed as rain regardless of actual precipitation type.

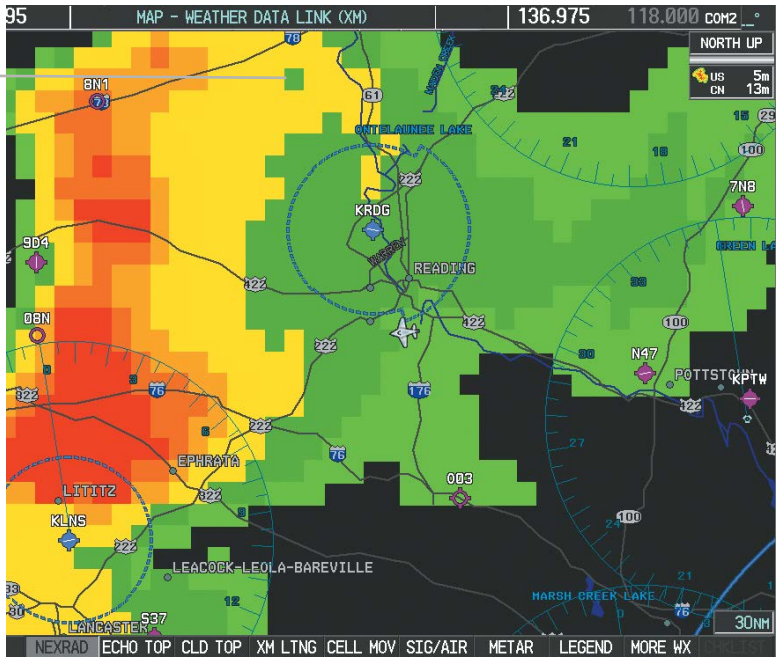


Figure 6-12 NEXRAD Weather Product with 30 NM Map Range

The following may cause abnormalities in displayed NEXRAD radar images:

- Ground clutter
- Strobes and spurious radar data
- Sun strobes (when the radar antenna points directly at the sun)
- Interference from buildings or mountains, which may cause shadows
- Metallic dust (chaff) from military aircraft, which can cause alterations in radar scans

NEXRAD Limitations (Canada)

- Radar coverage extends to 55°N.
- Any precipitation displayed between 52°N and 55°N is displayed as mixed regardless of actual precipitation type.

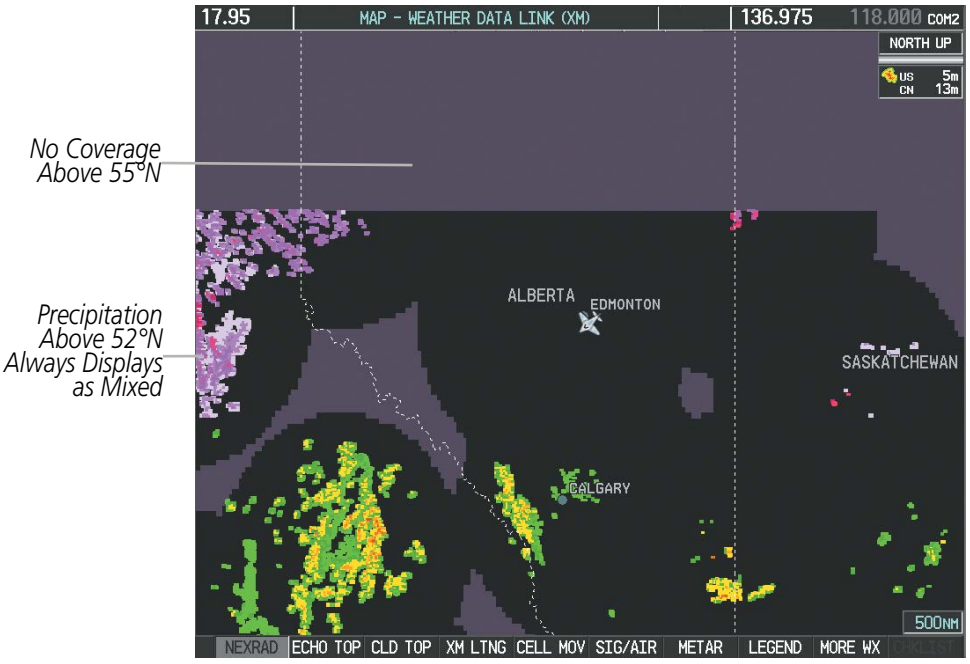


Figure 6-13 NEXRAD Weather Product - Canada

ECHO TOPS

NOTE: *Echo tops cannot be displayed at the same time as NEXRAD or Cloud Tops are selected for display.*

The Echo Tops weather product (Figure 6-14) shows the location, elevation, and direction of the highest radar echo. The highest radar echo does not indicate the top of a storm or clouds; rather it indicates the highest altitude at which precipitation is detected. Information is derived from NEXRAD data.

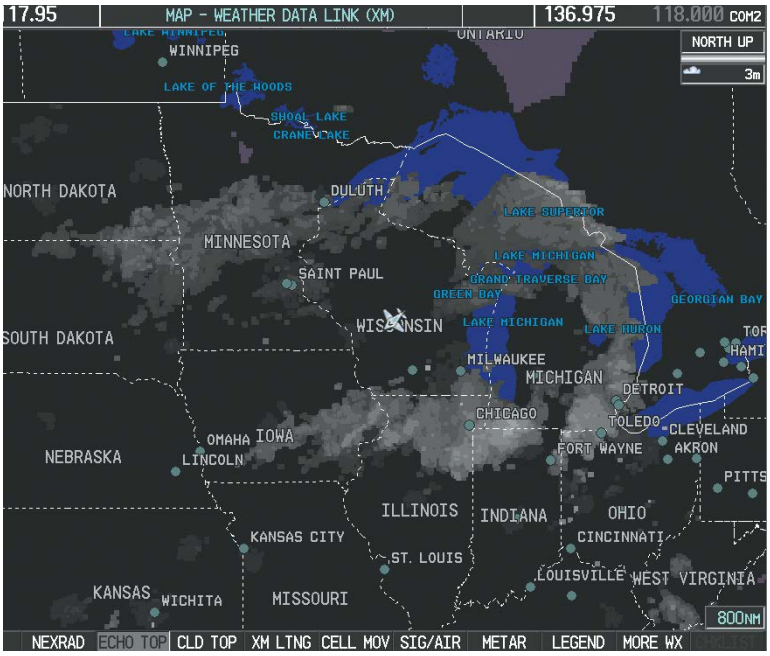


Figure 6-14 Echo Tops Weather Product

Displaying Echo Tops information:

1) Select the Weather Data Link (XM) Page.
2) Press the **ECHO TOP** Softkey.

To display the Echo Tops legend (Figure 6-15), press the **LEGEND** Softkey when Echo Tops is selected for display. Since Echo Tops and Cloud Tops use the same color scaling to represent altitude, display of these weather products is mutually exclusive. When Echo Tops is activated, NEXRAD and Cloud Tops data are removed.

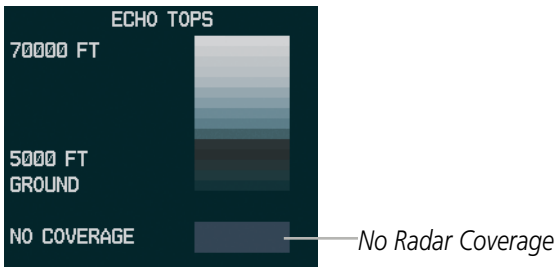


Figure 6-15 Echo Tops Legend

The display of No Radar Coverage is always active when either NEXRAD or Echo Tops is selected. Areas where NEXRAD radar coverage and Echo Tops information is not currently available or is not being collected are indicated in gray shade of-purple.

CLOUD TOPS

NOTE: *Cloud Tops and Echo Tops cannot be displayed at the same time.*

The Cloud Tops weather product (Figure 6-16) depicts cloud top altitudes as determined from satellite imagery.

NOTE: *If a GDL 69/69A SXM receiver is installed, the broadcast rate for Cloud Tops is 30 minutes. As with all SiriusXM Weather products, the product age becomes amber when it reaches half of the expiration time, which is 60 minutes for Cloud Tops. Therefore, this weather product age may be amber during routine operation.*

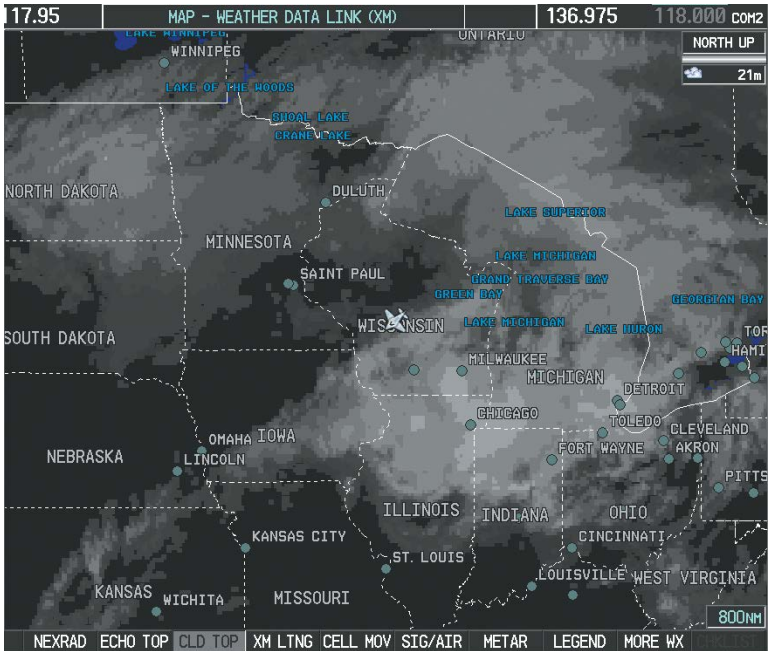


Figure 6-16 Cloud Tops Weather Product

Displaying Cloud Tops information:

1) Select the Weather Data Link (XM) Page.
2) Press the **CLD TOP** Softkey.

To display the Cloud Tops legend (Figure 6-17), press the **LEGEND** Softkey when Cloud Tops is selected for display. Since Cloud Tops and Echo Tops use the same color scaling to represent altitude, display of these weather products is mutually exclusive. When Cloud Tops is activated, Echo Tops data is removed.

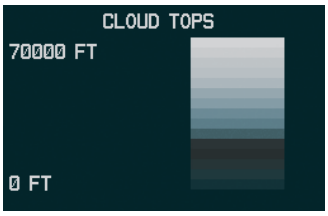


Figure 6-17 Cloud Tops Legend

SIRIUSXM LIGHTNING

NOTE: *The SiriusXM Lightning weather product cannot be displayed at the same time as another lightning source (such as optional Stormscope) is displayed on the same map.*

The SiriusXM Lightning weather product (Figure 6-18) shows the approximate location of cloud-to-ground lightning strikes. A strike icon represents a strike that has occurred within a two-kilometer region. The exact location of the lightning strike is not displayed.

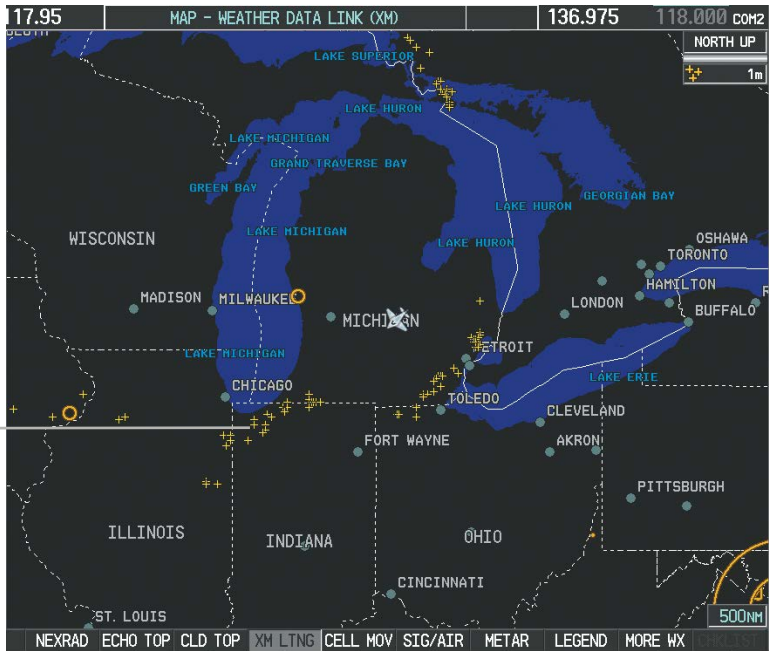


Figure 6-18 SiriusXM Lightning Weather Product

Displaying XM Lightning information:

1) Press the **MAP** Softkey (for the PFD Inset Map, press the **INSET** Softkey). This step is not necessary on the Weather Data Link (XM) Page.

2) Press the **XM LTNG** Softkey (**LTNG** Softkey on the Weather Data Link (XM) Page).

To display the XM Lightning legend on the Weather Data Link (XM) Page (Figure 6-19), press the **LEGEND** Softkey when XM Lightning is selected for display.



Figure 6-19 XM Lightning Legend

CELL MOVEMENT

The Cell Movement weather product (Figure 6-20) shows the location and movement of storm cells as identified by the ground-based system. Cells are represented by yellow squares, with direction of movement indicated with short, orange arrows.

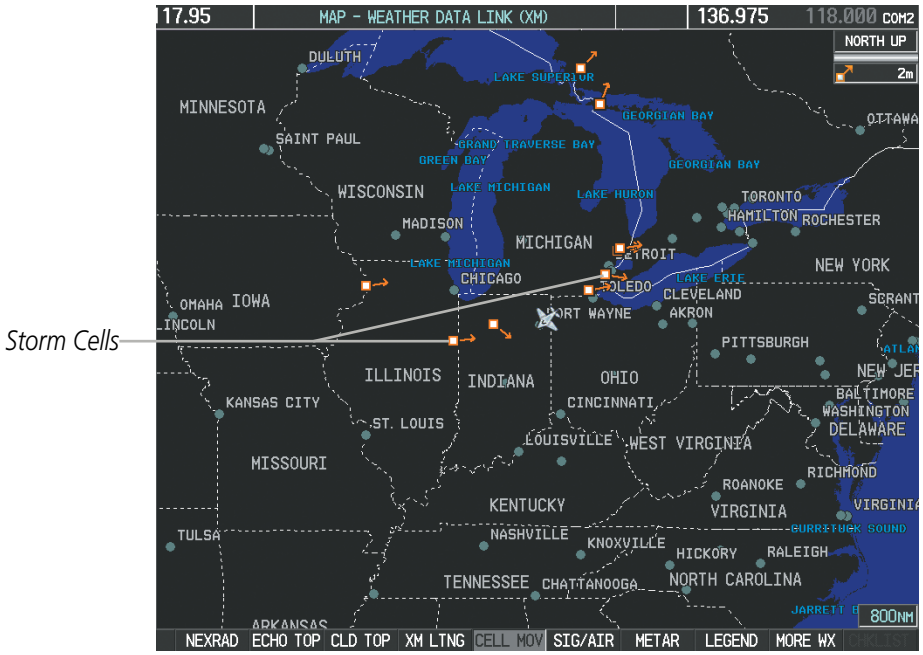


Figure 6-20 Cell Movement Data

NOTE: *The Storm Cell base height is not available if a GDL 69A SXM data link receiver is installed. In this case, the Storm Cell base height is displayed as 0 feet when the map pointer selects a storm cell.*

On most applicable maps, the Cell Movement weather product is selected for display along with NEXRAD. On the Weather Data Link (XM) Page, Cell Movement can be selected independently.

Displaying Cell Movement information:

1) Press the **MAP** Softkey (for the PFD Inset Map, press the **INSET** Softkey). This step is not necessary on the Weather Data Link (XM) Page.
2) Press the **NEXRAD** Softkey (**CEL MOV** Softkey on the Weather Data Link (XM) Page). For Cell Movement to be displayed on maps other than the Weather Data Link (XM) Page, Cell Movement must be turned on in the Navigation Map Setup Menu (see "Setting Up SiriusXM Weather").

To display the Cell Movement legend on the Weather Data Link (XM) Page, (Figure 6-21), press the **LEGEND** Softkey when Cell Movement is selected for display.



Figure 6-21 Cell Movement Legend

SIGMETS AND AIRMETS

SIGMETs (SIGnificant METeorological Information) and AIRMETs (AIRmen's METeorological Information) are broadcast for potentially hazardous weather. A Convective SIGMET is issued for hazardous convective weather. A localized SIGMET is a significant weather condition occurring at a localized geographical position.

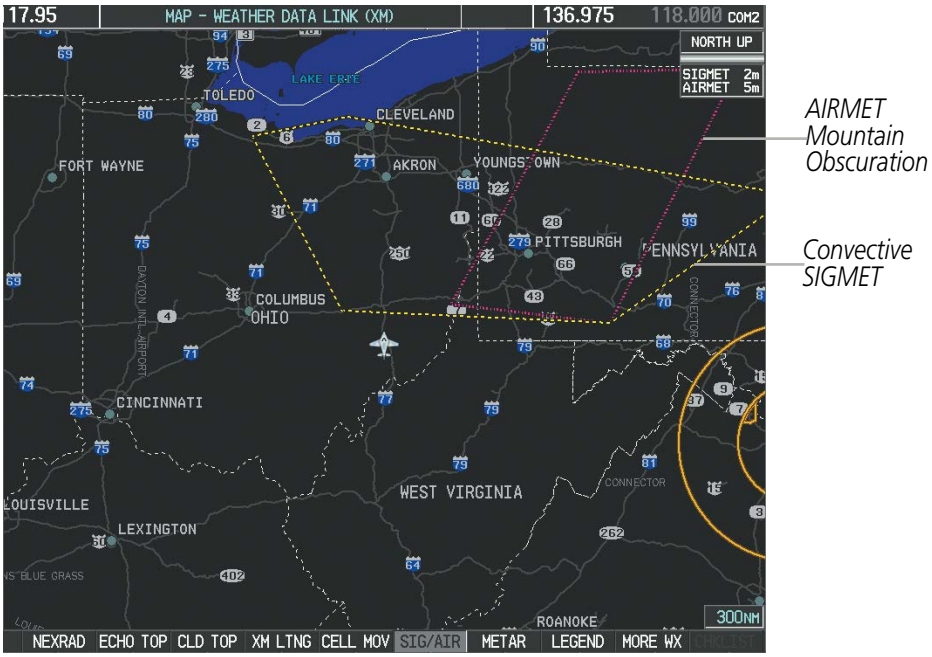


Figure 6-22 SIGMET/AIRMET Data

Displaying SIGMETs and AIRMETs:

1) Select the Weather Data Link (XM) Page.
2) Press the **SIG/AIR** Softkey.
3) To view the text of the SIGMET or AIRMET, press the **Joystick** and move the Map Pointer over the icon.
4) Press the **ENT** key. Figure 6-23 shows sample SIGMET text.

To display the SIGMET and AIRMET legend (Figure 6-24), press the **LEGEND** Softkey when SIGMETs and AIRMETs are enabled for display.

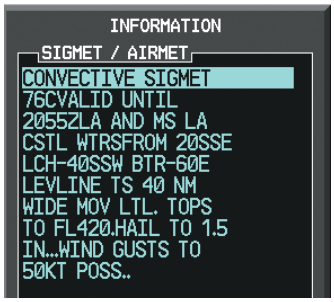


Figure 6-23 Sample SIGMET Text



Figure 6-24 SIGMET/AIRMET Legend

NOTE: *If a GDL 69A SXM receiver installed, the SIGMET and AIRMET weather products are not available unless at least one SIGMET or AIRMET has been received. The weather product age indicates 'N/A' when no SIGMET or AIRMET is available.*

METARS AND TAFS

NOTE: *Atmospheric pressure as reported for METARs is given in hectopascals (hPa), except for in the United States, where it is reported in inches of mercury (in Hg). Temperatures are reported in Celsius.*

NOTE: *METAR information is only displayed within the installed navigation database service area.*

METARs (METeorological Aerodrome Reports) typically contain information about the temperature, dewpoint, wind, precipitation, cloud cover, cloud heights, visibility, and barometric pressure at an airport or observation station. They can also contain information on precipitation amounts, lightning, and other critical data. METARs reflect routine hourly observations; non-routine updates include the code "SPECI" in the report. METARs are shown as colored flags at airports that provide them.



Figure 6-25 METAR Flags on the Weather Data Link (XM) Page

TAFs (Terminal Aerodrome Forecasts) are weather predictions for specific airports typically within a 24-hour period, but may span a longer period. TAFs may include forecast wind, visibility, weather phenomena, and sky conditions using METAR codes.

METAR and TAF text are displayed on the Weather Information Page. METAR data is displayed first in a decoded fashion, followed by the original text. Note the original text may contain additional information not found in the decoded version. TAF information, when available, is displayed only in its original form.

Displaying METAR and TAF text:

1) On the Weather Data Link (XM) Page, press the **METAR** Softkey.
2) Press the **Joystick** and pan to the desired airport.
3) Press the **ENT** Key. The Weather Information Page is shown with METAR and TAF text.
4) Use the **FMS** Knob or the **ENT** Key to scroll through the METAR and TAF text. METAR text must be completely scrolled through before scrolling through the TAF text.
5) Press the **FMS** Knob or the **CLR** Key to return to the Weather Data Link (XM) Page.

Or:

1) Select the Weather Information Page.
   a) Turn the large **FMS** Knob to select the Waypoint Page Group.
   b) Press the **WX** Softkey to select the Weather Information Page.
2) Press the **FMS** Knob to display the cursor.
3) Use the **FMS** Knob to enter the desired airport and press the **ENT** Key.
4) Use the **FMS** Knob or the **ENT** Key to scroll through the METAR and TAF text. Note that the METAR text must be completely scrolled through before scrolling through the TAF text.

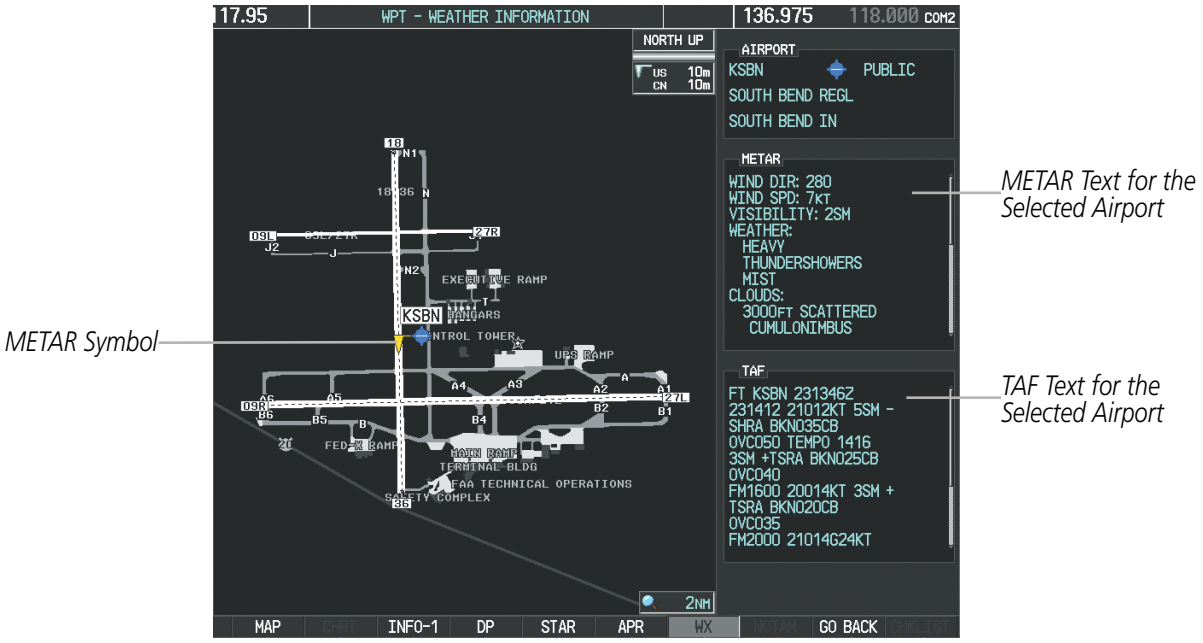


Figure 6-26 METAR and TAF Text on the Weather Information Page

Original METAR text is also accessible while panning the map cursor over a METAR flag on any map page on which a METAR is displayed. The METAR text is shown in a box near the METAR flag.

In addition, METAR flags and their associated text are displayed on the Active Flight Plan Page on the MFD. METAR flags appears next to waypoints in the flight plan with an associated METAR. A solid METAR flag indicates the METAR observations are available for a specific waypoint; a hollow METAR flag indicates an off-route METAR near the waypoint is available.

Displaying original METAR text on the Active Flight Plan Page:

1) Select the Active Flight Plan Page on the MFD.
2) Press the **FMS** Knob to activate the cursor.
3) Turn the large **FMS** Knob to highlight the desired waypoint. The METAR text will appear in the 'SELECTED WAYPOINT WEATHER' window below.
4) When finished, press the **FMS** Knob to remove the cursor or press the **FPL** Key to exit the Active Flight Plan Page.

To display the METAR legend on the Weather Data Link (XM) Page (Figure 6-27), press the **LEGEND** Softkey when METARs are selected for display.

The METAR flag color is determined by the information in the METAR text. A gray METAR flag is displayed when the METAR text does not contain adequate information.

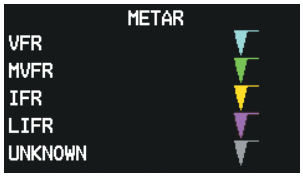


Figure 6-27 METAR Legend

SURFACE ANALYSIS AND CITY FORECAST

NOTE: *Surface Analysis and City Forecast data are displayed only within the installed Aviation Database service area.*

Surface Analysis and City Forecast information is available for current and forecast weather conditions. Forecasts are available for intervals of 12, 24, 36, and 48 hours.

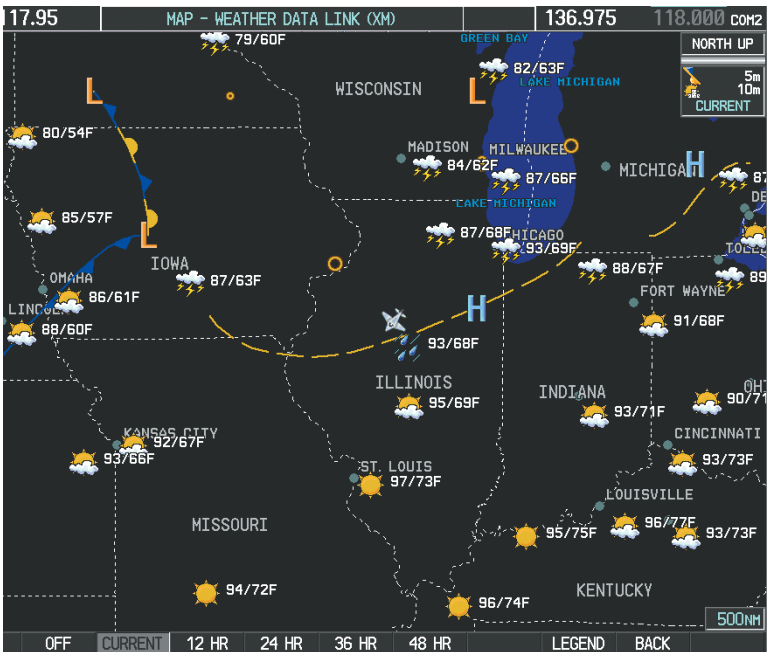


Figure 6-28 Current Surface Analysis Data

Displaying Surface Analysis and City Forecast information:

1) Select the Weather Data Link (XM) Page.
2) Press the **MORE WX** Softkey.
3) Press the **SFC** Softkey.
4) Select the desired forecast time: **CURRENT**, **12 HR**, **24 HR**, **36 HR**, or **48 HR**. The **SFC** Softkey label changes to reflect the forecast time selected.

To display the Surface Analysis and City Forecast legend (Figure 6-29), press the **LEGEND** Softkey when Surface Analysis and City Forecast are selected to be displayed.

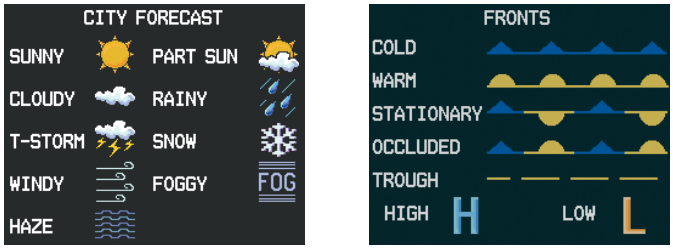


Figure 6-29 Surface Analysis Legend

FREEZING LEVELS

Freezing Level data shows the color-coded contour lines for the altitude and location at which the first isotherm is found (Figure 6-30). When no data is displayed for a given altitude, the data for that altitude has not been received, or is out of date and has been removed from the display. New data appears at the next update.

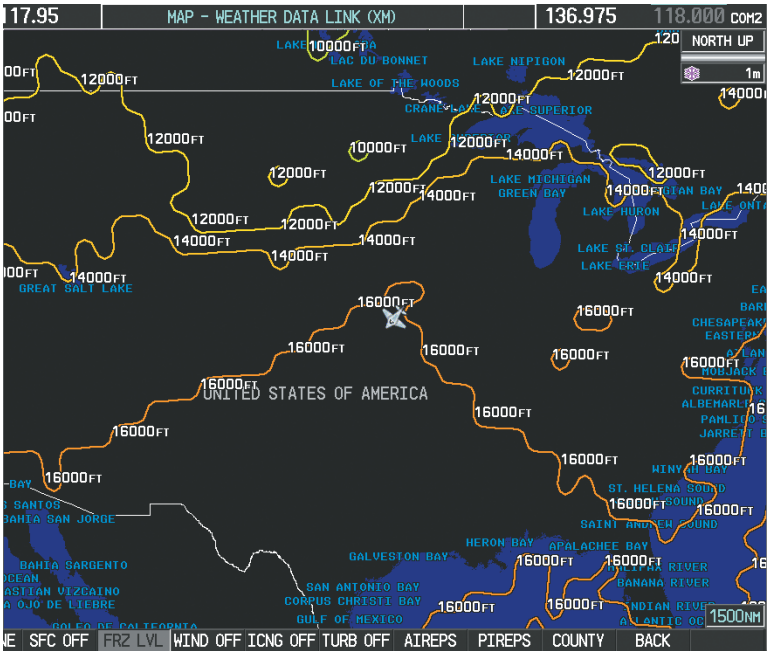


Figure 6-30 Freezing Level Data

Displaying Freezing Level information:

1) Press the Weather Data Link (XM) Page.
2) Press the **MORE WX** Softkey.
3) Press the **FRZ LVL** Softkey.

To display the Freezing Level legend (Figure 6-31), press the **LEGEND** Softkey when Freezing Level data is selected to be displayed.

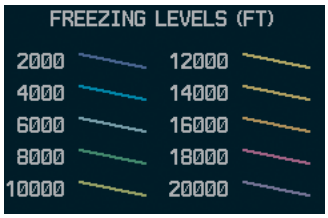


Figure 6-31 Freezing Level Legend

WINDS ALOFT

Winds Aloft data (Figure 6-32) shows the predicted wind speed and direction at the surface and at selected altitudes. Altitude can be displayed in 3,000-foot increments up to 42,000 feet MSL.

Displaying Winds Aloft data:

1) Select the Weather Data Link (XM) Page.
2) Press the **MORE WX** Softkey.
3) Press the **WIND** Softkey.
4) Select the desired altitude level: SFC (surface) up to 42,000 feet. Press the **NEXT** or **PREV** Softkey to cycle through the altitude softkeys. The **WIND** Softkey label changes to reflect the altitude selected.

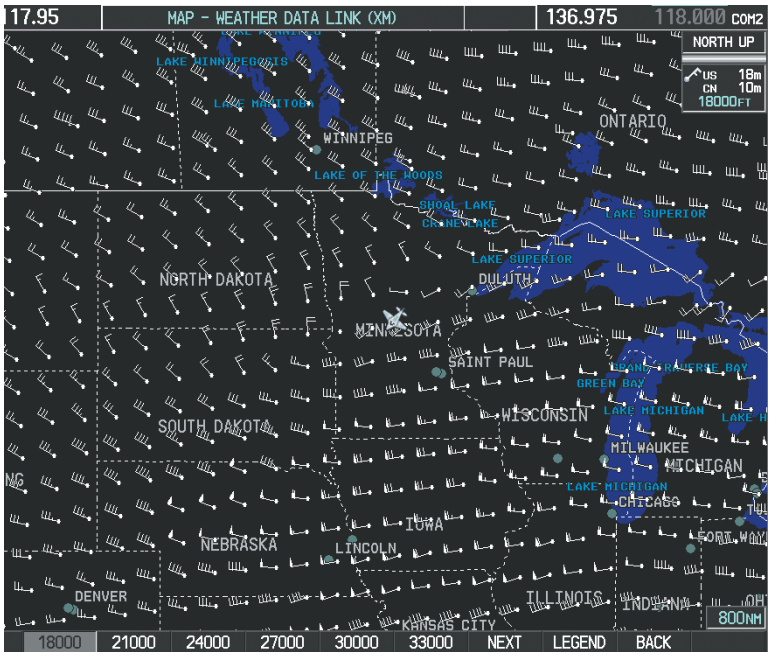


Figure 6-32 Winds Aloft Data at 12,000 Feet

To display the Winds Aloft legend (Figure 6-33), press the **LEGEND** Softkey when Winds Aloft is selected for display.

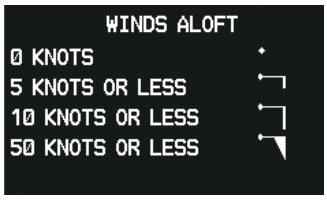


Figure 6-33 Winds Aloft Data with Legend

Headwind and tailwind components aloft are available inside the Profile View on the Navigation Map Page (Figure 6-34). The displayed components are relative to current aircraft altitude and track, but not to aircraft speed.

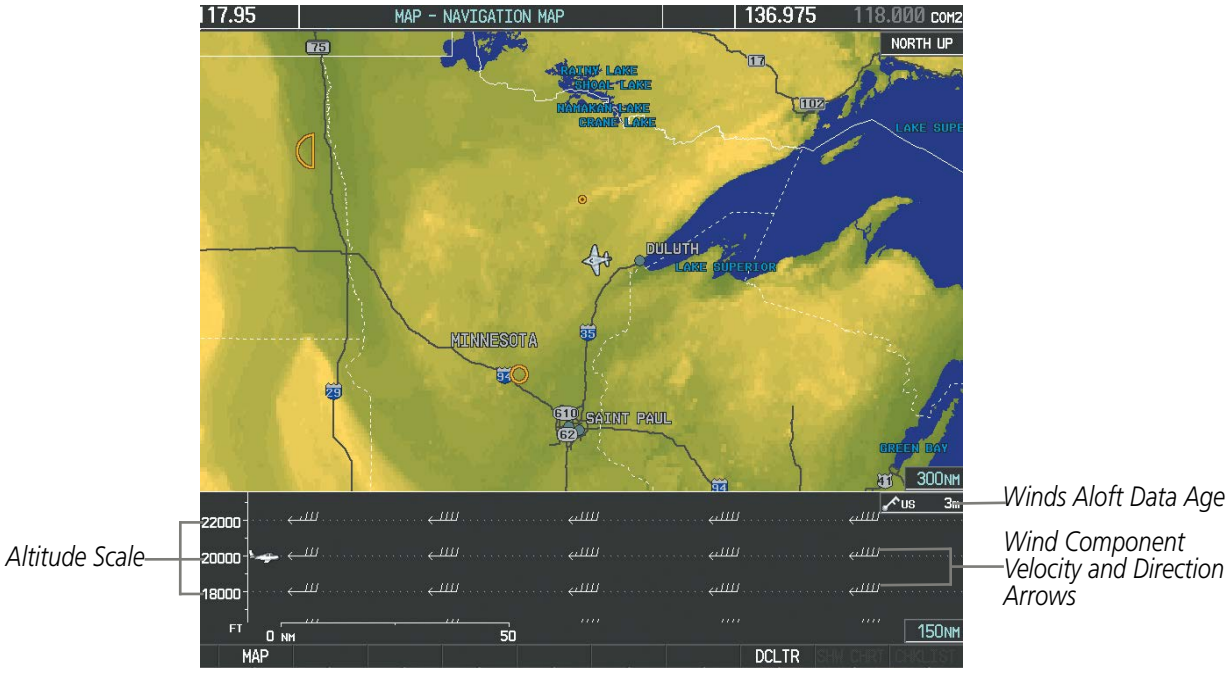


Figure 6-34 Navigation Map Page with Winds Aloft Data on Profile View

Arrows pointing to the left indicate headwind components; tailwind component arrows point to the right, as shown in Table 6-3.

Headwind Symbol	Tailwind Symbol	Headwind/Tailwind Component
None	None	Less than 5 knots
		5 knots
		10 knots
		50 knots

Table 6-3 Profile View Headwind/Tailwind Component Symbols

Showing/Hiding Profile View (containing winds aloft data)

1) Select the Navigation Map Page.
2) Press the **MAP** Softkey.
3) Press the **PROFILE** Softkey.

Or:

1) Select the Navigation Map Page
2) Press the **MENU** Key.
3) Turn the large FMS Knob to highlight 'Show Profile View' or 'Hide Profile View' (choice dependent on current state) and press the **ENT** Key.

Winds Aloft information inside the Profile View is enabled by default when the Profile View is displayed on the Navigation Map Page. This behavior can be changed on the Navigation Map Page.

Enabling/disabling winds aloft data display in Profile View:

1) Select the Navigation Map Page.
2) Press the **MENU** Key.
3) With Map Setup highlighted, press the **ENT** Key (Figure 6-35).
4) Turn the small **FMS** Knob to select the Profile Group and press the **ENT** Key (Figure 6-36).
5) Turn the large **FMS** Knob to select 'Profile Winds' (Figure 6-37).
6) Turn the small **FMS** Knob to select 'On' or 'Off'.
7) Press the **FMS** Knob or **CLR** Key to return to the Navigation Map Page with the changed settings.

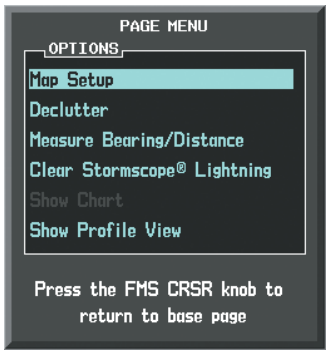


Figure 6-35 Navigation Map Page Menu



Figure 6-36 Navigation Map Page Setup Menu



Figure 6-37 Navigation Map Page Setup Menu, Weather Group

COUNTY WARNINGS

The County weather product (Figure 6-38) provides specific public awareness and protection weather warnings from the National Weather Service (NWS) for severe thunderstorms, tornadoes, and flood conditions.

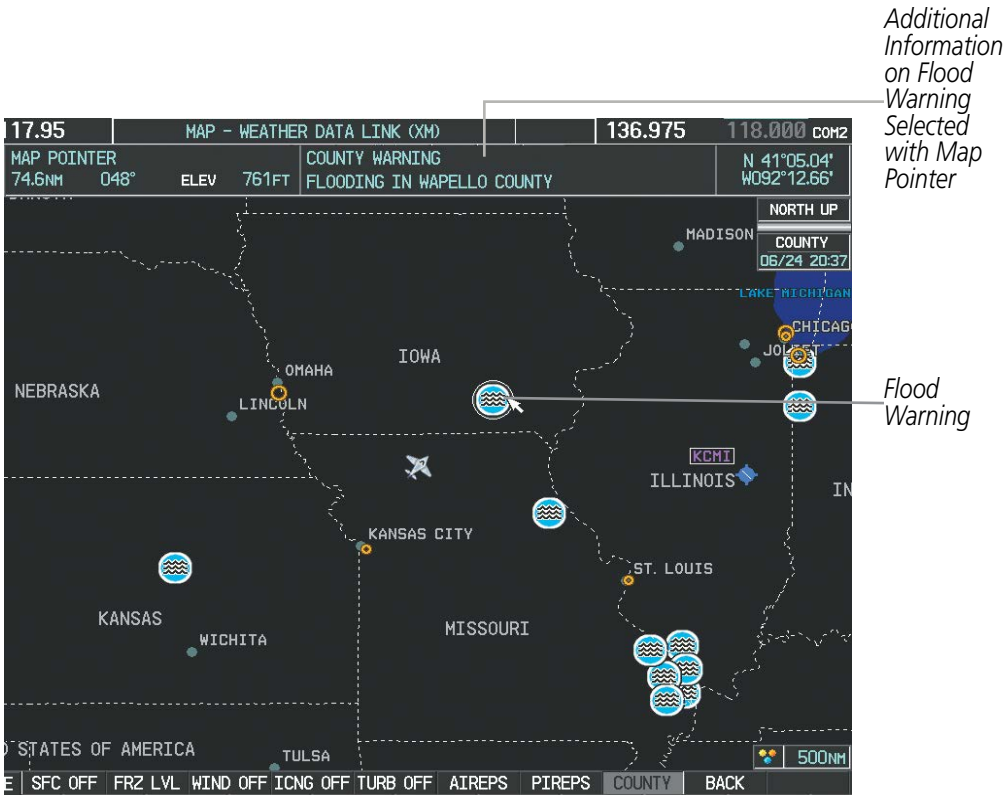


Figure 6-38 County Flood Warning

Displaying County Warning information:

1) Select the Weather Data Link (XM) Page.
2) Press the **MORE WX** Softkey.
3) Press the **COUNTY** Softkey.

To display the County Warnings legend (Figure 6-39), press the **LEGEND** Softkey when County Warnings are selected to be displayed.

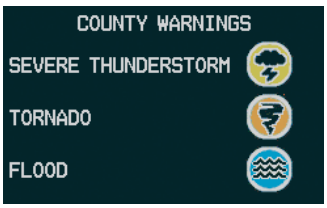


Figure 6-39 County Warnings Legend

CYCLONE

The Cyclone weather product (Figure 6-40) shows the current location of cyclones (hurricanes) and tropical storms using the symbol shown below (Figure 6-40). Storm tracks include the predicted date and time of arrival inside orange boxes.



Figure 6-40 Cyclone Data Selected for Display

Displaying cyclone (hurricane) track information:

1) Select the Weather Data Link (XM) Page.
2) Press the **MORE WX** Softkey.
3) Press the **CYCLONE** Softkey.

To display the Cyclone legend (Figure 6-41), press the **LEGEND** Softkey when the Cyclone weather product is enabled.

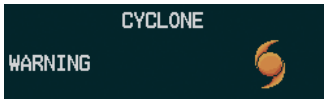


Figure 6-41 Cyclone Legend

NOTE: *If a GDL 69A SXM receiver is installed, the Cyclone weather product is not available unless at least one cyclone or tropical storm has been received. The weather product age indicates 'N/A' when no cyclone or tropical storm has been received.*

ICING (CIP & SLD)

NOTE: *Icing data cannot be displayed at the same time as NEXRAD data is displayed.*

Current Icing Product (CIP) data shows a graphical view of the current icing environment (Figure 6-42). Icing severity is displayed in four categories: light, moderate, severe, and extreme (not specific to aircraft type). The CIP product is not a forecast, but a presentation of the current conditions at the time of the analysis.

Supercooled Large Droplet (SLD) icing conditions are characterized by the presence of relatively large, super cooled water droplets indicative of freezing drizzle and freezing rain aloft. SLD threat areas are depicted as magenta dots over the CIP colors.

Displaying Icing data:

1) Select the Weather Data Link (XM) Page.
2) Press the **MORE WX** Softkey.
3) Press the **ICNG** Softkey.
4) Select the desired altitude level: 1,000 feet up to 30,000 feet. Press the **NEXT** or **PREV** Softkey to cycle through the altitude softkeys. The **ICNG** Softkey label changes to reflect the altitude selected.

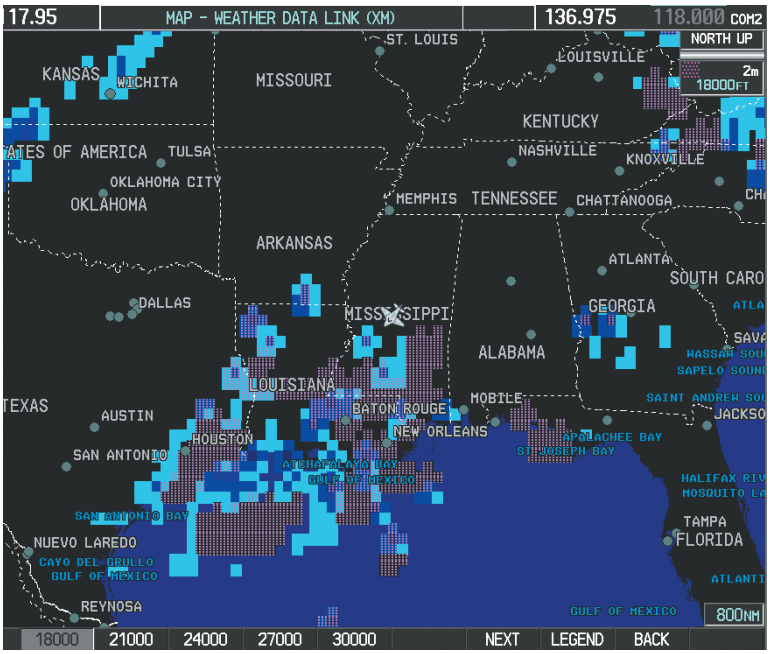


Figure 6-42 Icing Data at 18,000 Feet

To display the Icing Potential legend (Figure 6-43), press the **LEGEND** Softkey when Icing is selected for display.

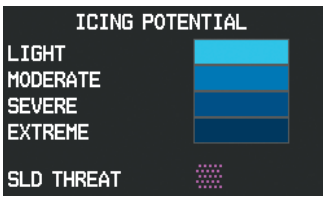


Figure 6-43 Icing Potential Legend

TURBULENCE

NOTE: *The Turbulence weather product cannot be displayed at the same time as the NEXRAD weather product is selected for display.*

The Turbulence weather product identifies the potential for erratic movement of high-altitude air mass associated winds. Turbulence is classified as light, moderate, severe or extreme, at altitudes between 21,000 and 45,000 feet. Turbulence information is intended to supplement AIRMETs and SIGMETs.

Displaying the Turbulence weather product:

1) Select the Weather Data Link (XM) Page.
2) Press the **MORE WX** Softkey.
3) Press the **TURB** Softkey.
4) Select the desired altitude level: 21,000 feet up to 45,000 feet. Press the **NEXT** or **PREV** Softkey to cycle through the altitude softkeys. The **TURB** Softkey label changes to reflect the altitude selected.

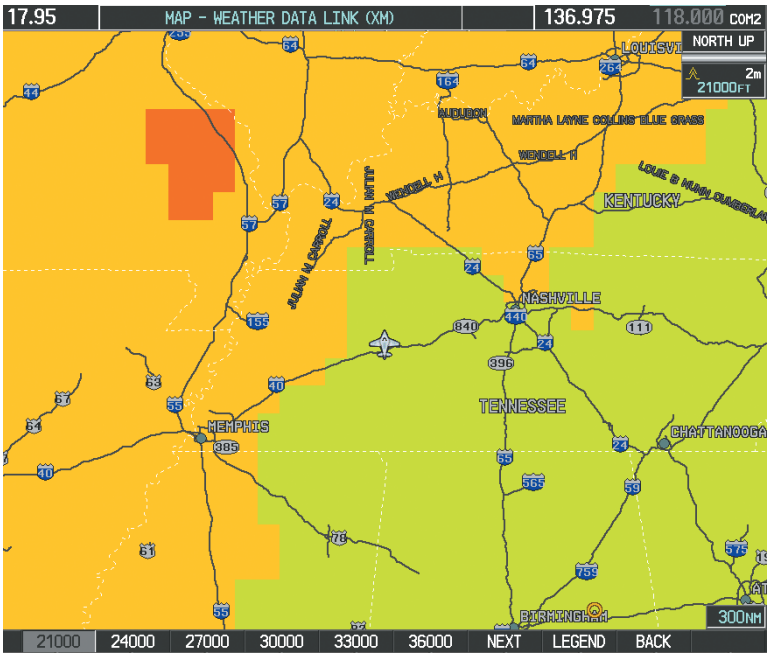


Figure 6-44 Turbulence Data at 21,000 Feet

To display the Turbulence legend (Figure 6-45), press the **LEGEND** Softkey when Turbulence is selected for display.

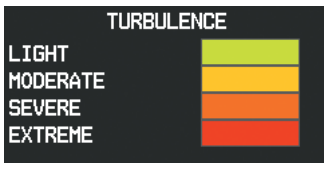


Figure 6-45 Turbulence Legend

PIREPS AND AIREPS

Pilot Weather Reports (PIREPs) are airborne weather reports collected from pilots. When significant weather conditions are reported or forecast, Air Traffic Control (ATC) facilities are required to solicit PIREPs. A PIREP may contain adverse weather conditions, such as low in-flight visibility, icing conditions, wind shear, and turbulence. PIREPs are issued as either Routine (UA) or Urgent (UUA).

Another type of PIREP is an Air Report (AIREP). Commercial airlines typically generate AIREPs.

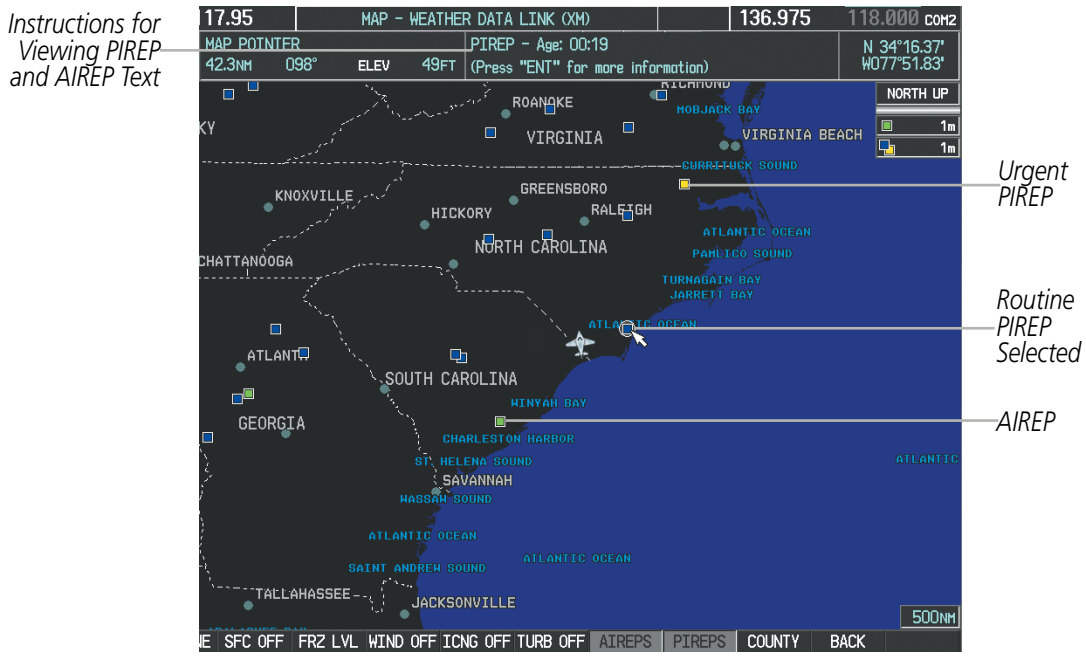


Figure 6-46 AIREPs and PIREPs on the Weather Data Link (XM) Page

Displaying PIREP and AIREP text:

1) Select the Weather Data Link (XM) Page.
2) Press the **MORE WX** Softkey.
3) Press the **AIREPS** or **PIREPS** Softkey.
4) Press the **Joystick** and pan to the desired weather report. A gray circle will appear around the weather report when it is selected.
5) Press the **ENT** Key. The Weather Information Page is shown with PIREP or AIREP text. The data is first displayed in a decoded fashion, followed by the original text. Note the original text may contain additional information not found in the decoded version.
6) Use the **FMS** Knob or the **ENT** Key to scroll through the PIREP or AIREP text.
7) Press the **FMS** Knob or the **CLR** Key to return to the Weather Data Link (XM) Page.

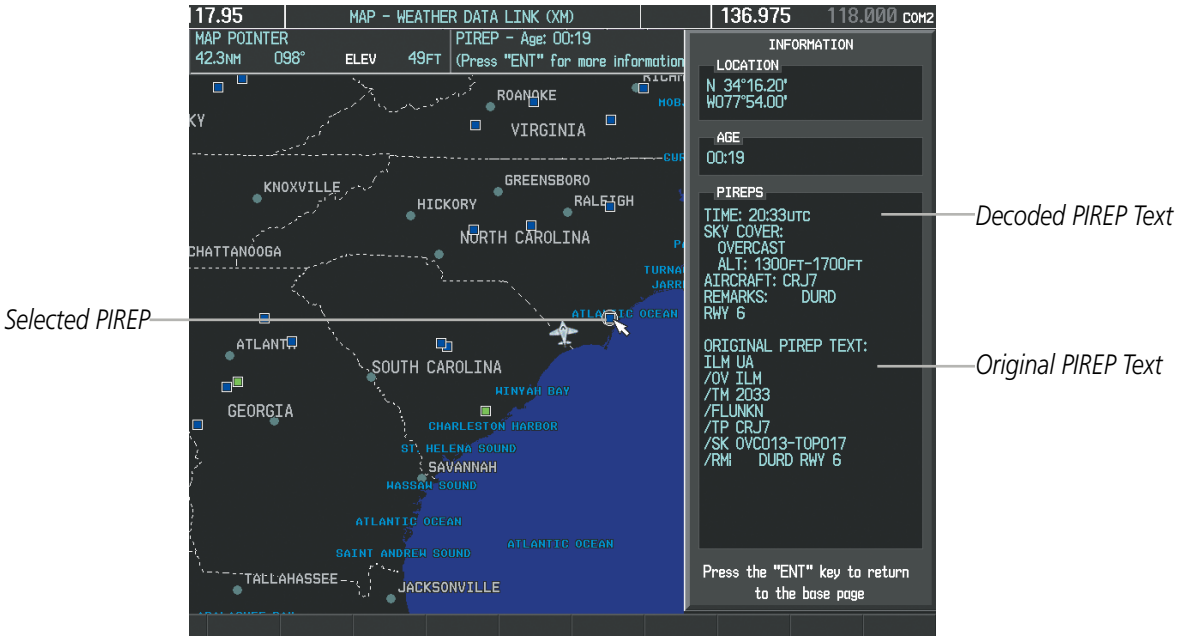


Figure 6-47 PIREP Text on the Weather Information Page

To display the PIREP or AIREP legend (Figure 6-48), press the **LEGEND** Softkey when PIREPs or AIREPs are selected for display.

The PIREP color is determined by the type (routine or urgent).



Figure 6-48 AIREPs & PIREPs Legend

TEMPORARY FLIGHT RESTRICTIONS (TFRS)

NOTE: *Do not rely solely upon data link services to provide Temporary Flight Restriction (TFR) information. Always confirm TFR information through official sources such as Flight Service Stations or Air Traffic Control.*

The Federal Aviation Administration (FAA) issues TFRs to designate areas where flight is restricted. TFRs are issued to restrict flight for a variety of reasons including national security, law enforcement, firefighting operations, airshows, and large sporting events. TFRs may be issued at any time, and TFR data displayed on the system is only intended to supplement TFR information obtained from official sources including Flight Service Stations (FSS), and air traffic control.

The system does not display the age TFR product was assembled on the ground by the data provider is not shown; however, if TFR product is not available or has expired, the system displays 'TFR N/A' in the upper-left corner of maps on which the display of TFR information is enabled.

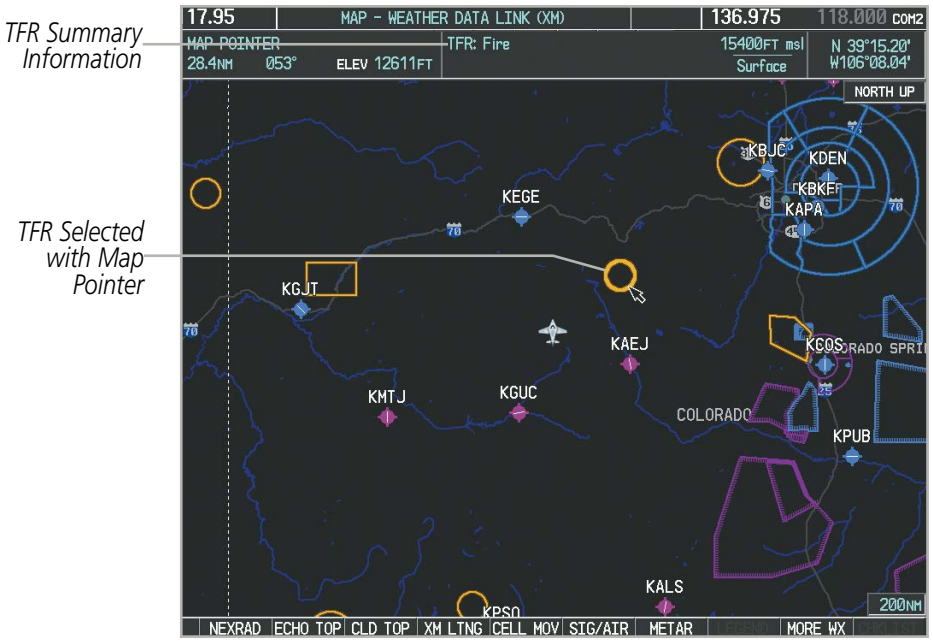


Figure 6-49 TFR Data on the Weather Data Link (XM) Page

Displaying TFR Data:

1) Select the Weather Data Link (XM) Page or Navigation Map Page.
2) Press the **Joystick** and pan the map pointer over a TFR to highlight it. The system displays TFR summary information above the map.
3) Press the **ENT** Key. The system displays a pop-up menu.
4) If necessary, turn the **FMS** Knob to select 'Review Airspaces' and press the **ENT** Key. The system displays the TFR Information window.
5) Press the **FMS** Knob or the **CLR** Key to remove the TFR Information window.

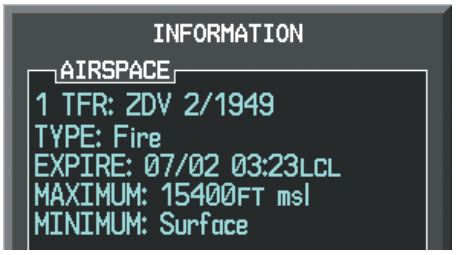


Figure 6-50 Full Text for Selected TFR

The setup menus for the Navigation Map Page control the map range settings above which TFR data is decluttered from the display. If a map range larger than the TFR product map range setting is selected, the TFR product data is removed from the map.

Maps other than the Navigation Map Page use settings based on those selected for the Navigation Map Page.

Setting up and customizing TFR data for maps on which TFR data can be displayed:

1) Select the Navigation Map Page.
2) Press the **MENU** Key.
3) With Map Setup highlighted, press the **ENT** Key (Figure 6-51).
4) Turn the small **FMS** Knob to select the Aviation Group and press the **ENT** Key (Figure 6-52).
5) Turn the large **FMS** Knob to scroll to the TFR product range setting (Figure 6-53).
6) Turn the small **FMS** Knob to scroll through options (Off, range settings).
7) Press the **ENT** Key to select an option.
8) Press the **FMS** Knob or **CLR** Key to return to the Navigation Map Page with the changed settings.

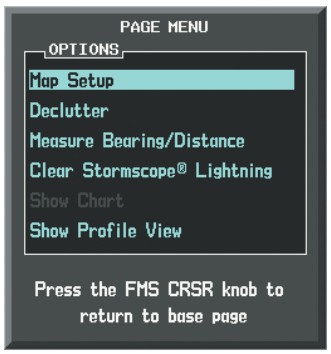


Figure 6-51 Navigation Map Page Menu



Figure 6-52 Navigation Map Page Setup Menu

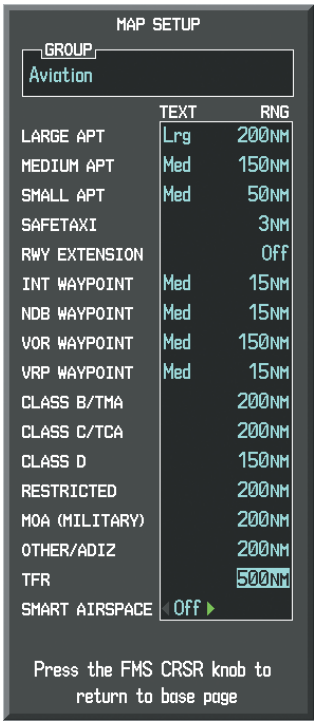


Figure 6-53 Navigation Map Page Setup Menu, Aviation Group

6.2 GARMIN CONNEXT WEATHER

WARNING: *Do not use data link weather information for maneuvering in, near, or around areas of hazardous weather. Information contained within data link weather products may not accurately depict current weather conditions.*

WARNING: *Do not use the indicated data link weather product age to determine the age of the weather information shown by the data link weather product. Due to time delays inherent in gathering and processing weather data for data link transmission, the weather information shown by the data link weather product may be significantly older than the indicated weather product age.*

NOTE: *The availability of specific Garmin Connext Weather products varies by region. For product coverage information, refer to http://fly.garmin.com/fly-garmin/connext/worldwide-weather/.*

The optional GSR 56 Iridium satellite data link receiver provides extensive weather information to the system through the Garmin Connext™ Weather service. The system displays graphical weather information and its associated text on the Multi Function Display (MFD) and the Primary Flight Display (PFD) Inset Map.

The system provides weather information after the flight crew selects either a manual or automatic Connext Data Request on the Weather Data Link (CNXT) Page on the MFD.

Garmin Connext Weather requires an active subscription to both the Iridium (satellite telephone) and Garmin Connext Weather services.

ACCESSING GARMIN CONNEXT WEATHER PRODUCTS

The primary map for viewing Garmin Connext Weather information is the Weather Data Link (CNXT) Page in the Map Page Group (Figure 6-57). This is the only map display capable of showing information for all available Garmin Connext weather products, with the exception of TAFs, which are discussed later. No weather data is displayed until an initial Connext Weather Data Request has been completed.

Viewing the Weather Data Link (CNXT) Page:

1) Turn the large **FMS** Knob to select the Map Page Group.
2) Turn the small **FMS** Knob to select the Weather Data Link (CNXT) Page. If the name of another weather data service provider is listed in the page title (such as 'XM'), proceed to the next step.
3) Press the MENU Key.
4) Turn the large **FMS** Knob to select 'Display Connext Weather' and and press the **ENT** Key. The page title changes to 'Weather Data Link (CNXT)' to indicate Garmin Connext is now the selected weather source.

REGISTERING THE IRIDIUM SATELLITE SYSTEM

Before setting up an Iridium account, obtain the serial number of the Iridium Transceiver (GSR1) and the System ID by selecting the AUX- SYSTEM STATUS Page as shown in Figure 6-54. Contact Garmin at 1-866-739-5687 in the United States or 913-397-8200, ext. 1135 with this information. Note the access code Garmin provides during this process.



Figure 6-54 Identification Needed for Iridium Registration

REGISTERING THE SYSTEM FOR GARMIN CONNEXT WEATHER

After a subscriber account has been established, the system must be registered to receive Garmin Connext Weather data. Registration is accomplished by entering the required access code provided by Garmin. This process is only performed when initially setting up the system for Garmin Connext Weather.

Registering the system to receive Garmin Connext Weather:

1) With the aircraft outside and having a clear view of the sky, turn the large **FMS** Knob on the MFD to select the MAP page group.
2) Turn the small **FMS** Knob to select the MAP-WEATHER DATA LINK (CNXT or XM) Page. If 'XM' is displayed in the page title, it will be necessary to change the data link weather source to Garmin Connext (CNXT) before continuing. Refer to 'Viewing the Weather Data Link (CNXT) Page' procedure to change the data link weather source to Garmin Connext prior to registration.
3) If the system displays the 'CONNEXT REGISTRATION' Window, proceed to step 7. Otherwise, press the **MENU** Key. The Page Menu window is now displayed as seen in Figure 6-55.

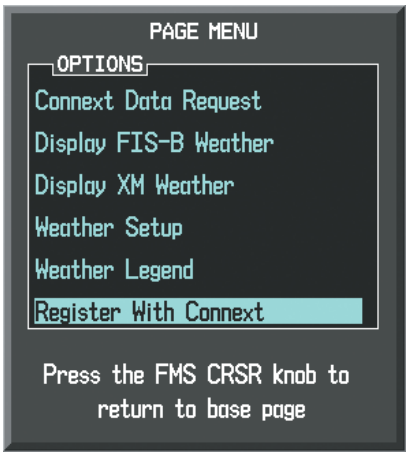


Figure 6-55 Select 'Register With Connext'

4) Turn the large **FMS** Knob to select 'Register With Connext' in the menu list.

5) Press the **ENT** Key. The system displays the CONNEXT REGISTRATION Window as shown in Figure 6-56.

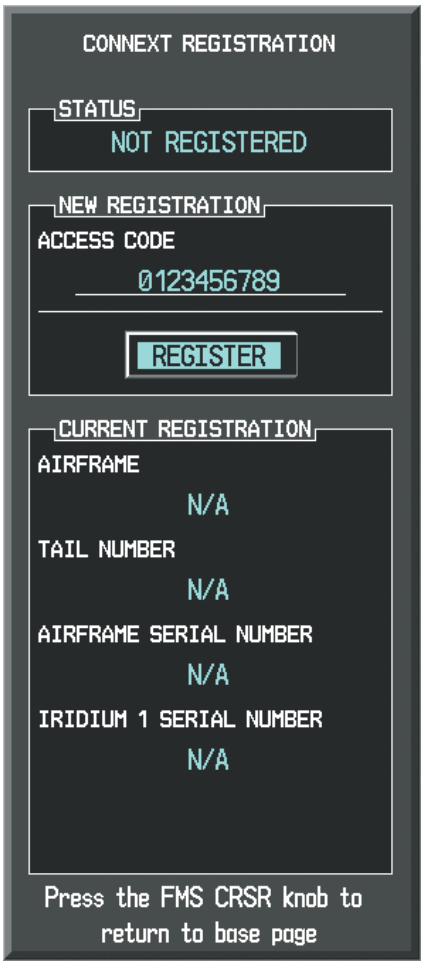
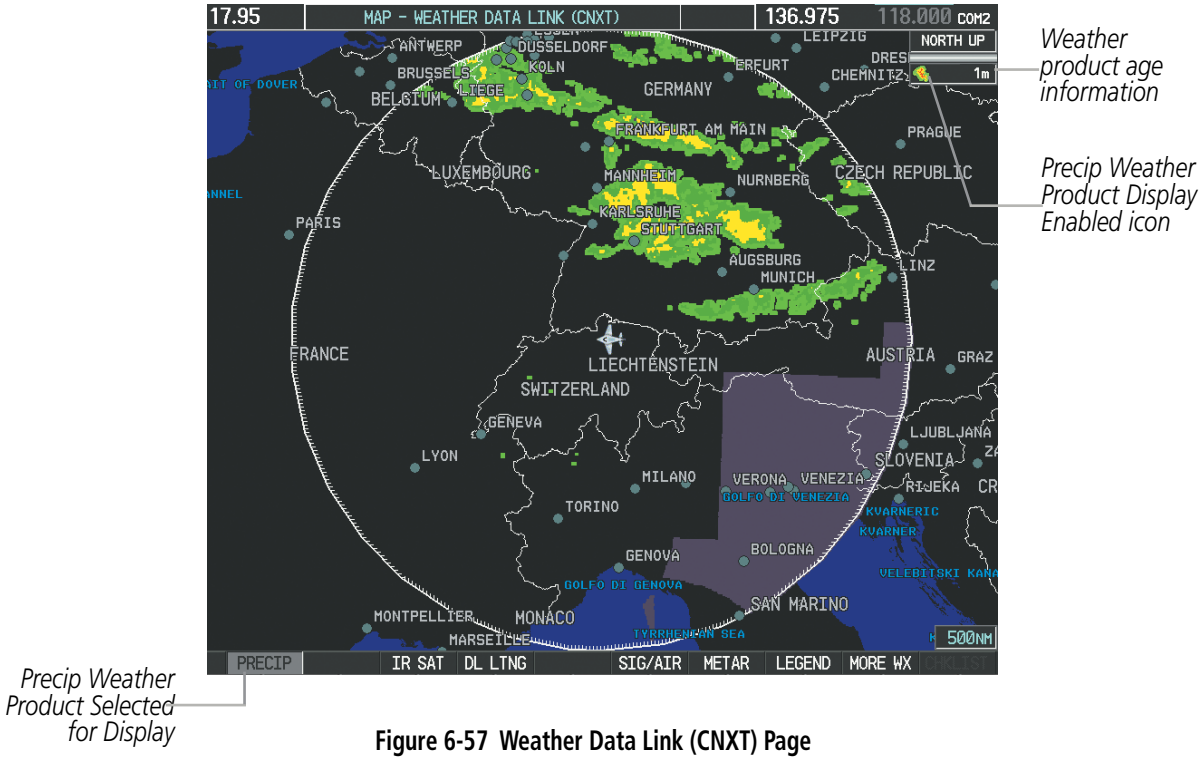


Figure 6-56 Enter Access Code

6) Enter the access code provided by Garmin customer service in the ACCESS CODE field.

7) Press the **ENT** Key. 'REGISTER' will now be highlighted as in Figure 6-56.

8) Press the **ENT** Key. The system contacts Garmin Connext services. System registration is complete when 'REGISTERED' is displayed in the STATUS field.



Weather product age information

Precip Weather Product Display Enabled icon

Precip Weather Product Selected for Display

Figure 6-57 Weather Data Link (CNXT) Page (After Connext Data Request)

When a weather product is selected for display on the Weather Data Link (CNXT) Page, a box containing a symbol for the product and its age (in minutes) are shown in the upper right (Figure 6-57). If weather data has not been requested yet or is not available, 'N/A' is shown next to the product symbol instead of age. The age of the weather product is based on the time difference between when the data was assembled on the ground and the current GPS time. Weather products are updated continuously or refreshed at specific intervals (defined in the **Refresh Rate** column in Table 6-4).

If for any reason, a weather product is not refreshed within the defined **Expiration Time** intervals (see Table 6-4), the data is considered expired and is removed from the display. The age of the expired product is replaced by dashes. If more than half of the expiration time has elapsed, the color of the product age changes to amber. Table 6-4 shows the Garmin Connext weather product symbols, the expiration time and the refresh rates. The refresh rate represents the interval at which the Garmin Connext ground-based servers make available the most current known weather data. It does not necessarily represent the rate at which new content is received from weather sources.

NOTE: *The availability of specific Garmin Connext Weather products varies by region. For product coverage information, refer to http://fly.garmin.com/fly-garmin/connext/worldwide-weather/.*

Garmin Connext Weather Product	Symbol	Expiration Time (Minutes)	Refresh Rate (Minutes)
Radar Precipitation (PRECIP)		30	U.S.: 3* Canada: 3*† Europe: 15 Australia: 15ˆ
Infrared Satellite (IR SAT)		60	30
Data Link Lightning (DL LTNG)		30	Continuous
SIGMETs/AIRMETs (SIG/AIR)		60	Continuous
Meteorological Aerodrome Report (METARs)		90	Continuous
Winds Aloft (WIND)		60	Continuous
Pilot Weather Report (PIREPs)		90	Continuous
Temporary Flight Restrictions (TFRs)	no product image	60	Continuous
Terminal Aerodrome Reports (TAFs)	no product image	60	Continuous

** The precipitation mosaic is updated every 3 minutes, but individual radar sites may take between 3 and 10 minutes to provide new data.*
† Canadian radar precipitation data provided by Environment Canada.
ˆ Australian radar precipitation data provided by the Australia Bureau of Meteorology

Table 6-4 Garmin Connext Weather Product Symbols and Data Timing

Table 6-5 shows which Garmin Connext Weather products can be displayed (indicated with a '+' symbol) on specific maps.

Garmin Connext Weather Product	PFD Inset Map	Navigation Map Page	Weather Data Link (CNXT) Page	Weather Information Page	AUX - Trip Planning Page	AUX - Video Page	Nearest Page Group	Flight Plan Pages
Precipitation (PRECIP)	+	+	+		+	+	+	+
Infrared Satellite (IR SAT)			+					
Garmin Connext Lightning (DL LTNG)	+	+	+		+		+	+
SIGMETs/AIRMETs (SIG/AIR)			+					
METARs	+	+	+	+	+	+	+	+
Winds Aloft (WIND)		+	+*					
PIREPs			+	+				
Radar Coverage	+	+	+					
TFRs	+	+	+	+	+	+	+	+
TAFs				+				

** Winds Aloft data available on Navigation Map Page inside Profile View window.*

Table 6-5 Garmin Connext Weather Product Display Maps

Softkeys control the display of weather information on most MFD pages and the PFD Inset Map (Figure 6-58 shows the weather product softkeys for the Weather Data Link (CNXT) Page). When a weather product is selected for display, the corresponding softkey label changes to gray to indicate the product display is enabled.

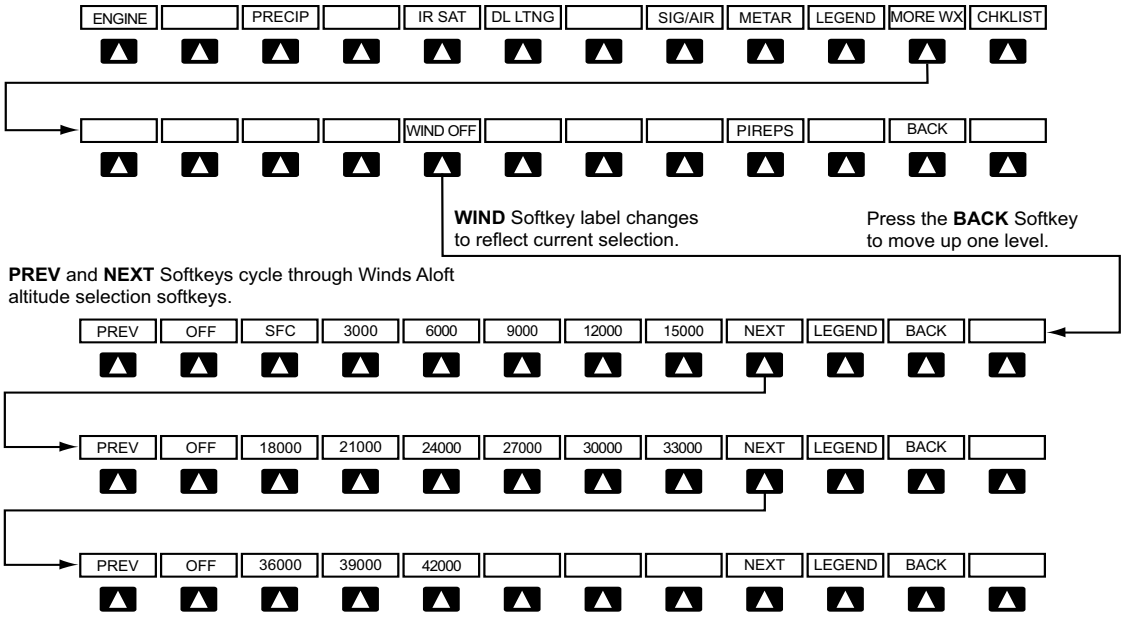


Figure 6-58 Weather Data Link (CNXT) Page Softkeys (MFD)

The setup menus for the Navigation Map Page and the Weather Data Link (CNXT) Page control the map range settings above which weather products data are decluttered from the display. If a map range larger than the weather product map range setting is selected, the weather product data is removed from the map. The menus also provide a means in addition to the softkeys for enabling/disabling display of weather products.

Setting up and customizing the Weather Data Link (CNXT) Page:

1) Select the Weather Data Link (CNXT) Page.
2) Press the **MENU** Key.
3) With 'Weather Setup' highlighted, press the **ENT** Key (Figure 6-59).
4) Turn the small **FMS** Knob to select 'PRODUCT GROUP 1' or 'PRODUCT GROUP 2', and press the **ENT** Key (Figure 6-60).
5) Turn the large **FMS** Knob or press the **ENT** Key to scroll through product selections.
6) Turn the small **FMS** Knob to scroll through options for each product (ON/OFF, range settings, etc.).
7) Press the **ENT** Key to select an option.
8) Press the **FMS** Knob or **CLR** Key to return to the Weather Data Link (CNXT) Page with the changed settings.

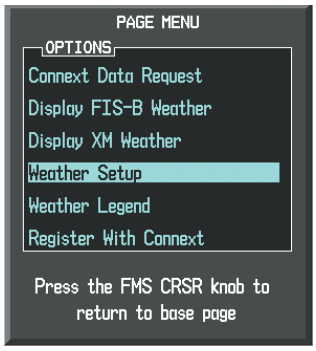


Figure 6-59 Weather Data Link (CNXT) Page Menu



Figure 6-60 Weather Data Link (CNXT) Page Setup Menu

Restoring default Weather Data Link (CNXT) Page settings:

1) Select the Weather Data Link (CNXT) Page.
2) Press the **MENU** Key.
3) With 'Weather Setup' highlighted, press the **ENT** Key.
4) Press the **MENU** Key.
5) Highlight the desired default(s) to restore (all or for selection) and press **ENT** Key.

If multiple data link weather services are installed, customizing the display settings for the corresponding weather products shown in Table 6-6 will result in identical settings for a comparable weather product from another service provider.

SiriusXM Weather Product and Softkey	Garmin Connext Weather Product	FIS-B Weather Product
Next-generation Radar (NEXRAD) and No Radar Coverage	Precipitation (PRECIP) and No Radar Coverage	Next-generation Radar (NEXRAD) and No Radar Coverage
Cloud Top (CLD TOP)	Infrared Satellite (IR SAT)	Not Available
SiriusXM Lightning (XM LTNG)	Garmin Connext Data Link Lightning (DL LTNG)	Not Available
SIGMETs/AIRMETs (SIG/AIR)	SIGMETs/AIRMETs (SIG/AIR)	SIGMETs/AIRMETs (SIG/AIR)
Meteorological Aerodrome Report (METARs)	Meteorological Aerodrome Report (METARs)	Meteorological Aerodrome Report (METARs)
Winds Aloft (WIND)	Winds Aloft (WIND)	Winds Aloft (WIND)
Pilot Weather Report (PIREPs)	Pilot Weather Report (PIREPs)	Pilot Weather Report (PIREPs)

Table 6-6 Weather Data Link Map Settings Shared for Multiple Weather Data Link Sources

Maps besides the Weather Data Link (CNXT) Page use settings based on those selected for the Navigation Map Page.

Setting up and customizing weather data for the Navigation Map Page:

1) Select the Navigation Map Page.
2) Press the **MENU** Key.
3) With 'Map Setup' highlighted, press the **ENT** Key (Figure 6-61).
4) Turn the small **FMS** Knob to select the 'Weather' Group and press the **ENT** Key (Figure 6-62).
5) Turn the large **FMS** Knob or press the **ENT** Key to scroll through product selections (Figure 6-63).
6) Turn the small **FMS** Knob to scroll through options for each product (ON/OFF, range settings).
7) Press the **ENT** Key to select an option.
8) Press the **FMS** Knob or **CLR** Key to return to the Navigation Map Page with the changed settings.

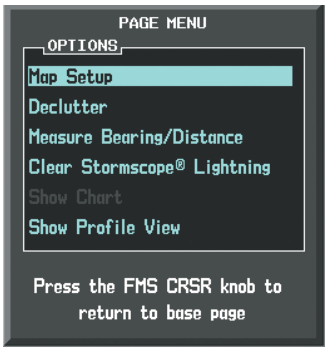


Figure 6-61 Navigation Map Page Menu



Figure 6-62 Navigation Map Page Setup Menu

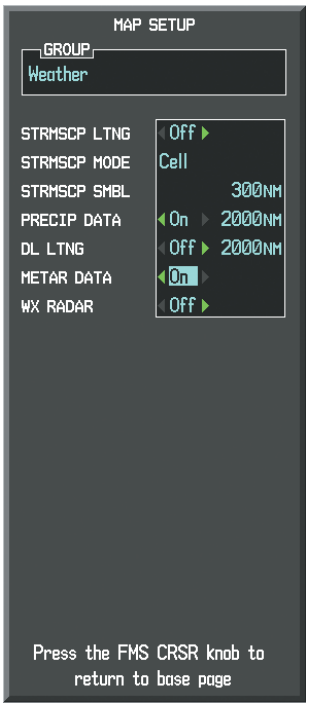


Figure 6-63 Navigation Map Page Setup Menu, Weather Group

Each active weather product has an associated legend which can be displayed on the Weather Data Link (CNXT) Page. If no weather product softkeys are selected, the **LEGEND** Softkey will be unavailable.

Viewing legends for displayed weather products

1) Select the Weather Data Link (CNXT) Page.
2) Press the **LEGEND** Softkey to display the legends for the displayed weather products.

   Or:

   a) Press the **MENU** Key.

   b) Select 'Weather Legend' and press the **ENT** Key.
3) Turn the **FMS** Knob to scroll through the legends if more are available than fit in the window.
4) To remove the Legend Window, press the **LEGEND** Softkey, the **ENT** or the **CLR** Key, or press the **FMS** Knob.

Additional information about the following can be displayed by panning over the display on the map:

- Infrared Satellite (IR SAT)
- SIGMETs
- AIRMETs
- METARs
- TFRs
- PIREPs

The map panning feature is enabled by pressing the **Joystick**. The map range is adjusted by turning the **Joystick**. If the map range is adjusted while panning is enabled, the map is re-centered on the Map Pointer.



Figure 6-64 Panning on the Weather Data Link (CNXT) Page

CONNEXT WEATHER DATA REQUESTS

The Connext Data Request window provides the flight crew with the options to enable or disable the requested weather coverage area(s), choose automatic weather update intervals (if desired), and the ability to send or cancel weather data requests. The status of the Connext Data Request process is also displayed.

Before a Connext Data Request can occur, a valid request coverage area must be defined from which all currently available Garmin Connext weather products will be retrieved. At a minimum, either the aircraft's present position or a waypoint (as part of a flight plan or entered directly in the 'WAYPOINT' coverage field) must be part of the request coverage area, otherwise the request status window will indicate 'INVALID COVERAGE AREA' and the system will not allow a request to occur.

It is not necessary for a destination (based on an active flight plan), a flight plan, or waypoint to be specified prior to enabling these coverage areas; however no weather data will be retrieved for these option(s) until a flight plan or waypoint is provided, respectively.

Requesting Garmin Connext weather data manually:

1) Select the Weather Data Link (CNXT) Page.
2) Press the **MENU** Key.
3) With 'Connext Data Request' highlighted, press the **ENT** Key (Figure 6-65).
4) Turn the large **FMS** Knob to highlight the desired coverage option(s) and press the **ENT** Key to select or deselect one of more of the following coverage selections (Figures 6-66, 6-67):

   • PRESENT POSITION – Requests data based on current location.

   • DESTINATION – Requests data based on the active flight plan destination (Direct-To destinations excluded). See the Flight Management section for more information about entering and activating flight plans.

- FPL – Requests data along an active flight plan, if one exists. Turn the small **FMS** Knob to select the desired flight plan look-ahead distance option (or choose 'REMAINING FPL' to request the remainder of the flight plan), then press the **ENT** Key.
- WAYPOINT – Requests data based on a waypoint (which may be off-route). Turn the large and small **FMS** Knobs to enter a waypoint, then press the **ENT** Key.

5) Turn the large **FMS** Knob highlight to the 'DIAMETER / RTE WIDTH' (diameter/route width) distance field and turn the small **FMS** Knob to select the desired diameter and route width of the request, then press the **ENT** Key.

6) Turn the large **FMS** Knob until the 'SEND REQ' button is highlighted. Press the **ENT** Key to initiate the request immediately or press the **FMS** Knob to return to the Weather Data Link (CNXT) Page without requesting weather data.

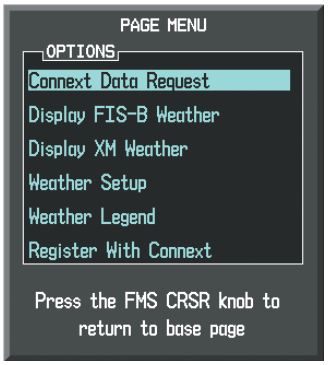


Figure 6-65 Weather Data Link (CNXT) Page Menu

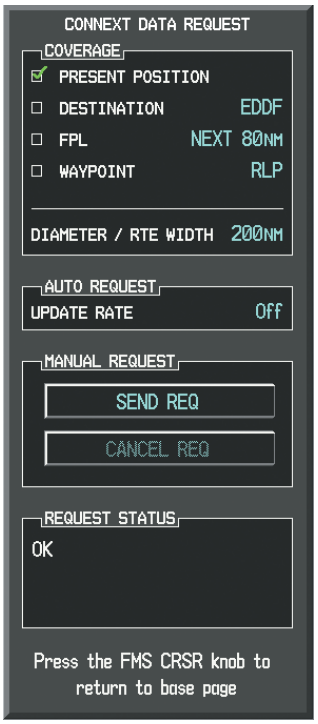
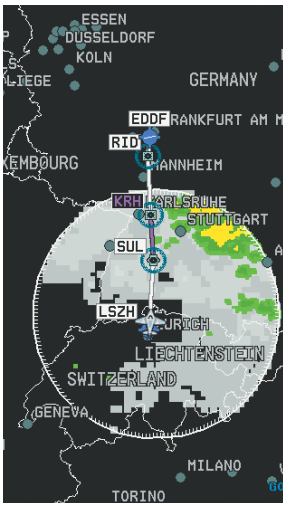
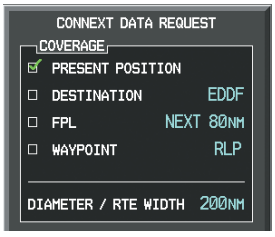
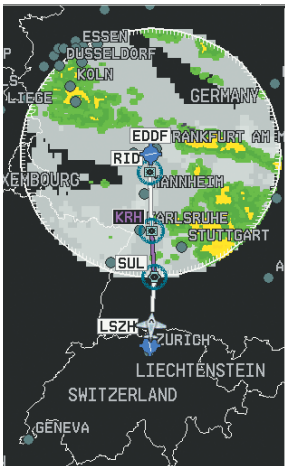


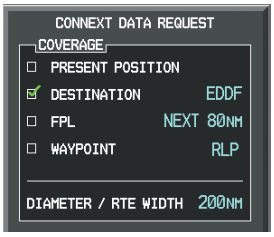
Figure 6-66 Connext Data Request Window



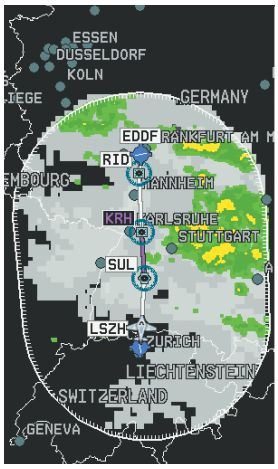


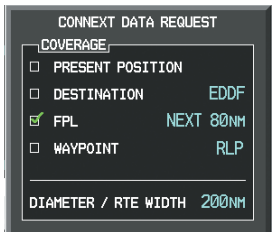
Present Position Selected, 200 nm Diameter Requested



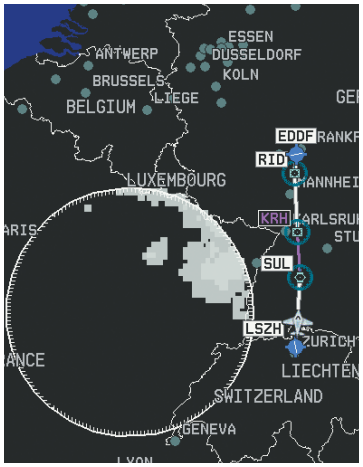


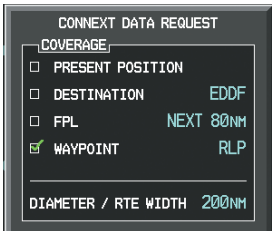
Destination Selected, 200 nm Diameter Requested





Next 80 nm of Flight Plan Selected, 200 nm Route Width Requested





Off-Route Waypoint Selected, 200 nm Diameter Requested

Figure 6-67 Connext Data Request Results with Precipitation and Infrared Satellite Displayed

During a Connext Data Request, the Request Status box initially displays "Contacting Connext...". Once a connection is established, the Request Status Box displays "Receiving Wx Data... Time Remaining:" with an estimated data transfer time (either minutes or seconds). If desired, the Connext Data Request window may be closed while the data request is processing by pressing the **FMS** Knob; the data request will continue to process in the background. Connext Data Requests typically take between 1 to 4 minutes to complete depending on the size of the selected weather coverage area and Iridium signal strength.

The system retrieves all available Garmin Connext Weather products within the selected coverage area during an initial Connext Data Request, regardless of which products (if any) are currently enabled for display. On subsequent requests, previously retrieved textual data (such as METARs and TAFS) is retained if it has not expired, while new textual weather data matching the current coverage area and all graphical weather data is downloaded during every data request.

At the completion of a successful weather data request, the request status window (if still open) will indicate 'OK'.

Cancelling a Connext Weather Data Request in Progress:

1) Select the Weather Data Link (CNXT) Page.
2) Press the **MENU** Key.
3) With 'Connext Data Request' highlighted, press the **ENT** Key.
4) Turn the large **FMS** Knob to select 'CANCEL REQ' and press the **ENT** Key. The request status box indicates 'Request Cancelled'.
5) Press the **FMS** Knob to return to the Weather Data Link (CNXT) Page.

The pilot can schedule Connext Data Requests to recur automatically. Auto requests remain enabled until the pilot disables them, or the system power is cycled. The Request Status window will indicate a countdown timer until the next automatic data request occurs.

NOTE: *If automatic Connext Data Requests were enabled prior to the system entering Reversionary Mode, the automatic weather data requests will continue in Reversionary Mode, however the Connext Data Request window and its associated options will not be available.*

Enabling/disabling automatic Connext Data Requests:

1) Select the Weather Data Link (CNXT) Page.
2) Press the **MENU** Key.
3) With 'Connext Data Request' highlighted, press the **ENT** Key.
4) Choose the desired weather coverage options.
5) Turn the large **FMS** Knob to select the 'UPDATE RATE' setting. Then turn the small **FMS** Knob to highlight the desired automatic update frequency (Off, 5 Min, 10 Min, 15 Min, 20 Min, 30 Min, 45 Min, or 60 Min), then press the **ENT** Key.
6) The 'SEND REQ" button is highlighted and a countdown timer is displayed in the 'REQUEST STATUS' based on the currently selected update rate. Press the **ENT** Key to immediately send an immediate Connext Data Request.

   Or:

   Press the **FMS** Knob to return to the Weather Data Link (CNXT) Page.

GARMIN CONNEXT WEATHER PRODUCTS

PRECIPITATION

The Precipitation weather product provides radar precipitation information in selected radar coverage areas. This information comes from individual weather radar sites and weather data sources such as government agencies. Each radar site or source may provide weather data at differing rates and times. Periodically, the Garmin Connext Weather service compiles the available information to form a composite image, and assigns a single time to indicate when it created the image. This image becomes the Precipitation weather product. Individual images--gathered from each radar site--differ in age, and are always older than the displayed Precipitation weather product age.

Because of the time required to detect, assemble, and distribute the Precipitation weather product, the displayed weather information contained within the product may be significantly older than the current radar synopsis and may not depict the current weather conditions. The Precipitation weather product should never be used as a basis for maneuvering in, near, or around areas of hazardous weather regardless of the information it contains.

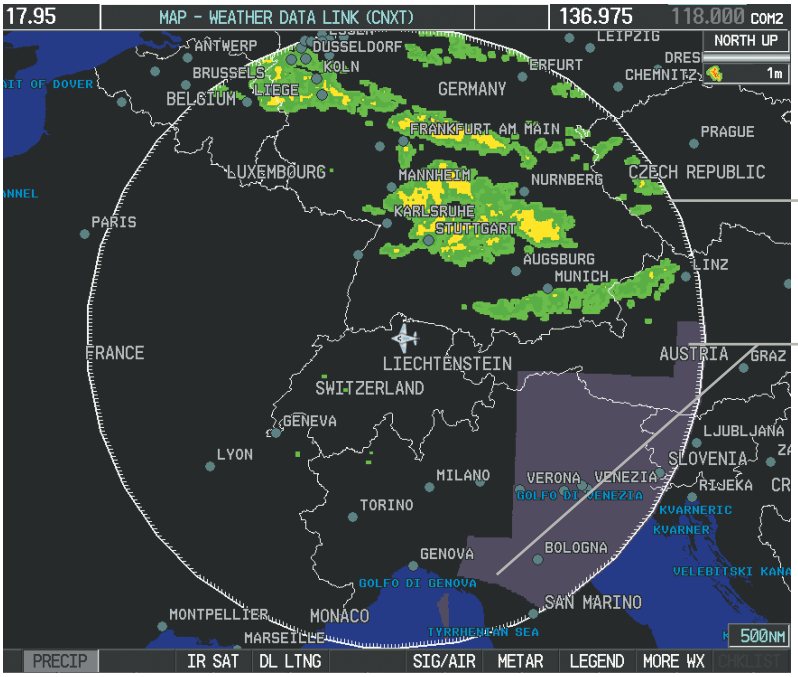


Figure 6-68 Precipitation Data on the Weather Data Link (CNXT) Page

Precipitation data can be displayed on the following maps:

- PFD Inset Map
- Navigation Map Page
- Weather Data Link (CNXT) Page
- Airport Information Page
- Trip Planning Page
- Nearest Pages
- Flight Plan Pages
- AUX - Video Page

Displaying Precipitation weather information:

1) Press the **MAP** Softkey (for the PFD Inset Map, press the **INSET** Softkey). This step is not necessary on the Weather Data Link (CNXT) Page.
2) Press the **PRECIP** Softkey.

The system displays either base or composite NEXRAD imagery, depending on the region.

Region	Radar Reflectivity Type
United States	Composite Reflectivity
Canada, Europe, Australia	Base Reflectivity

The base reflectivity precipitation weather product shows the radar returns from the perspective of a single antenna tilt angle. The composite reflectivity precipitation weather product shows the *highest* radar energy received from multiple antenna tilt angles. The display of the information is color-coded to indicate the intensity of the echoes and the type of precipitation.

All weather product legends can be viewed on the Weather Data Link (CNXT) Page. For the Precipitation legend (Figure 6-69), press the **LEGEND** Softkey when Precipitation is selected for display.

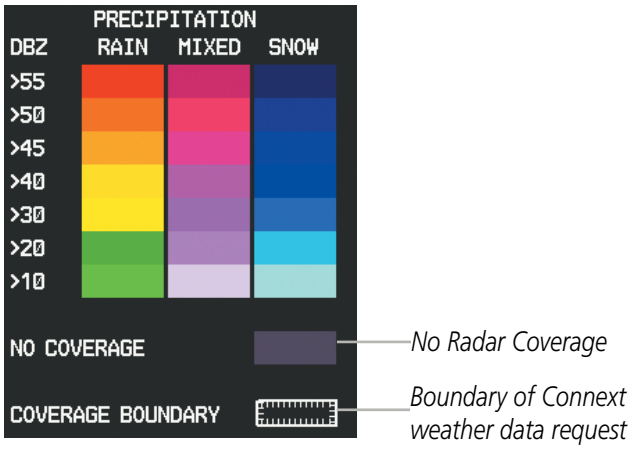


Figure 6-69 Precipitation Data Legend

The display of No Radar Coverage is enabled when Precipitation is selected for display. Areas where precipitation radar coverage is not currently available or is not being collected are indicated in gray shade of purple. A white boundary line with white tick marks depicts the selected coverage area of the Connext Data Request. This boundary encloses the precipitation data when this weather product is displayed.

Reflectivity

Reflectivity is the amount of transmitted power returned to the radar receiver. Colors on the Precipitation display directly correlate to the level of detected reflectivity. Reflectivity as it relates to hazardous weather can be very complex.

The role of radar is essentially to detect moisture in the atmosphere. Simply put, certain types of weather reflect radar better than others. The intensity of a radar reflection is not necessarily an indication of the

weather hazard level. For instance, wet hail returns a strong radar reflection, while dry hail does not. Both wet and dry hail can be extremely hazardous.

The different radar echo intensities are measured in decibels (dB) relative to reflectivity (Z). Weather radars measure the reflectivity ratio, or the energy reflected *back to* the radar receiver (designated by the letter Z). The value of Z increases as the returned signal strength increases.

Precipitation Limitations

Radar images may have certain limitations:

- Undetermined precipitation types may be displayed as mixed.
- Base reflectivity is sampled at the minimum antenna elevation angle. An individual radar site cannot depict high altitude storms at close ranges. It has no information about storms directly over the site.
- When zoomed in to a range of 30 nm, each square block on the display represents an area of four square kilometers.
- The radar beam may overshoot precipitation occuring below the radar beam, which will be undetected.

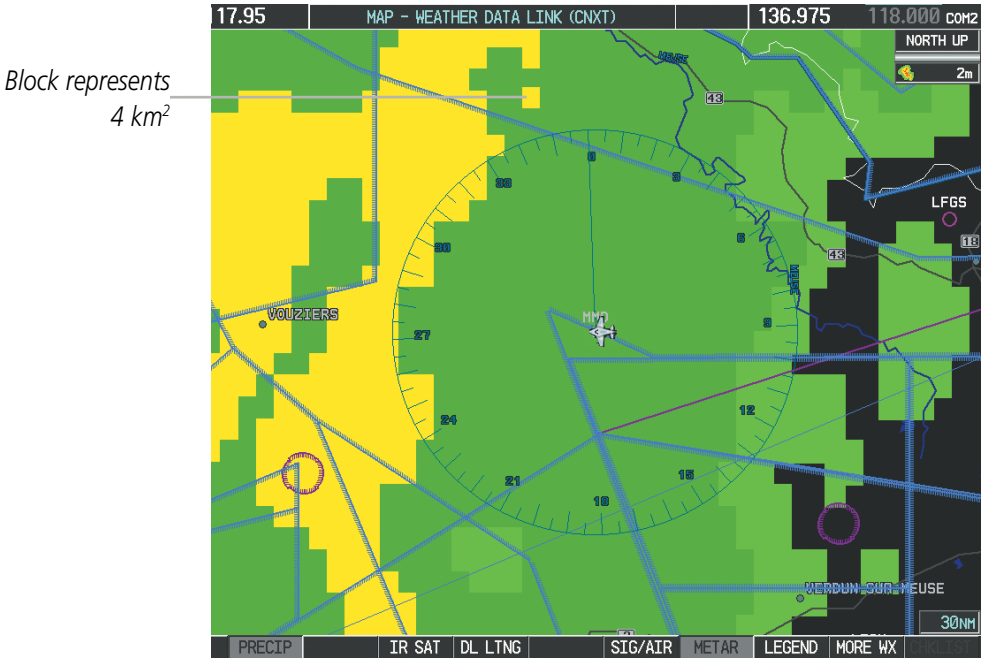


Figure 6-70 Precipitation Weather Product - Zoomed

The following may cause abnormalities in displayed radar images:

- Ground clutter
- Strobes and spurious radar data
- Sun strobes (when the radar antenna points directly at the sun)
- Interference from buildings or mountains, which may cause shadows
- Metallic dust (chaff) from military aircraft, which can cause alterations in radar scans

INFRARED SATELLITE

The Infrared Satellite (IR SAT) weather product (Figure 6-71) depicts cloud top temperatures from satellite imagery. Brighter cloud top colors indicate cooler temperatures occurring at higher altitudes.

When the Map Pointer is activated and panning over an area of displayed cloud tops, the system shows a range of cloud top temperatures for the selected location.

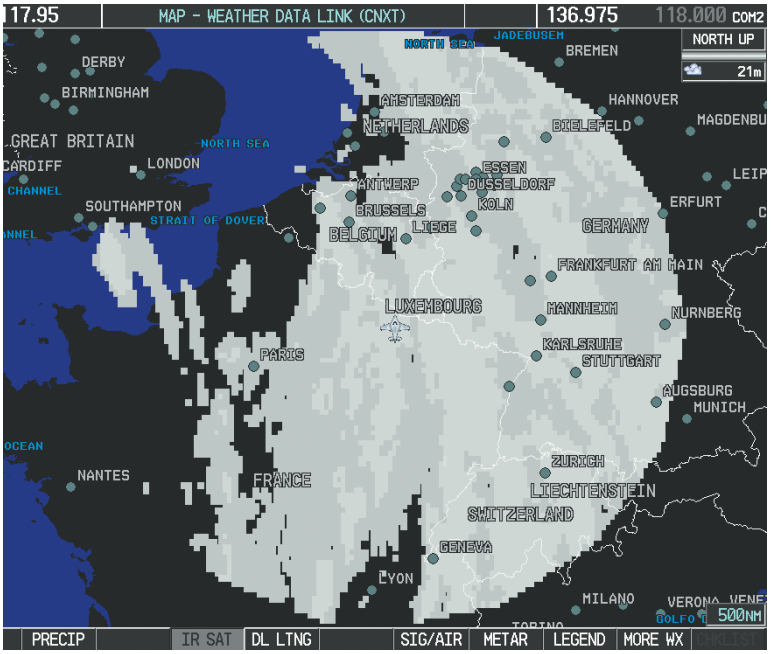


Figure 6-71 Infrared Satellite Data on the Weather Data Link (CNXT) Page

Displaying Cloud Tops information:

1) Select the Weather Data Link (CNXT) Page.
2) Press the **IR SAT** Softkey.

To display the Infrared Satellite legend (Figure 6-72), press the **LEGEND** Softkey when Infrared Satellite data is selected for display.



Figure 6-72 Infrared Satellite Legend

GARMIN CONNEXT DATA LINK LIGHTNING

The Garmin Connext Data Link Lightning (DL LTNG) weather product (Figure 6-73) shows the approximate location of cloud-to-ground lightning strikes. A strike icon represents a strike that has occurred within a two-kilometer region. Neither cloud-to-cloud nor the exact location of the lightning strike is displayed.



Figure 6-73 Garmin Connext Data Link Lightning

Displaying Data Link Lightning information:

1) Press the **MAP** Softkey (for the PFD Inset Map, press the **INSET** Softkey). This step is not necessary on the Weather Data Link (CNXT) Page.
2) Press the **DL LTNG** Softkey.

To display the Data Link Lightning legend on the Weather Data Link (CNXT) Page (Figure 6-74), press the **LEGEND** Softkey when Data Link Lightning is selected for display.



Figure 6-74 Data Link Lightning Legend

SIGMETS AND AIRMETS

SIGMETs (SIGnificant METeorological Information) and AIRMETs (AIRmen's METeorological Information) are issued for potentially hazardous weather. A Convective SIGMET is issued for hazardous convective weather such as severe or widespread thunderstorms. A localized SIGMET can be displayed when significant weather conditions are not widespread.

The entire SIGMET or AIRMET is displayed as long as any portion of it is issued within the coverage area of the Connext Data Request.

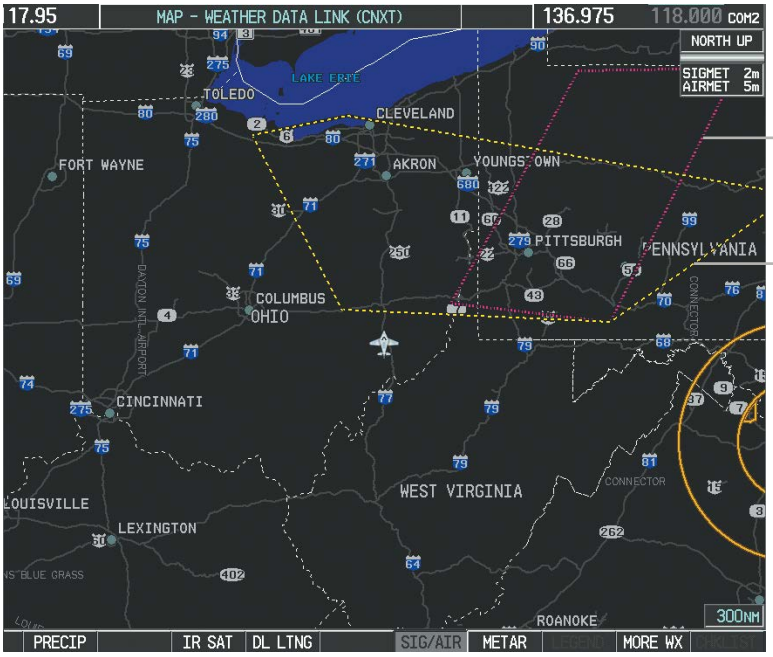


Figure 6-75 SIGMET/AIRMET Data

Displaying SIGMETs and AIRMETs:

1) Select the Weather Data Link (XM) Page.
2) Press the **SIG/AIR** Softkey.
3) To view the text of the SIGMET or AIRMET, press the **Joystick** and move the Map Pointer over the icon.
4) Press the **ENT** key. Figure 6-76 shows sample SIGMET text.

To display the SIGMET and AIRMET legend (Figure 6-77), press the **LEGEND** Softkey when SIGMETs and AIRMETs are selected for display.

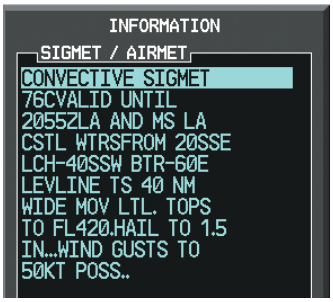


Figure 6-76 Sample SIGMET Text



Figure 6-77 SIGMET/AIRMET Legend

METARS AND TAFS

NOTE: *METAR information is only displayed within the installed navigation database service area.*

METARs (METeorological Aerodrome Reports) typically contain information about the temperature, dewpoint, wind, precipitation, cloud cover, cloud base heights, visibility, and barometric pressure at an airport or observation station. They can also contain information on precipitation amounts, lightning, and other critical data. METARs reflect hourly observations; non-routine updates include the code "SPECI" in the report. METARs are shown as colored flags at airports that provide them.



Figure 6-78 METAR Flags on the Weather Data Link (CNXT) Page

TAFs (Terminal Aerodrome Forecasts) are weather predictions for specific airports typically within a 24-hour period, but may span a longer period. TAFs may include forecast wind, visibility, weather phenomena, and sky conditions using METAR codes.

METAR and TAF text are displayed on the Weather Information Page. METAR data is displayed first in a decoded fashion, followed by the original text. Note the original text may contain additional information not found in the decoded version. TAF information, when available, is displayed only in its original form.

Displaying METAR and TAF text:

1) On the Weather Data Link (CNXT) Page, press the **METAR** Softkey.
2) Press the **Joystick** and pan to the desired airport.
3) Press the **ENT** Key. The Weather Information Page is shown with METAR and TAF text.
4) Use the **FMS** Knob or the **ENT** Key to scroll through the METAR and TAF text. METAR text must be completely scrolled through before scrolling through the TAF text.
5) Press the **FMS** Knob or the **CLR** Key to return to the Weather Data Link (CNXT) Page.

Or:

1) Select the Weather Information Page.
   a) Turn the large **FMS** Knob to select the Waypoint Page Group.
   b) Press the **WX** Softkey to select the Weather Information Page.
2) Press the **FMS** Knob to display the cursor.
3) Use the **FMS** Knob to enter the desired airport and press the **ENT** Key.
4) Use the **FMS** Knob or the **ENT** Key to scroll through the METAR and TAF text. Note that the METAR text must be completely scrolled through before scrolling through the TAF text.



Figure 6-79 METAR and TAF Text on the Weather Information Page

Original METAR text is also accessible while panning the map cursor over a METAR flag on any map page on which a METAR is displayed. The METAR text is shown in a box near the METAR flag.

In addition, METAR flags and their associated text are displayed on the Active Flight Plan Page on the MFD. METAR flags appears next to waypoints in the flight plan with an associated METAR. A solid METAR flag indicates the METAR observations are available for a specific waypoint; a hollow METAR flag indicates an off-route METAR near the waypoint is available.

Displaying original METAR text on the Active Flight Plan Page:

1) Select the Active Flight Plan Page on the MFD.
2) Press the **FMS** Knob to activate the cursor.
3) Turn the large **FMS** Knob to highlight the desired waypoint. The METAR text will appear in the 'SELECTED WAYPOINT WEATHER' window below.
4) When finished, press the **FMS** Knob to remove the cursor or press the **FPL** Key to exit the Active Flight Plan Page.

To display the METAR legend on the Weather Data Link (CNXT) Page (Figure 6-80), press the **LEGEND** Softkey when METARs are selected for display.

The METAR flag color is determined by the information in the METAR text. A gray METAR flag is displayed when the METAR text does not contain adequate information to determine the METAR category.

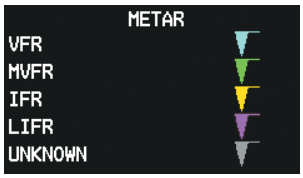


Figure 6-80 METAR Legend

WINDS ALOFT

Winds Aloft data (Figure 6-81) shows the forecasted wind speed and direction at the surface and at selected altitudes. Altitude can be displayed in 3,000-foot increments from the surface up to 42,000 feet MSL.

Displaying Winds Aloft data:

1) Select the Weather Data Link (CNXT) Page.
2) Press the **MORE WX** Softkey.
3) Press the **WIND** Softkey.
4) Select the desired altitude level: SFC (surface) up to 42,000 feet. Press the **NEXT** or **PREV** Softkey to cycle through the altitude softkeys. The **WIND** Softkey label changes to reflect the altitude selected.



Figure 6-81 Winds Aloft at 6,000 Feet

To display the Winds Aloft legend (Figure 6-82), press the **LEGEND** Softkey when Winds Aloft is selected for display.

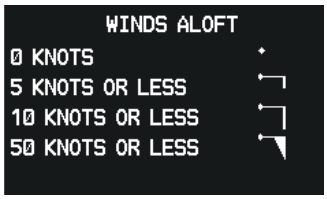


Figure 6-82 Winds Aloft Data with Legend

Headwind and tailwind components aloft are available inside the Profile View on the Navigation Map Page (Figure 6-83). The displayed components are relative to current aircraft altitude and track, but not to aircraft speed.

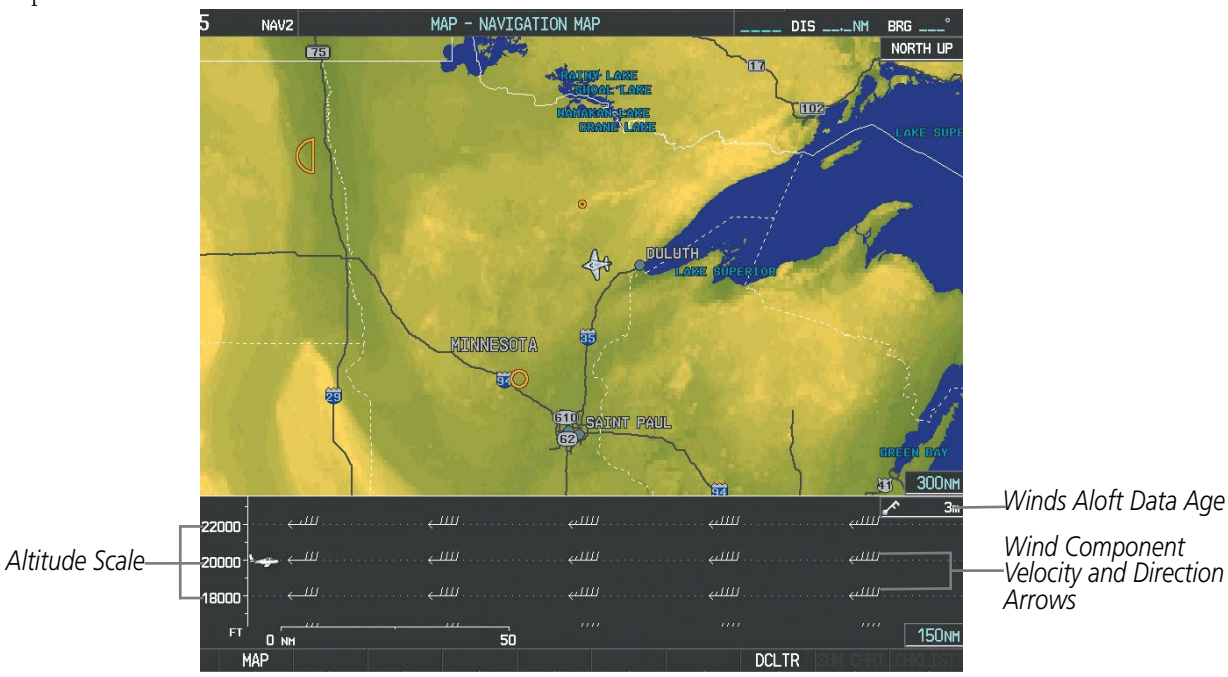


Figure 6-83 Navigation Map Page with Winds Aloft Data on Profile View

Arrows pointing to the left indicate headwind components; tailwind component arrows point to the right, as shown in Table 6-7.

Headwind Symbol	Tailwind Symbol	Headwind/Tailwind Component
None	None	Less than 5 knots
		5 knots
		10 knots
		50 knots

Table 6-7 Profile View Headwind/Tailwind Component Symbols

Showing/Hiding Profile View (containing winds aloft data)

1) Select the Navigation Map Page.
2) Press the **MAP** Softkey.
3) Press the **PROFILE** Softkey.

Or:

1) Select the Navigation Map Page
2) Press the **MENU** Key.
3) Turn the large FMS Knob to highlight 'Show Profile View' or 'Hide Profile View' (choice dependent on current state) and press the **ENT** Key.

Winds Aloft data inside the Profile View is enabled by default when the Profile View is displayed on the Navigation Map Page. This behavior can be changed on the Navigation Map Page.

Enabling/disabling winds aloft data display in Profile View:

1) Select the Navigation Map Page.
2) Press the **MENU** Key.
3) With Map Setup highlighted, press the **ENT** Key (Figure 6-84).
4) Turn the small **FMS** Knob to select the Profile Group and press the **ENT** Key (Figure 6-85).
5) Turn the large **FMS** Knob to select 'Profile Winds' (Figure 6-86).
6) Turn the small **FMS** Knob to select 'On' or 'Off'.
7) Press the **FMS** Knob or **CLR** Key to return to the Navigation Map Page with the changed settings.

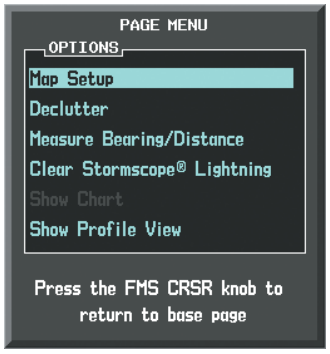


Figure 6-84 Navigation Map Page Menu



Figure 6-85 Navigation Map Page Setup Menu



Figure 6-86 Navigation Map Page Setup Menu, Weather Group

PIREPS

Pilot Weather Reports (PIREPs) describe in-flight weather encountered by pilots. A PIREP may contain adverse weather conditions, such as low in-flight visibility, icing conditions, wind shear, turbulence, and type of aircraft flown. PIREPs are issued as either Routine (UA) or Urgent (UUA).



Figure 6-87 PIREPs on the Weather Data Link (CNXT) Page

Displaying PIREP text:

1) Select the Weather Data Link (CNXT) Page.
2) Press the **MORE WX** Softkey.
3) Press the **PIREPS** Softkey.
4) Press the **Joystick** and pan to the desired weather report. A gray circle will appear around the weather report when it is selected.
5) Press the **ENT** Key. The PIREP is first displayed in a decoded fashion, followed by the original text. Note the original text may contain additional information not found in the decoded version.
6) Use the **FMS** Knob or the **ENT** Key to scroll through the PIREP text.
7) Press the **FMS** Knob or the **CLR** Key to close the PIREP text window and return to the Weather Data Link (CNXT) Page.

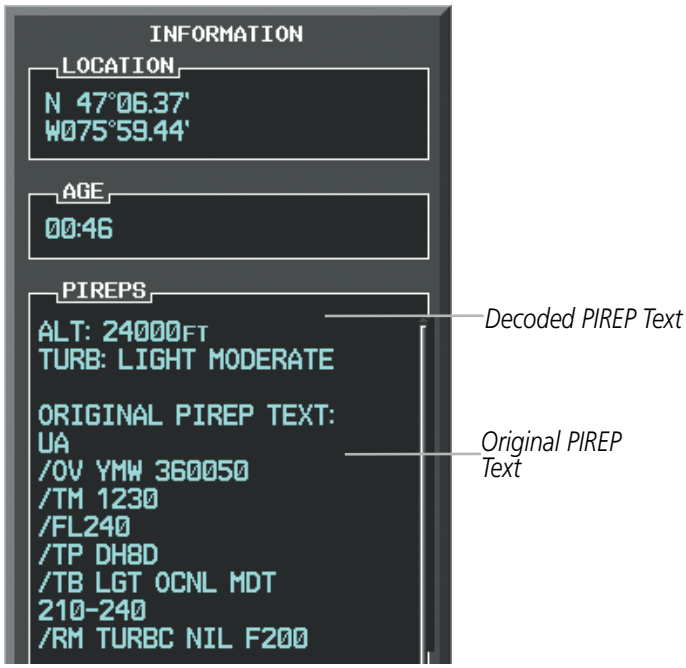


Figure 6-88 PIREP Text on the Weather Data Link (CNXT) Page

To display the PIREP legend (Figure 6-89), press the **LEGEND** Softkey when PIREPs are selected for display. The PIREP color is determined by the type (routine or urgent).



Figure 6-89 AIREPs & PIREPs Legend

TEMPORARY FLIGHT RESTRICTIONS (TFRS)

NOTE: *Do not rely solely upon data link services to provide Temporary Flight Restriction (TFR) information. Always confirm TFR information through official sources such as Flight Service Stations or Air Traffic Control.*

NOTE: *Temporary Flight Restriction (TFR) data from Garmin Connext is only available in the United States (not including any U.S. territories.) Refer to http://fly.garmin.com/fly-garmin/connext/worldwide-weather/ for coverage information.*

The Federal Aviation Administration (FAA) issues TFRs to designate areas where flight is restricted. TFRs are issued to restrict flight for a variety of reasons including national security, law enforcement, firefighting operations, airshows, and large sporting events. TFRs may be issued at any time, and TFR data displayed on the system is only intended to supplement TFR information obtained from official sources including Flight Service Stations (FSS), and air traffic control.

The system does not display the age TFR product was assembled on the ground by the data provider is not shown; however, if TFR product is not available or has expired, the system displays 'TFR N/A' in the upper-left corner of maps on which the display of TFR information is enabled.

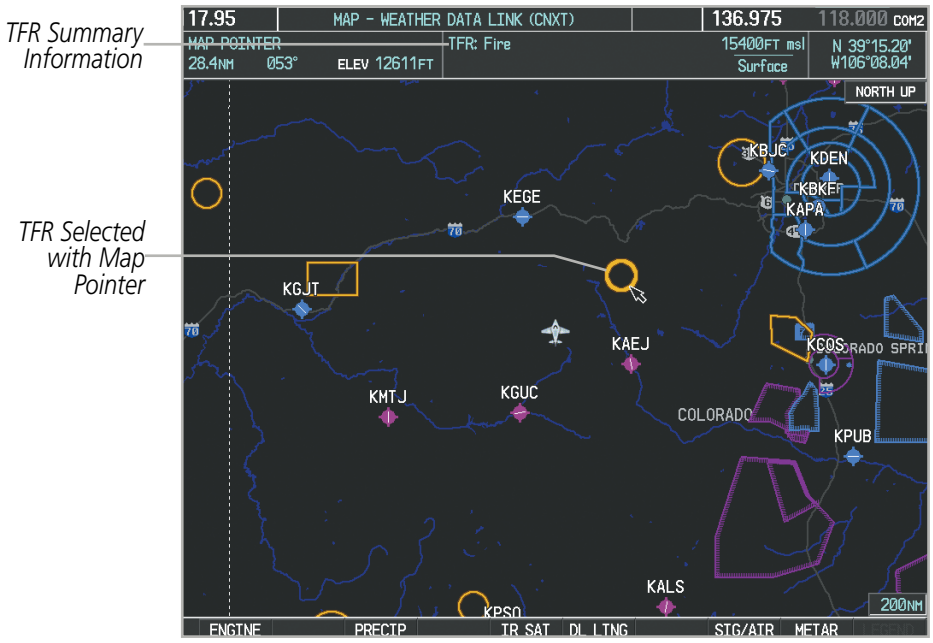


Figure 6-90 TFR Data on the Weather Data Link (CNXT) Page

Displaying TFR Data:

1) Select the Weather Data Link (CNXT) Page or Navigation Map Page.
2) Press the **Joystick** and pan the map pointer over a TFR to highlight it. The system displays TFR summary information above the map.
3) Press the **ENT** Key. The system displays a pop-up menu.
4) If necessary, turn the **FMS** Knob to select 'Review Airspaces' and press the **ENT** Key. The system displays the TFR Information window.
5) Press the **FMS** Knob or the **CLR** Key to remove the TFR Information window.

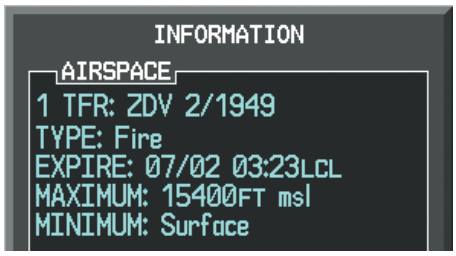


Figure 6-91 Full Text for Selected TFR

The setup menus for the Navigation Map Page control the map range settings above which TFR data is decluttered from the display. If a map range larger than the TFR product map range setting is selected, the TFR product data is removed from the map.

Maps other than the Navigation Map Page use settings based on those selected for the Navigation Map Page.

Setting up and customizing TFR data for maps on which TFR data can be displayed:

1) Select the Navigation Map Page.
2) Press the **MENU** Key.
3) With Map Setup highlighted, press the **ENT** Key (Figure 6-92).
4) Turn the small **FMS** Knob to select the Aviation Group and press the **ENT** Key (Figure 6-93).
5) Turn the large **FMS** Knob to scroll to the TFR product range setting (Figure 6-94).
6) Turn the small **FMS** Knob to scroll through options (Off, range settings).
7) Press the **ENT** Key to select an option.
8) Press the **FMS** Knob or **CLR** Key to return to the Navigation Map Page with the changed settings.

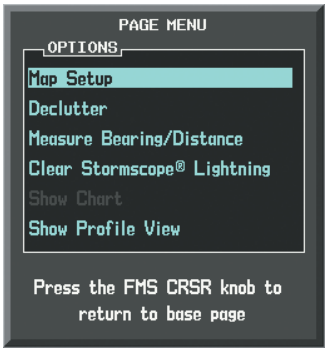


Figure 6-92 Navigation Map Page Menu



Figure 6-93 Navigation Map Page Setup Menu

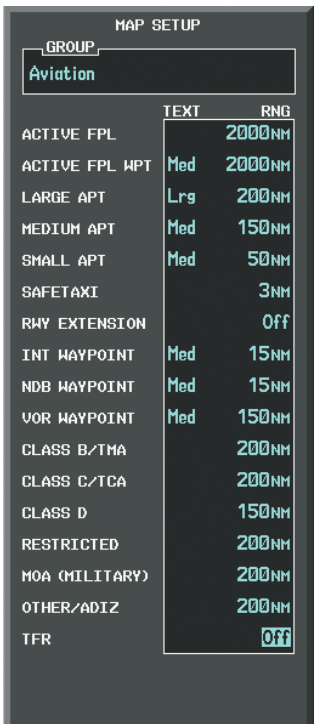


Figure 6-94 Navigation Map Page Setup Menu, Aviation Group

ABNORMAL OPERATIONS

If the system cannot complete a Connext Data Request, one or more messages will appear in the request status window.

Weather Request Status Message	Description
Auto requests inhibited Send manual request to reset.	The system has disabled automatic weather data requests due to excessive errors. Automatic weather data requests have stopped. Send a manual weather data request to resume automatic updates.
Auto update retry: ## Seconds	The system will attempt another automatic weather data request after an error occurred during the previous request. Timer counts down until the next automatic request occurs.
Connext Comm Error [2]	A communications error has occurred with the GIA. The system should be serviced.
Connext Comm Error [4]	This occurs if multiple automatic weather data requests have recently failed, or the GIA or optional GDL 59 is off-line.
Connext Comm Error [5]	The Iridium or Connext networks are not accessible. Check Iridium signal strength. If this error persists, the system should be serviced.
Connext Comm Error [6]	A communications error has occurred. It this error persists, the system should be serviced.
Connext Comm Error [7]	A weather data transfer has timed out. Check Iridium signal strength and re-send the data request.
Connext Comm Error [8]	A server error has occurred or invalid data received.
Connext Login Invalid	There is a problem with the Garmin Connext registration. Contact Garmin at 1-866-739-5687 in the United States or 913-440-1135 for assistance.
Connext Server Temporarily Inop	The Garmin Connext weather data server is temporarily out of service, but is expected to return to service in less than 30 minutes.
Connext Server Inop	The Garmin Connext weather data server will be out of service for at least 30 minutes.
Invalid Coverage Area	The weather data request coverage area does not contain at least one of the following: a waypoint, a flight plan, or a flight plan destination. Verify at least one of the coverage options is enabled (checked) and contains required criteria, then re-send the data request.
No Connext Subscription	The system is not be currently subscribed to the Garmin Connext Weather service, or the access code is incorrect. Verify the access code. Contact Garmin at 1-866-739-5687 in the United States or 913-440-1135 for assistance.
Reduce Request Area	The Garmin Connext weather data request area exceeds size limits. Reduce weather coverage area and re-send data request.
Request Cancelled	The user has cancelled a Garmin Connext weather data request.
Request Failed - Try Again	The weather data request timed-out. Re-send data request.

Table 6-8 Abnormal Garmin Connext Weather Request Status Messages

GARMIN CONNEXT WEATHER IN REVERSIONARY MODE

When the system is operating in Reversionary Mode, only those weather products which can be displayed on the PFD Inset Map will be available for display (see Table 6-5 for a list of weather products and their associated map availability).

If manual weather data requests were enabled prior to entering Reversionary Mode, no new Garmin Connext weather data can be retrieved while operating in Reversionary Mode. If automatic weather data requests were enabled prior to Reversionary Mode operation, the system will continue the automatic data requests in Reversionary Mode (provided automatic requests have not been inhibited due to a system error).

6.3 FIS-B WEATHER

WARNING: *Do not use data link weather information for maneuvering in, near, or around areas of hazardous weather. Information contained within data link weather products may not accurately depict current weather conditions.*

WARNING: *Do not use the indicated data link weather product age to determine the age of the weather information shown by the data link weather product. Due to time delays inherent in gathering and processing weather data for data link transmission, the weather information shown by the data link weather product may be significantly older than the indicated weather product age.*

The optional GDL 88 is a Universal Access Transceiver (UAT). It receives Flight Information Services - Broadcast (FIS-B) weather data from a network of UAT ground-based transceivers (GBTs). The system displays FIS-B graphical weather information and associated text on the Multi Function Display (MFD) and the Primary Flight Display (PFD) Inset Map.

FIS-B weather data reception requires the aircraft be within range and line-of-sight of an operating GBT broadcasting FIS-B weather data. Reception may be affected by factors including altitude and terrain.

Reception of FIS-B weather data occurs automatically without any pilot action. FIS-B broadcasts provide weather data in a repeating cycle which may take approximately ten minutes to transmit all available weather data. Therefore, not all available weather data may be available immediately upon initial FIS-B signal acquisition.

USING FIS-B WEATHER PRODUCTS

The primary map for viewing FIS-B Weather data is the Weather Data Link (FIS-B) Page in the Map Page Group.

Viewing the Weather Data Link (FIS-B) Page:

1) Turn the large **FMS** Knob to select the Map Page Group.
2) Turn the small **FMS** Knob to select the Weather Data Link (FIS-B, XM, or CNXT) Page.
3) If the page title displays a weather data link weather source other than 'FIS-B', such as 'XM' or 'CNXT', proceed to the following steps to change the data link weather source.
4) Press the **MENU** Key.
5) Turn the small **FMS** Knob to select 'Display FIS-B Weather' and press the **ENT** Key. The page title will display 'MAP - WEATHER DATA LINK (FIS-B)' to indicate FIS-B is now the selected data link weather source.

On the Weather Data Link (FIS-B) page, the pilot can enable/disable the FIS-B weather feature, which includes all FIS-B weather products and related softkeys on various maps.

Enabling/disabling the FIS-B weather feature:

1) Select the Weather Data Link (FIS-B) Page.
2) Press the **MENU** Key.
3) Turn the small **FMS** Knob to highlight 'Enable FIS-B Weather' or 'Disable FIS-B Weather', and press the **ENT** Key.

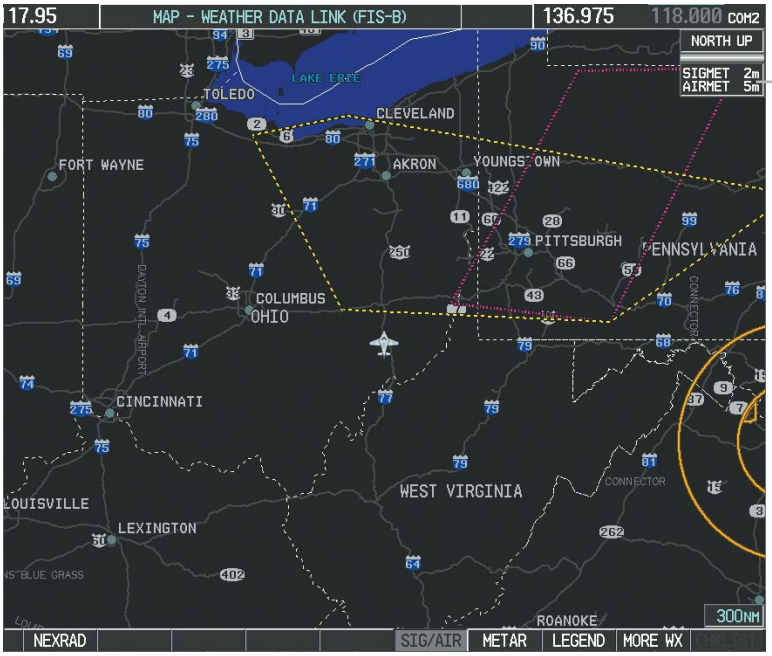


Figure 6-95 Weather Data Link (FIS-B) Page

When a FIS-B weather product is active on a map, the age of the data is displayed on the screen to the right of the product symbol (Figure 6-95). The age of the product is based on the time difference between when the data was assembled on the ground and the current GPS time. Weather products are transmitted at specific intervals (defined in the **Broadcast Rate** column in Table 6-9).

If for any reason, a weather product is not refreshed within the **Expiration Time** intervals (see Table 6-9), the data is considered expired and is removed from the display. This ensures that the displayed data is consistent with FIS-B broadcast data. If more than half of the expiration time has elapsed, the color of the product age displayed changes to amber. The system displays dashes instead of a product age when a product has expired. If a weather product is not available or has not been received, the system displays 'N/A' instead of a product age.

Table 6-9 shows the FIS-B weather product symbols, the expiration times, and broadcast rates. The broadcast rate represents the interval at which FIS-B GBTs broadcast new signals that may or may not contain new weather data. It does not represent the rate at which weather data is updated or new content is received by the UAT.

FIS-B Weather Product	Symbol	Expiration Time (Minutes)	Broadcast Rate (Minutes)
NEXRAD Composite (US)		30	15
NEXRAD Composite (Regional)		30	2.5
Meteorological Aerodrome Report (METARs		90	5
Pilot Weather Report (PIREPs)		90	10
Winds Aloft (WIND)		90	10
SIGMETs/AIRMETs (SIG/AIR)		60	5
No Radar Coverage	no product image	30	2.5
Terminal Aerodrome Forecast	no product image	60	10
Temporary Flight Restriction (TFR)	no product image	60	10

Table 6-9 Weather Product Symbols and Data Timing

Table 6-10 shows which FIS-B weather products can be displayed (indicated with a '+' symbol) on specific maps.

FIS-B Weather Product	PFD Inset Map	Navigation Map Page	Weather Data Link (FIS-B) Page	Weather Information Page	AUX - Trip Planning Page	AUX - Video Page	Nearest Page Group	Flight Plan Pages
NEXRAD	+	+	+		+	+	+	+
METARs	+	+	+	+	+	+	+	+
PIREPs			+	+				
No Radar Coverage	+	+	+		+	+	+	
SIGMETs/AIRMETs (SIG/AIR)			+					
TAFs				+				
TFRs	+	+	+	+	+	+	+	+
Winds Aloft* (WIND)		+*	+					

** Winds Aloft information appears inside Profile View window on the Navigation Map Page.*

Table 6-10 FIS-B Weather Product Display Maps

Softkeys control the display of weather information on most MFD pages and the PFD Inset Map (Figure 6-96) shows the weather product softkeys for the Weather Data Link (FIS-B) Page). When a weather product is enabled for display, the corresponding softkey label changes to gray.

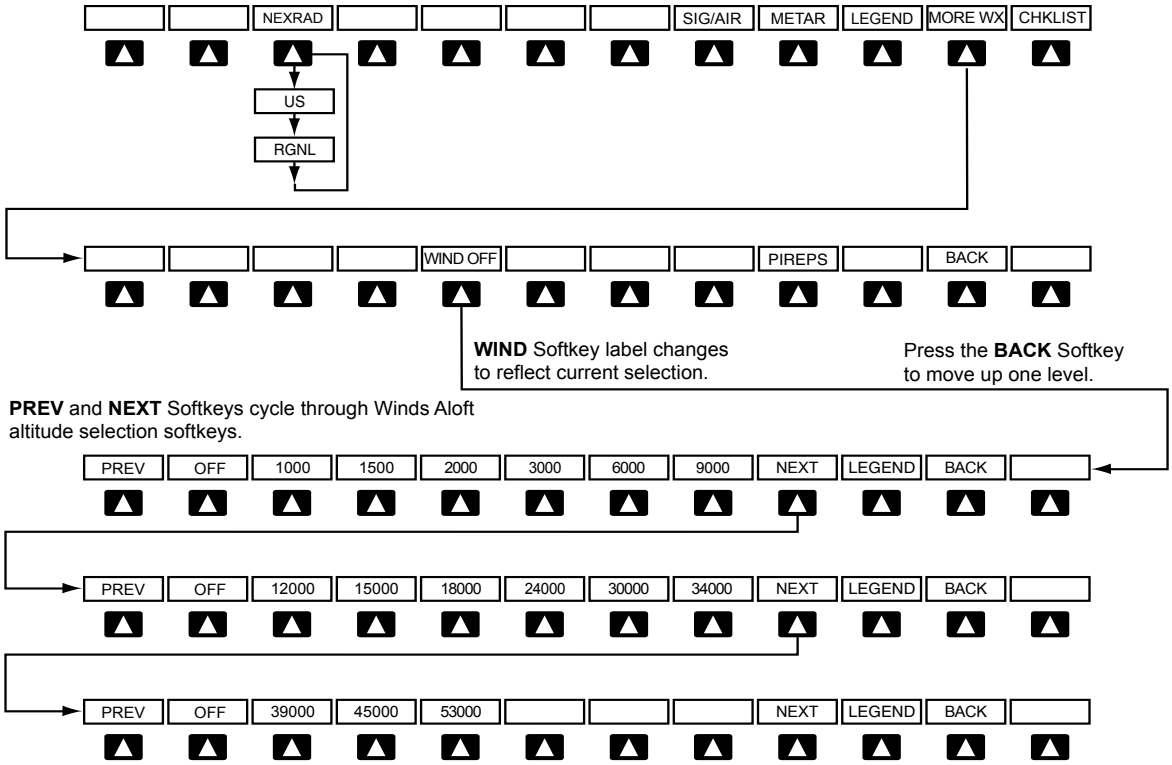


Figure 6-96 Weather Data Link (FIS-B) Weather Product Softkeys

Maps besides the Weather Data Link (FIS-B) Page use settings based on those selected for the Navigation Map Page.

Setting up and customizing FIS-B weather data for the Navigation Map Page:

1) Select the Navigation Map Page.
2) Press the **MENU** Key.
3) With 'Map Setup' highlighted, press the **ENT** Key (Figure 6-97).
4) Turn the small **FMS** Knob to select the 'Weather' Group and press the **ENT** Key (Figure 6-98).
5) Turn the large **FMS** Knob or press the **ENT** Key to scroll through product selections (Figure 6-99).
6) Turn the small **FMS** Knob to scroll through options for each product (ON/OFF, range settings).
7) Press the **ENT** Key to select an option.
8) Press the **FMS** Knob or **CLR** Key to return to the Navigation Map Page with the changed settings.

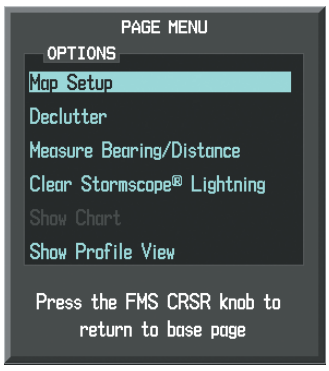


Figure 6-97 Navigation Map Page Menu



Figure 6-98 Navigation Map Page Setup Menu

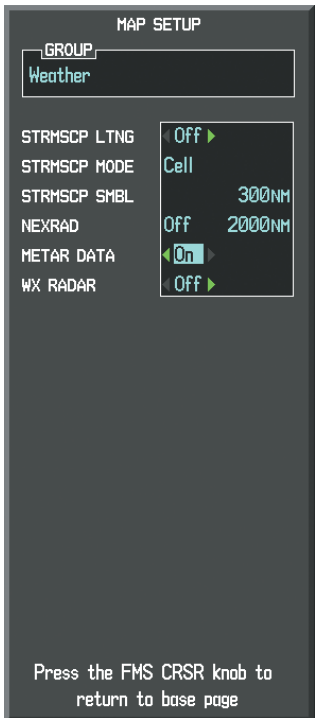


Figure 6-99 Navigation Map Page Setup Menu, Weather Group

The setup menus for the Navigation Map Page and the Weather Data Link (FIS-B) Page control the map range settings above which weather products data are decluttered from the display. If a map range larger than the weather product map range setting is selected, the weather product data is removed from the map. The menus also provide a means in addition to the softkeys for enabling/disabling display of weather products.

Setting up and customizing the Weather Data Link (FIS-B) Page:

1) Select the Weather Data Link (FIS-B) Page.
2) Press the **MENU** Key.
3) With 'Weather Setup' highlighted, press the **ENT** Key (Figure 6-100).
4) Turn the small **FMS** Knob to select 'PRODUCT GROUP 1', and press the **ENT** Key (Figure 6-101).
5) Turn the large **FMS** Knob or press the **ENT** Key to scroll through product selections.
6) Turn the small **FMS** Knob to scroll through options for each product (ON/OFF, range settings, etc.).
7) Press the **ENT** Key to select an option.
8) Press the **FMS** Knob or **CLR** Key to return to the Weather Data Link (FIS-B) Page with the changed settings.

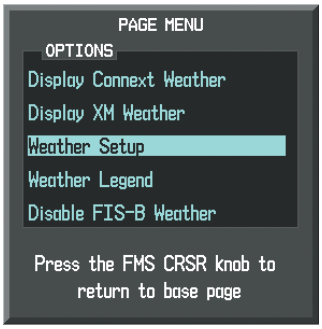


Figure 6-100 Weather Data Link (FIS-B) Page Menu

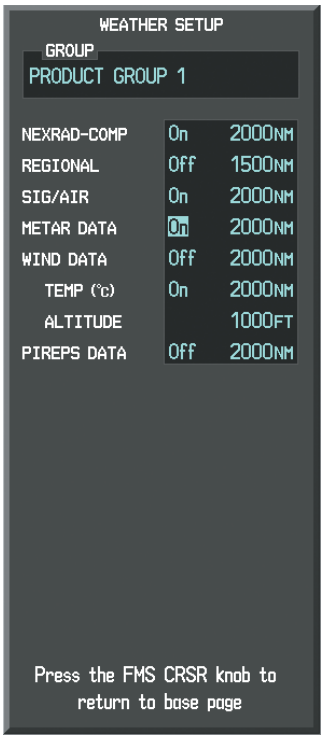


Figure 6-101 Weather Data Link (FIS-B) Page Setup Menu

Restoring default Weather Data Link (FIS-B) Page settings:

1) Select the Weather Data Link (FIS-B) Page.
2) Press the **MENU** Key.
3) With 'Weather Setup' highlighted, press the **ENT** Key.
4) Turn the small **FMS** Knob to select 'PRODUCT GROUP 1', and press the **ENT** Key (Figure 6-101).
5) If restoring an individual weather product setting to its default value, turn the large **FMS** Knob to highlight the desired field to restore.
6) Press the **MENU** Key.
7) Turn the large **FMS** Knob if needed to highlight 'Restore Selection Default' (to restore only the highlighted field) or 'Restore All Defaults' (to restore all products within the selected product group to their default settings), and press the **ENT** Key.

If multiple data link weather services are installed, customizing the display settings for the corresponding weather products shown in Table 6-11 will result in identical settings for all services.

SiriusXM Weather Product and Softkey	Garmin Connext Weather Product	FIS-B Weather Product
Next-generation Radar (NEXRAD) and No Radar Coverage	Precipitation (PRECIP) and No Radar Coverage	Next-generation Radar (NEXRAD) and No Radar Coverage
Cloud Top (CLD TOP)	Infrared Satellite (IR SAT)	Not Available
SiriusXM Lightning (XM LTNG)	Garmin Connext Data Link Lightning (DL LTNG)	Not Available
SIGMETs/AIRMETs (SIG/AIR)	SIGMETs/AIRMETs (SIG/AIR)	SIGMETs/AIRMETs (SIG/AIR)
Meteorological Aerodrome Report (METARs)	Meteorological Aerodrome Report (METARs)	Meteorological Aerodrome Report (METARs)
Winds Aloft (WIND)	Winds Aloft (WIND)	Winds Aloft (WIND)
Pilot Weather Report (PIREPs)	Pilot Weather Report (PIREPs)	Pilot Weather Report (PIREPs)

Table 6-11 Weather Data Link Map Settings Shared for Multiple Weather Data Link Sources

When a FIS-B weather product is enabled for display on the PFD Inset Map, the weather product information box (with the product icon and age) can be displayed inside the PFD Inset Map.

Displaying/removing the weather product information box on the PFD Inset Map:

1) On the PFD, press the **INSET** Softkey.
2) Press the **WX LGND** Softkey.
3) To remove the weather product information box, press the **WX LGND** Softkey again.

Each active weather product has an associated legend which can be displayed on the Weather Data Link (FIS-B) Page. A weather product legend can also be displayed on the Navigation Map Page for active FIS-B weather products displayed on that page.

Viewing legends for displayed weather products on the Weather Data Link (FIS-B) Page:

1) Select the Weather Data Link (FIS-B) Page.
2) Press the **LEGEND** Softkey to display the legends for the displayed weather products.

   Or:

   a) Press the **MENU** Key.

   b) Select 'Weather Legend' and press the **ENT** Key.
3) To remove the Legend Window, press the **LEGEND** Softkey, the **ENT** or the **CLR** Key, or press the **FMS** Knob.

Viewing legends for displayed weather products (on the Navigation Map Page):

1) Select the Navigation Map Page.
2) Press the **MAP** Softkey.
3) Press the **LEGEND** Softkey (available if one or more FIS-B weather products are enabled for display).
4) To remove the Legend Window, press the **LEGEND** Softkey, the **ENT** or the **CLR** Key, or press the **FMS** Knob.

Additional information about METARs, SIGMETs, AIRMETs, PIREPs, and TFRs can be selected by using the Map Pointer to pan to the desired information on the map.

The map panning feature is enabled by pressing the **Joystick**. The map range is adjusted by turning the **Joystick**. If the map range is adjusted while panning is enabled, the map is re-centered on the Map Pointer.

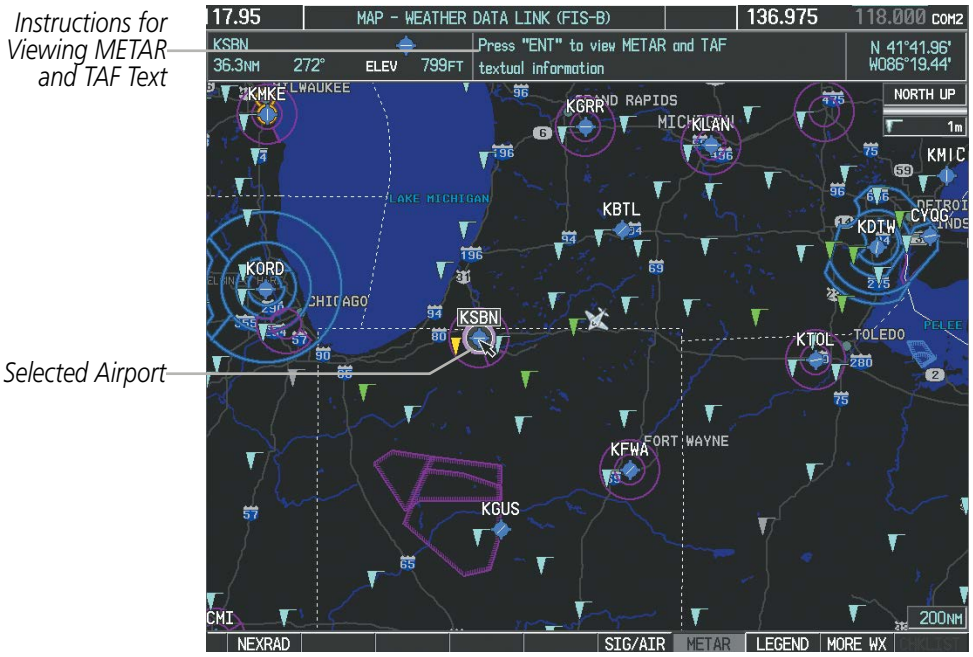


Figure 6-102 METAR Flags on the Weather Data Link (FIS-B) Page

NEXRAD

NOTE: *The NEXRAD weather product cannot be displayed at the same time as terrain.*

The National Weather Service (NWS) operates the WSR-88D, or NEXRAD (NEXt-generation RADar) system, an extensive network of 156 high-resolution Doppler radar systems. The NEXRAD network provides centralized meteorological information for the continental United States and selected overseas locations. The maximum range of a single NEXRAD site is 250 nm.

Individual NEXRAD sites supply the network with radar images, and the images from each radar site may arrive at the network at different rates and times. Periodically, the weather data provider to FIS-B compiles the available individual site images from the network to form a composite image, and assigns a single time to indicate when it created the image. This image becomes the NEXRAD weather product. Individual images--gathered from each NEXRAD site--differ in age, and are always older than the displayed NEXRAD

weather product age. The data provider then sends the NEXRAD data to the FIS-B GBTs, which transmit this information during the next designated broadcast time for the NEXRAD weather product.

Because of the time required to detect, assemble, and distribute the NEXRAD weather product, the displayed weather information contained within the product may be significantly older than the current radar synopsis and may not depict the current weather conditions. NEXRAD information should never be used as a basis for maneuvering in, near, or around areas of hazardous weather regardless of the information it contains.

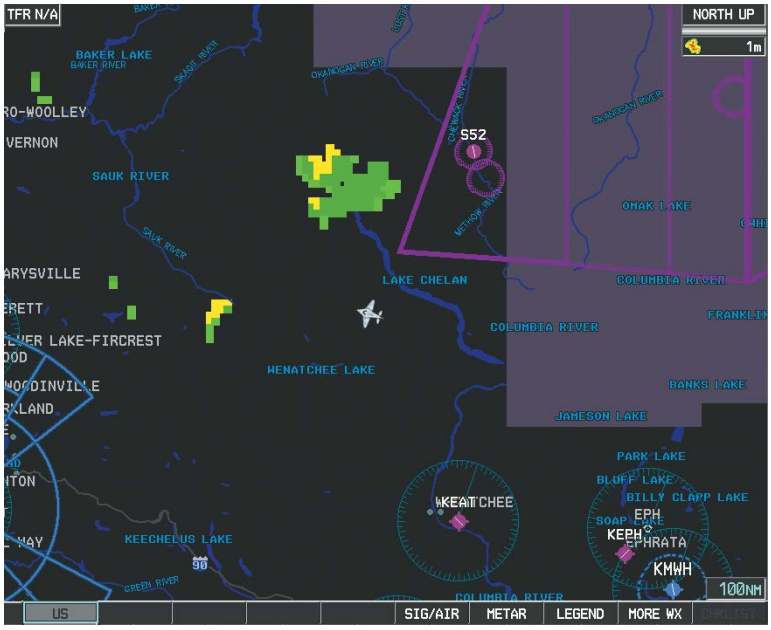


Figure 6-103 NEXRAD Weather Product on the Weather Data Link (FIS-B) Page)

The FIS-B NEXRAD weather product may be displayed for a region around the GBT (higher resolution, updated more frequently) or for across the continental United States (lower resolution, updated less frequently). The pilot can choose which type of NEXRAD weather product is displayed.

Displaying the NEXRAD weather product::

1) Press the **MAP** Softkey (for the PFD Inset Map, press the **INSET** Softkey). This step is not necessary on the Weather Data Link (FIS-B) Page.
2) Press the **NEXRAD** Softkey. This softkey becomes the **US** Softkey. A mosaic of NEXRAD data for the continental United States (CONUS) is displayed.
3) To display the regional version of the NEXRAD weather product, press the **US** Softkey. Softkey becomes the **RGNL** Softkey.
4) To remove the NEXRAD weather product, press the **RGNL** Softkey. Softkey becomes the **NEXRAD** Softkey.

The regional NEXRAD weather product coverage area varies, as it is determined by the data received from ground-based sources. When the regional NEXRAD weather product is enabled, a white hashed boundary rectangle encloses this area to indicate the geographic limits of the regional NEXRAD coverage being displayed. The system shows composite radar data from all available NEXRAD sites inside of this boundary area.

If the continental United States version of the NEXRAD weather product is shown (**US** Softkey enabled), the coverage boundary is not shown on the map.

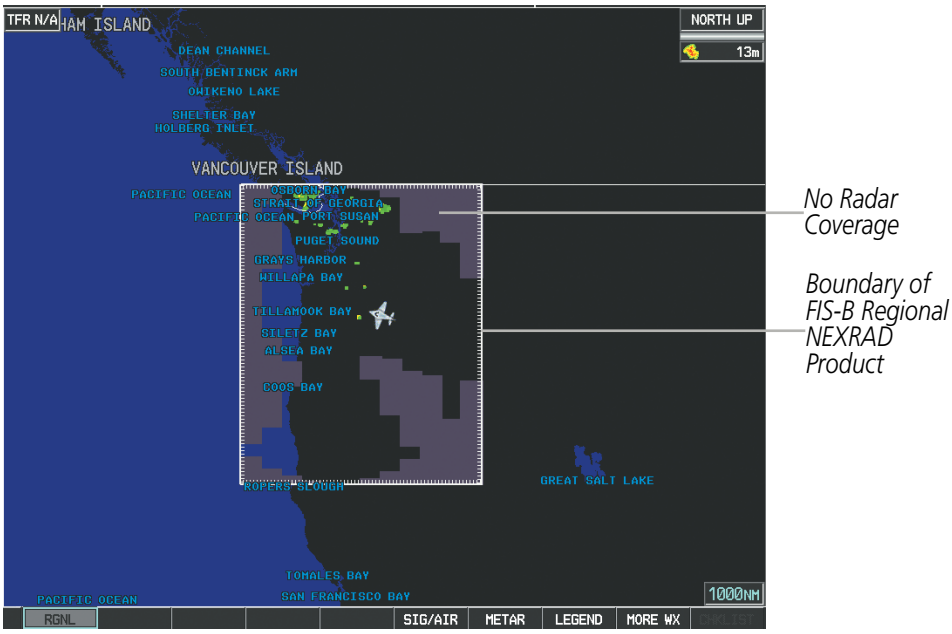


Figure 6-104 Regional NEXRAD on the Weather Data Link (FIS-B) Page)

This data is composed of the maximum reflectivity from the individual radar sweeps. The display of the information is color-coded to indicate the weather severity level. All weather product legends can be viewed on the Weather Data Link (FIS-B) Page. For the NEXRAD legend (Figure 6-105), press the **LEGEND** Softkey when the NEXRAD weather product is enabled.

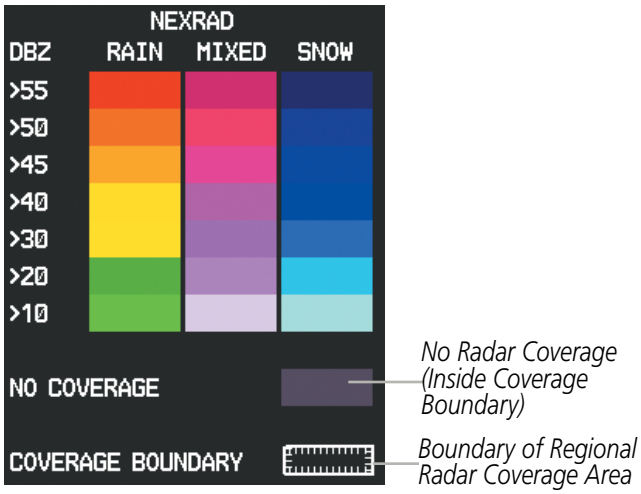


Figure 6-105 NEXRAD Weather Product Legend

The display of no radar coverage is enabled when NEXRAD is selected for display. Areas where radar data is not currently available, has not yet been received, or is not being collected are indicated in gray shade of purple.

NOTE: *If the system has not received all available NEXRAD weather data (such as during initial FIS-B signal acquisition or in areas of marginal or poor signal reception), the system may display areas of no radar coverage which are subsequently removed as radar data is received. It may take up to approximately ten minutes to receive all FIS-B data, when adequate reception is available.*

Reflectivity

Reflectivity is the amount of transmitted power returned to the radar receiver. Colors on the NEXRAD display are directly correlative to the level of detected reflectivity. Reflectivity as it relates to hazardous weather can be very complex.

The role of radar is essentially to detect moisture in the atmosphere. Simply put, certain types of weather reflect radar better than others. The intensity of a radar reflection is not necessarily an indication of the weather hazard level. For instance, wet hail returns a strong radar reflection, while dry hail does not. Both wet and dry hail can be extremely hazardous.

The different NEXRAD echo intensities are measured in decibels (dB) relative to reflectivity (Z). NEXRAD measures the radar reflectivity ratio, or the energy reflected *back to* the radar receiver (designated by the letter Z). The value of Z increases as the returned signal strength increases.

NEXRAD Limitations

NEXRAD radar images may have certain limitations:

- At a map range of 30 nm or less, individual blocks of NEXRAD weather data are viewable. For the regional version of the NEXRAD weather product, each block is 1.5 nm wide by 1 nm tall. For the continental United States version of the NEXRAD weather product, each block is 7.5 nm wide by 5 nm wide.
- The continental US version of the NEXRAD weather product is not available above 60º of latitude.
- Preciptiation occuring below the radar beam will not be detected.

The following may cause abnormalities in displayed NEXRAD radar images:

- Ground clutter
- Strobes and spurious radar data
- Sun strobes (when the radar antenna points directly at the sun)
- Interference from buildings or mountains, which may cause shadows
- Metallic dust (chaff) from military aircraft, which can cause alterations in radar scans

SIGMETS AND AIRMETS

SIGMETs (SIGnificant METeorological Information) and AIRMETs (AIRmen's METeorological Information) are issued for potentially hazardous weather. A Convective SIGMET is issued for hazardous convective weather such as severe or widespread thunderstorms. A localized SIGMET can be displayed when significant weather conditions are not widespread.

The entire SIGMET or AIRMET is shown as long as any portion of it is issued within the selected coverage area of the Connext Data Request.

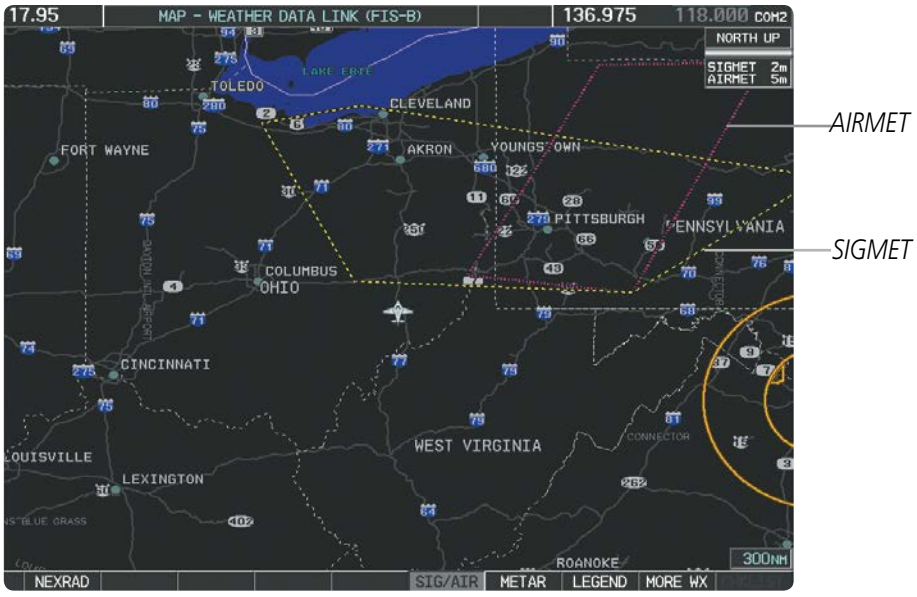


Figure 6-106 SIGMET/AIRMET Data

Displaying SIGMETs and AIRMETs:

1) Select the Weather Data Link (FIS-B) Page.
2) Press the **SIG/AIR** Softkey.
3) To view the text of the SIGMET or AIRMET, press the **Joystick** and move the Map Pointer over the icon.
4) Press the **ENT** key. Figure 6-107 shows sample SIGMET text.

To display the SIGMET and AIRMET legend (Figure 6-108), press the **LEGEND** Softkey when SIGMETs and AIRMETs are selected for display.

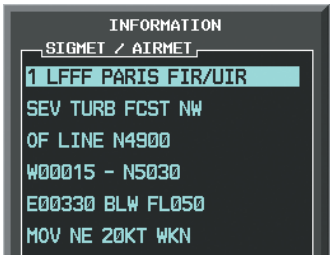


Figure 6-107 Sample SIGMET Text



Figure 6-108 SIGMET/AIRMET Legend

METARS AND TAFS

NOTE: *Atmospheric pressure is reported in inches of mercury (in Hg). Temperatures are reported in Celsius.*

NOTE: *The system will begin to display METAR flags as it receives reports; however it may take approximately ten minutes for all available METAR and TAF data to be received over a FIS-B broadcast.*

Aviation Routine Weather Reports or METARs typically contain current information about the temperature, dewpoint, wind, precipitation, cloud cover, cloud heights, visibility, and barometric pressure at an airport or observation station. They can also contain information on precipitation amounts, lightning, and other critical data. METARs reflect routine hourly observations. An Aviation Selected Special Report or SPECI includes the code "SPECI" in the report, and may be issued if critical information has changed after the issuance of a METAR. The system displays colored flags at airports with report(s) available.

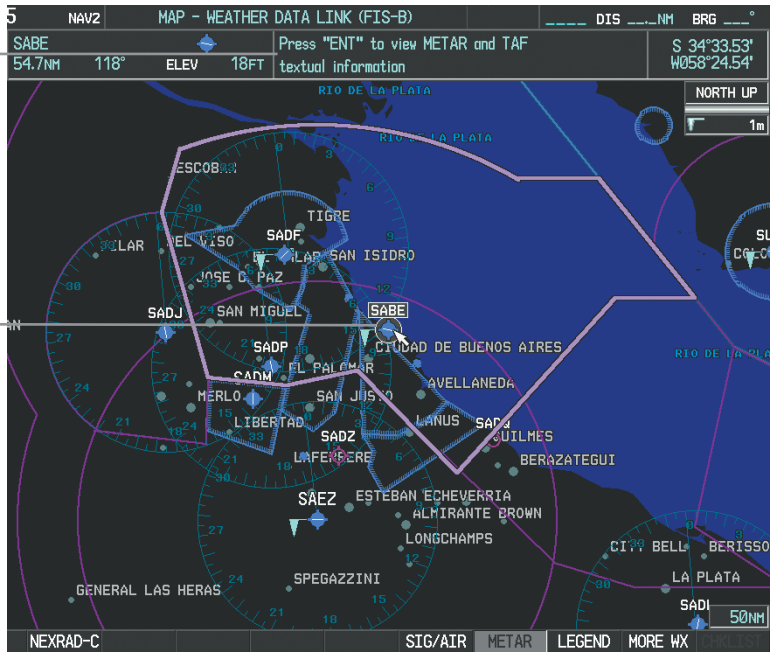


Figure 6-109 METAR Flags on the Weather Data Link (FIS-B) Page

TAFs (Terminal Aerodrome Forecasts) are predications of expected weather conditions for an area within five statute miles of the center of an airport's runway complex. The National Weather Service issues scheduled TAFs four times each day, and additional amended TAFs if conditions warrant. TAFs typically span a forecast period of 24 hours, but may be scheduled for a longer period. TAFs may include forecast wind, visibility, significant weather phenomena, and sky conditions using METAR codes.

METAR and TAF text are available on the Weather Information Page. METAR data is displayed first in a decoded fashion, followed by the original text. Note the original text may contain additional information not found in the decoded version. TAF information, when available, appears only in its original text.

Displaying METAR and TAF text:

1) On the Weather Data Link (FIS-B) Page, press the **METAR** Softkey.
2) Press the **Joystick** and pan to the desired airport.
3) Press the **ENT** Key. The Weather Information Page is shown with METAR and TAF text.
4) Use the **FMS** Knob or the **ENT** Key to scroll through the METAR and TAF text. METAR text must be completely scrolled through before scrolling through the TAF text.
5) Press the **FMS** Knob or the **CLR** Key to return to the Weather Data Link (FIS-B) Page.

Or:

1) Select the Weather Information Page.
   a) Turn the large **FMS** Knob to select the Waypoint Page Group.
   b) Press the **WX** Softkey to select the Weather Information Page.
2) Press the **FMS** Knob to display the cursor.
3) Use the **FMS** Knob to enter the desired airport and press the **ENT** Key.
4) Use the **FMS** Knob or the **ENT** Key to scroll through the METAR and TAF text. Note that the METAR text must be completely scrolled through before scrolling through the TAF text.



Figure 6-110 METAR and TAF Text on the Weather Information Page

Original METAR text is also accessible while panning the map cursor over a METAR flag on any map page on which a METAR is displayed. The METAR text is shown in a box near the METAR flag.

In addition, METAR flags and their associated text are displayed on the Active Flight Plan Page on the MFD. METAR flags appears next to waypoints in the flight plan with an associated METAR. A solid METAR flag indicates the METAR observations are available for specific waypoint; a hollow METAR flag indicates an off-route METAR is available near the waypoint.

Displaying original METAR text on the Active Flight Plan Page:

1) Select the Active Flight Plan Page on the MFD.
2) Press the **FMS** Knob to activate the cursor.
3) Turn the large **FMS** Knob to highlight the desired waypoint. The METAR text will appear in the 'SELECTED WAYPOINT WEATHER' window below.
4) When finished, press the **FMS** Knob to remove the cursor or press the **FPL** Key to exit the Active Flight Plan Page.

To display the METAR legend on the Weather Data Link (FIS-B) Page (Figure 6-111), press the **LEGEND** Softkey when METARs are selected for display.

The METAR flag color is determined by the information in the METAR text. The system displays a gray METAR flag when the METAR text does not contain enough information to determine the METAR category (e.g., VFR, IFR).

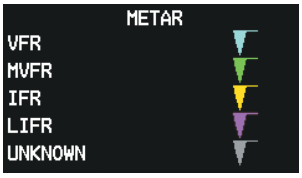


Figure 6-111 METAR Legend

WINDS ALOFT

The Winds Aloft weather product (Figure 6-112) shows the predicted wind speed and direction at selected altitudes. Winds aloft are available in various altitudes between 1,000 feet and 53,000 feet MSL.

Displaying Winds Aloft information:

1) Select the Weather Data Link (FIS-B) Page.
2) Press the **MORE WX** Softkey.
3) Press the **WIND OFF** Softkey.
4) Press the softkey for the desired altitude. Press the **NEXT** or **PREV** Softkey to cycle through the altitude softkeys. The **WIND** Softkey label changes to reflect the altitude selected.

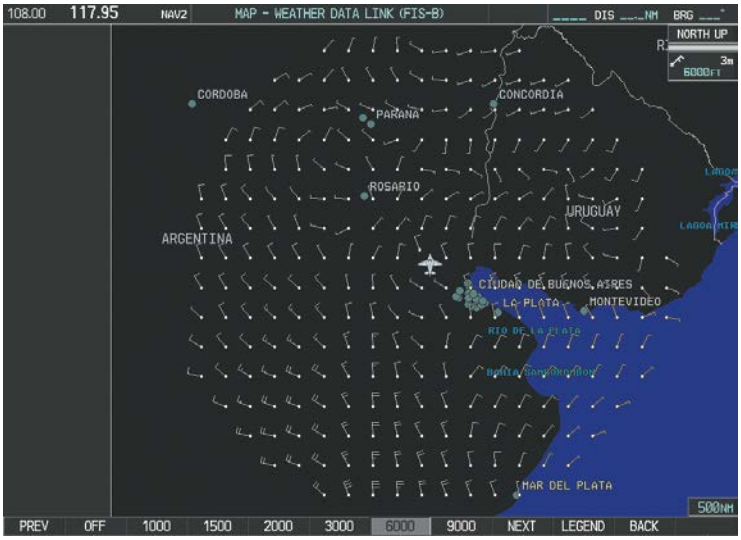


Figure 6-112 Winds Aloft at 6,000 Feet

To display the Winds Aloft legend (Figure 6-113), press the **LEGEND** Softkey when Winds Aloft is selected for display.

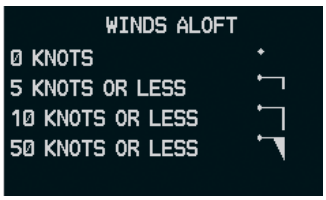


Figure 6-113 Winds Aloft Data with Legend

Headwind and tailwind components aloft are available inside the Profile View on the Navigation Map Page (Figure 6-114). The displayed components are relative to current aircraft altitude and track, but not to aircraft speed.

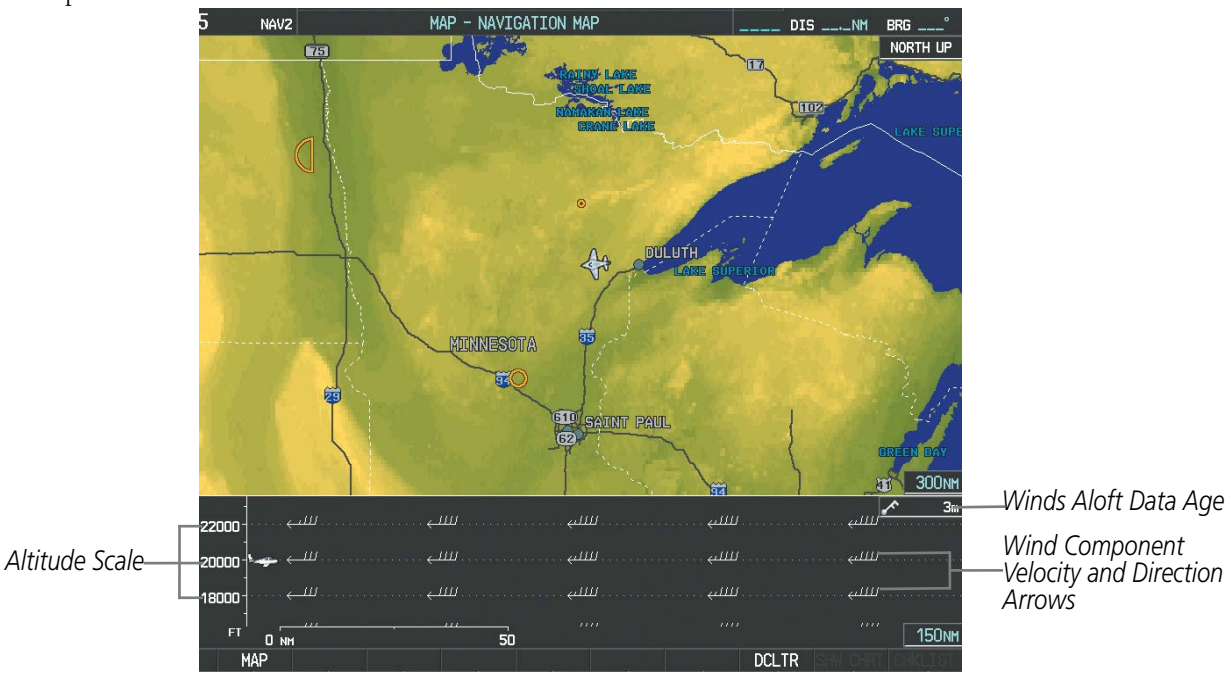


Figure 6-114 Navigation Map Page with Winds Aloft Data on Profile View

Arrows pointing to the left indicate headwind components; tailwind component arrows point to the right, as shown in Table 6-12.

Headwind Symbol	Tailwind Symbol	Headwind/Tailwind Component
None	None	Less than 5 knots
		5 knots
		10 knots
		50 knots

Table 6-12 Profile View Headwind/Tailwind Component Symbols

Enabling/disabling profile view (containing winds aloft data)

1) Select the Navigation Map Page.
2) Press the **PROFILE** Softkey.

Or:

1) Press the **MENU** Key.
2) Turn the large FMS Knob to highlight 'Show Profile View' or 'Hide Profile View' (choice dependent on current state) and press the **ENT** Key.

Winds Aloft data inside the Profile View is enabled by default when the Profile View is displayed on the Navigation Map Page. This behavior can be changed on the Navigation Map Page.

Enabling/disabling winds aloft data display in Profile View:

1) Select the Navigation Map Page.
2) Press the **MENU** Key.
3) With Map Setup highlighted, press the **ENT** Key (Figure 6-115).
4) Turn the small **FMS** Knob to select the Profile Group and press the **ENT** Key (Figure 6-116).
5) Turn the large **FMS** Knob to select 'Profile Winds' (Figure 6-117).
6) Turn the small **FMS** Knob to select 'On' or 'Off'.
7) Press the **FMS** Knob or **CLR** Key to return to the Navigation Map Page with the changed settings.

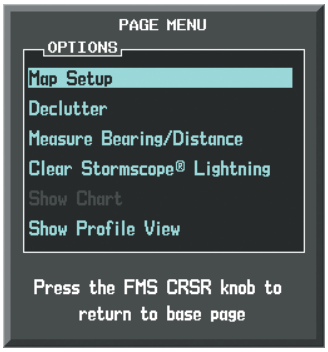


Figure 6-115 Navigation Map Page Menu



Figure 6-116 Navigation Map Page Setup Menu



Figure 6-117 Navigation Map Page Setup Menu, Weather Group

PIREPS

Pilot Weather Reports (PIREPs) describe in-flight weather encountered by pilots. A PIREP may contain adverse weather conditions, such as low in-flight visibility, icing conditions, wind shear, turbulence, and type of aircraft flown. PIREPs are issued as either Routine (UA) or Urgent (UUA).

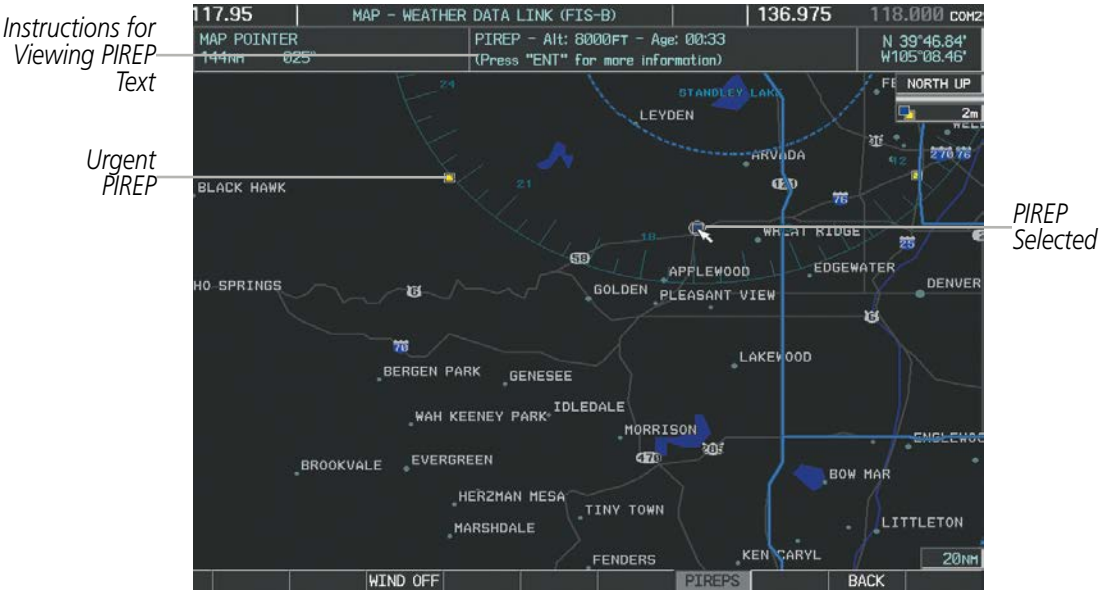


Figure 6-118 PIREPs on the Weather Data Link (CNXT) Page

Displaying PIREP text:

1) Select the Weather Data Link (FIS-B) Page.
2) Press the **MORE WX** Softkey.
3) Press the **PIREPS** Softkey.
4) Press the **Joystick** and pan to the desired weather report. A gray circle will appear around the weather report when it is selected.
5) Press the **ENT** Key. The PIREP text is first displayed in a decoded fashion, followed by the original text. Note the original text may contain additional information not shown in the decoded version.
6) Use the **FMS** Knob or the **ENT** Key to scroll through the PIREP text.
7) Press the **FMS** Knob or the **CLR** Key to close the PIREP text window and return to the Weather Data Link (FIS-B) Page.

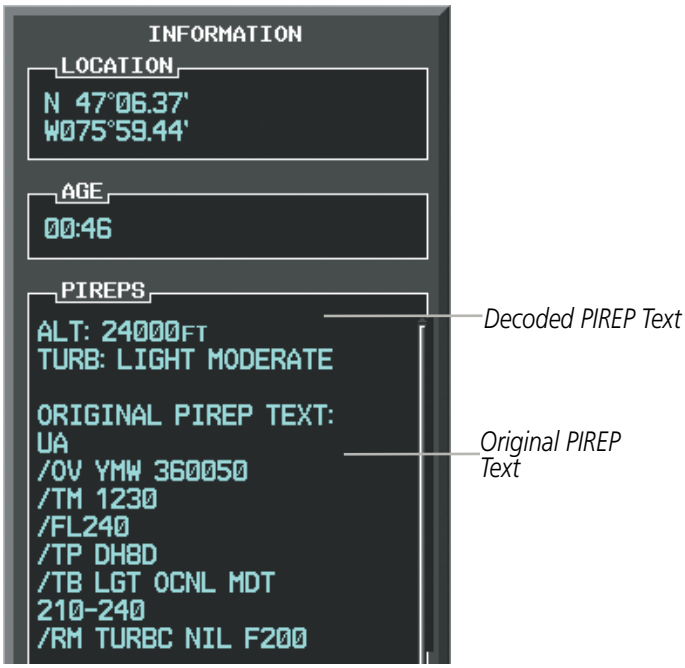


Figure 6-119 PIREP Text on the Weather Data Link (CNXT) Page

To display the PIREP legend (Figure 6-120), press the **LEGEND** Softkey when PIREPs are selected for display. The PIREP color is determined by the report type (routine or urgent).



Figure 6-120 AIREPs & PIREPs Legend

TFRS

NOTE: *Do not rely solely upon data link services to provide Temporary Flight Restriction (TFR) information. Always confirm TFR information through official sources such as Flight Service Stations or Air Traffic Control.*

In the United States, the Federal Aviation Administration (FAA) issues Temporary Flight Restrictions (TFRs) to designate areas where flight is restricted. TFRs are issued to restrict flight for a variety of reasons including national security, law enforcement, natural disasters, airshows, and large sporting events. TFRs may be issued at any time, and TFR data displayed is only intended to supplement official TFR information obtained from Flight Service Stations (FSS), and air traffic control.

The age of TFR data is not shown; however, if TFR data is not available or has expired, the system displays 'TFR N/A' in the upper-left corner of maps on which TFRs can be displayed.

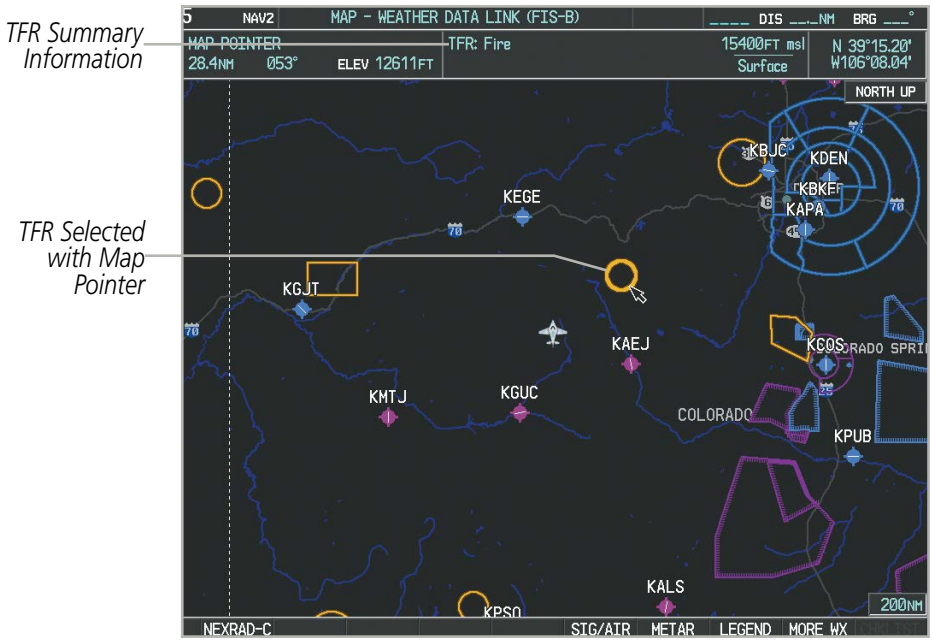


Figure 6-121 TFR Data on the Weather Data Link (FIS-B) Page

Displaying TFR Data:

1) Select the Weather Data Link (FIS-B) Page or Navigation Map Page.
2) Press the **Joystick** and pan the map pointer over a TFR to highlight it. The system displays TFR summary information above the map.
3) Press the **ENT** Key. The system displays a pop-up menu.
4) If necessary, turn the **FMS** Knob to select 'Review Airspaces' and press the **ENT** Key. The system displays the TFR Information window.
5) Press the **FMS** Knob or the **CLR** Key to remove the TFR Information window.

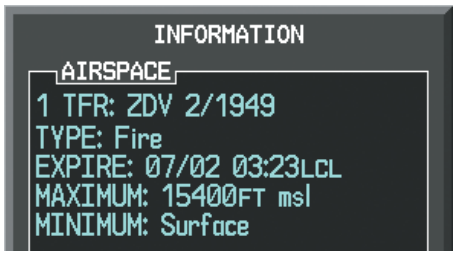


Figure 6-122 Full Text for Selected TFR

The setup menus for the Navigation Map Page control the map range settings above which TFR data is decluttered from the display. If a map range larger than the TFR product map range setting is selected, the TFR product data is removed from the map.

Maps other than the Navigation Map Page use settings based on those selected for the Navigation Map Page.

Setting up and customizing TFR data for maps on which TFR data can be displayed:

1) Select the Navigation Map Page.
2) Press the **MENU** Key.
3) With Map Setup highlighted, press the **ENT** Key (Figure 6-123).
4) Turn the small **FMS** Knob to select the Aviation Group and press the **ENT** Key (Figure 6-124).
5) Turn the large **FMS** Knob to scroll to the TFR product range setting (Figure 6-125).
6) Turn the small **FMS** Knob to scroll through options (Off, range settings).
7) Press the **ENT** Key to select an option.
8) Press the **FMS** Knob or **CLR** Key to return to the Navigation Map Page with the changed settings.

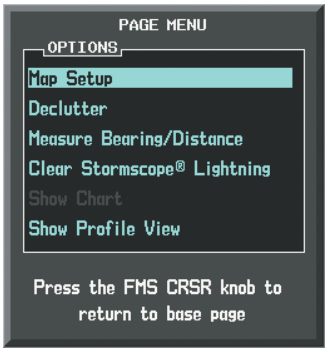


Figure 6-123 Navigation Map Page Menu



Figure 6-124 Navigation Map Page Setup Menu

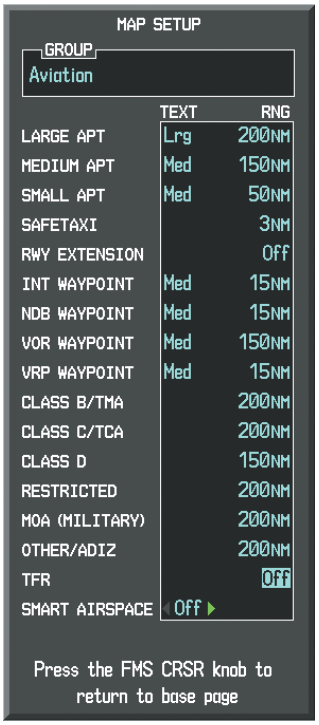


Figure 6-125 Navigation Map Page Setup Menu, Aviation Group

FIS-B WEATHER STATUS

Additional information about the status of FIS-B weather products is available on the AUX - ADS-B Status Page.

Viewing FIS-B status:

1) Turn the large **FMS** Knob to select the AUX Page Group.
2) Turn the small **FMS** Knob to select the AUX - ADS-B Status Page.



Figure 6-126 Viewing FIS-B Weather Status on ADS-B Status Page

ADS-B Status Page Item	Status Message	Description
FIS-B Weather Status: FIS-B Processing	ENABLED	The FIS-B weather feature is enabled to process and display FIS-B weather products.
	DISABLED	The FIS-B weather feature is disabled.
	----------	No data received from the GDL 88 UAT.
Weather Products: AIRMET CONUS NEXRAD METAR METAR GRAPHICAL NOTAM/TFR PIREP REGIONAL NEXRAD SIGMET TAF WINDS/TEMPS ALOFT	AVAILABLE	FIS-B weather data is available for display for the weather product.
	NOT AVAILABLE	FIS-B weather data is not available for the weather product, and/or the system is not receiving the FIS-B weather service.
	AWAITING DATA	The system is receiving the FIS-B weather service, and is waiting to receive the weather product from the FIS-B data broadcast.

Table 6-13 AUX-ADS-B Status Page Messages for FIS-B Weather

6.4 LIGHTNING DETECTION SYSTEM

WARNING: *Do not rely on information from a lightning detection system display as the sole basis for hazardous weather avoidance. Range limitations and interference may cause the system to display inaccurate or incomplete information. Refer to documentation from the lightning detection system manufacturer for detailed information about the system.*

NOTE: *Lightning information from data link services such as SiriusXM Weather or Garmin Connext cannot be displayed at the same time as on-board lightning detection system data is selected for display.*

The following pages can display on-board lightning detection system data:

- Stormscope Page
- Navigation Map
- AUX - Video Page
- AUX - Trip Planning Page
- Nearest Pages

To display lightning data on the Navigation Map, AUX - Trip Planning Page, or any of the Nearest Pages, press the **MAP** Softkey, then press the **STRMSCP** Softkey. These pages can also display cell or strike data using the lightning strike symbols shown in Table 6-14.

Lightning Age	Symbol
Strike is less than 6 seconds old	
Strike is between 6 and 60 seconds old	
Strike is between 1 and 2 minutes old	
Strike is between 2 and 3 minutes old	

Table 6-14 Lightning Age and Symbols

SETTING UP LIGHTNING DETECTION ON THE NAVIGATION MAP

Setting up lightning detection options on the Navigation Map:

1) On the Navigation Map Page, press the **MENU** Key.
2) With 'Map Setup' selected (Figure 6-127), press the **ENT** Key.
3) Turn the small **FMS** Knob to display the group selection window. Turn the small **FMS** Knob to select 'Weather' (Figure 6-128), and press the **ENT** Key.
4) Turn the large **FMS** Knob to highlight and move between the product selections.
5) When an item is highlighted, turn the small **FMS** Knob to select the option.
6) Press the **ENT** Key.
7) Press the **FMS** Knob to return to the Navigation Map Page (Figure 6-129).

The following options are available (Figure 6-128):

- **STRMSCP LTNG** – Turns the display of lightning detection data on or off.
- **STRMSCP MODE** – Selects the CELL or STRIKE mode of lightning activity. Cell mode identifies clusters or cells of electrical activity. Strike mode indicates the approximate location of lightning strikes.
- **STRMSCP SMBL** – Selects the range at which Stormscope data displays. The system removes Stormscope information when a map range greater than the STRMSCP SMBL value is selected.

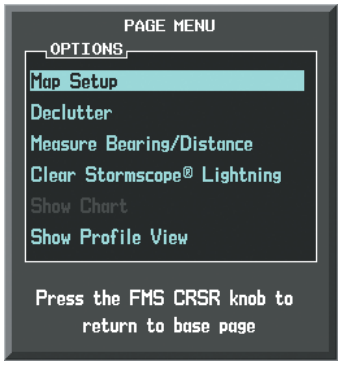


Figure 6-127 Navigation Map Page Menu

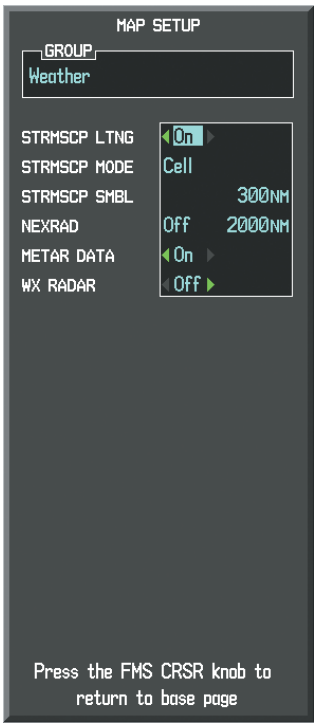


Figure 6-128 Map Setup Menu

CELL AND STRIKE MODE ON THE NAVIGATION MAP

On the Navigation Map, cell mode identifies cells of lightning activity (Figure 6-129). The system identifies clusters of electrical activity that indicate cells. Strike mode indicates the approximate location of lightning strikes.

Selecting the 'cell' or 'strike' mode on the Navigation Map:

1) Press the **MENU** Key.
2) With 'Map Setup' selected, press the **ENT** Key.
3) Select the 'Weather' group.
4) Press the **ENT** Key. The cursor flashes on 'STRMSCP LTNG'.
5) Turn the **large FMS** Knob to select 'STRMSCP MODE'.
6) Turn the **small FMS** Knob to change between 'CELL' and 'STRIKE' options. When an item is selected, press the **ENT** Key.
7) Press the **FMS** knob to return to the Navigation Map Page.



Figure 6-129 Navigation Map Page with Stormscope Lightning Data

If heading input is lost, strikes and/or cells must be cleared manually after the execution of each turn. This is to ensure that the strike and/or cell positions are depicted accurately in relation to the nose of the aircraft.

Manually clearing lightning detection data on the Navigation Map:

1) Press the **MENU** Key.
2) Select 'Clear Stormscope® Lightning' (Figure 6-130).
3) Press the **ENT** Key.

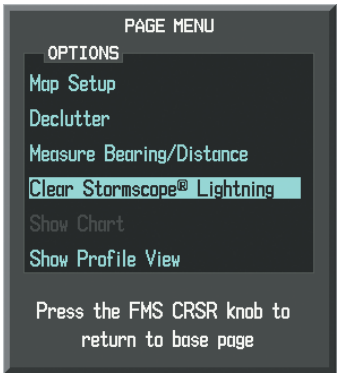


Figure 6-130 Navigation Map Page Menu

ZOOM RANGE ON THE NAVIGATION MAP

Lightning detection information can be displayed up to 800 nm zoom range (in North up mode) on the Navigation Map Page. **However, in the track up mode at the 500 nm range, a portion of the lightning data can be behind the aircraft and therefore not visible on the Navigation Map**. Since the range for Stormscope data is 400 nm diameter total (200 nm in front and 200 nm behind), the 500 nm range in North up mode shows all the data.

At a map range of less than 25 nm, the system removes lightning detection information from the map, although lightning may still be present.

Selecting a lightning detection range on the Navigation Map:

1) Press the **MENU** Key.
2) Select 'MAP SETUP'.
3) Select the 'Weather' group.
4) Press the **ENT** Key.
5) Turn the **large FMS** Knob to select 'STRMSCP SMBL'.
6) Turn the **small FMS** Knob to select the maximum display range.
7) Press the **ENT** Key.
8) Press the **FMS** Knob to return to the Navigation Map Page.

To change the display range on the Navigation Map Page, turn the **Joystick** clockwise to zoom out or counter-clockwise to zoom in.

SELECTING THE STORMSCOPE PAGE

Lightning data can be displayed at the ranges of 25 nm, 50 nm, 100 nm, and 200 nm.

Adjusting the Stormscope Map Range:

1) Turn the large **FMS** Knob to select the Map Page Group.
2) Turn the small **FMS** Knob to select the Stormscope Page.
3) To change the map range, turn the **Joystick** clockwise to zoom out or counter-clockwise to zoom in.

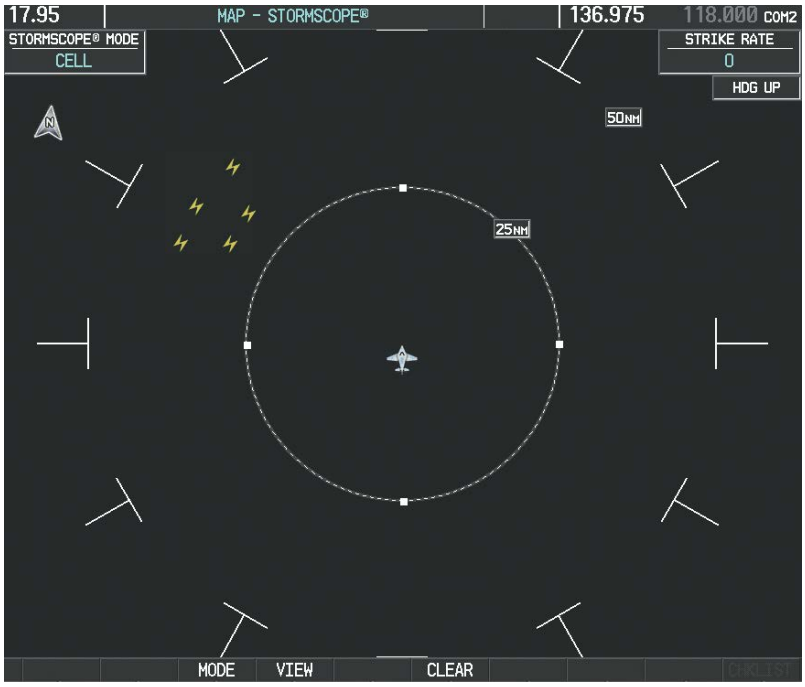


Figure 6-131 Stormscope Page

Changing between 'cell' and 'strike' mode on the Stormscope Page:

1) Select the Stormscope Page.
2) Press the **MODE** Softkey. The **CELL** and **STRIKE** softkeys are displayed.
3) Press the **CELL** Softkey to display 'CELL' data or press the **STRIKE** Softkey to display 'STRIKE' data. 'CELL' or 'STRIKE' is displayed in the mode box in the upper left corner of the Stormscope Page.
4) Press the **BACK** Softkey to return to the main Stormscope page.

Changing the viewing mode between 360° and 120° on the Stormscope Page:

1) Select the Stormscope Page.
2) Press the **VIEW** Softkey. The **360** and **ARC** softkeys are displayed. Press the **360** Softkey to display a 360° viewing area or press the **ARC** Softkey to display a 120° viewing area.
3) Press the **BACK** Softkey to return to the main Stormscope Page.

6.5 TERRAIN PROXIMITY

WARNING: *Do not use Terrain Proximity information for primary terrain avoidance. Terrain Proximity is intended only to enhance situational awareness.*

Terrain Proximity is a terrain awareness system that does not comply with TSO-C151b certification standards. It increases situational awareness and aids in reducing controlled flight into terrain (CFIT). Do not confuse Terrain Proximity with Terrain Awareness and Warning System (TAWS). TAWS is more sophisticated and robust, and it is TSO-C151b certified. Terrain Proximity does not provide warning annunciations or voice alerts. It only provides color indications on map displays when terrain and obstacles are within a certain altitude threshold from the aircraft. Although the terrain and obstacle color map displays are the same, TAWS uses more sophisticated algorithms to assess aircraft distance from terrain and obstacles.

Terrain Proximity requires the following components to operate properly:

- Valid 3-D GPS position
- Valid terrain/obstacle database

Terrain Proximity displays altitudes of terrain and obstructions relative to the aircraft position and altitude with reference to a database that may contain inaccuracies. Terrain and obstructions are shown only if they are in the database. Terrain and obstacle information should be used as an aid to situational awareness. They should never be used to navigate or maneuver around terrain.

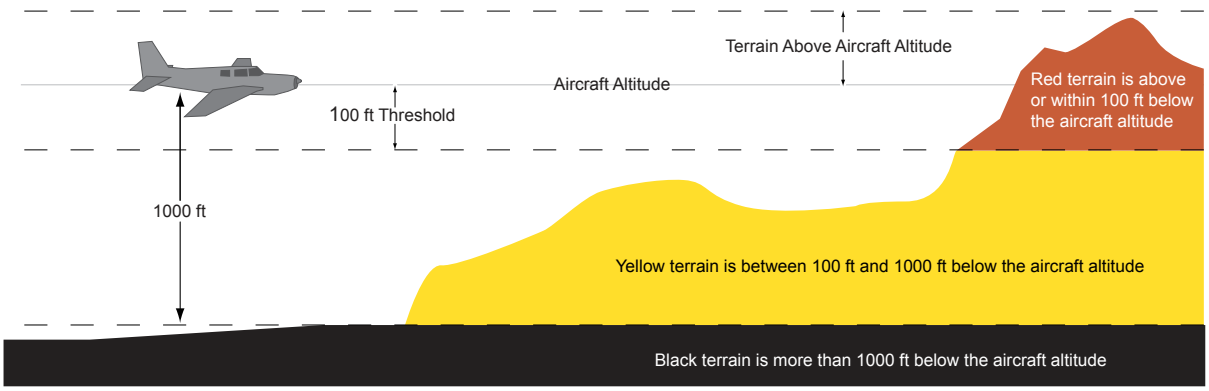
Note that all obstructions may not be available in the terrain and obstacle database. No terrain and obstacle information is shown without a valid 3-D GPS position.

The GPS receiver provides the horizontal position and altitude. GPS altitude is derived from satellite position. GPS altitude is then converted to the height above geodetic sea level (GSL), which is the height above mean sea level calculated geometrically. GSL altitude is used to determine terrain and obstacle proximity. GSL altitude accuracy is affected by satellite geometry, but is not subject to variations in pressure and temperature that normally affect pressure altitude sensors. GSL altitude does not require local altimeter settings to determine MSL altitude. It is a widely-used MSL altitude source.

Terrain and obstacle databases are referenced to MSL. Using the GPS position and altitude, the Terrain Proximity feature portrays a 2-D picture of the surrounding terrain and obstacles relative to the position and altitude of the aircraft. GPS position and GSL altitude are used to calculate and predict the aircraft's flight path in relation to the surrounding terrain and obstacles. In this way, the pilot can view predicted dangerous terrain and obstacle conditions.

DISPLAYING TERRAIN PROXIMITY DATA

The symbols and colors in Figure 6-132 and Table 6-15 are used to represent obstacles and aircraft altitude when the Terrain Proximity Page is selected for display. Terrain Proximity uses black, yellow, and red to represent terrain information relative to aircraft altitude. The color of each obstacle is associated with the altitude of the aircraft.



On the Terrain Proxmity Page only, a gray shade of purple indicates no terrain data is available.

Figure 6-132 Terrain Altitude/Color Correlation for Terrain Proximity

Unlighted Obstacle		Lighted Obstacle		Obstacle Location
< 1000' AGL	> 1000' AGL	< 1000' AGL	> 1000' AGL	
				Red obstacle is above or within 100' below current aircraft altitude
				Yellow obstacle is between 100' and 1000' below current aircraft altitude
				Gray obstacle is more than 1000 ft below aircraft altitude

Table 6-15 Terrain Proximity Terrain/Obstacle Colors and Symbology

Terrain and obstacle information can be displayed on the following pages:

- PFD Inset Map
- Navigation Map Page
- Terrain Proximity Page
- Trip Planning Page
- Flight Plan Page
- AUX - Video Page

Displaying terrain and obstacle information (maps other than the Terrain Proximity Page):

1) Press the **MAP** Softkey (for the PFD Inset Map, press the **INSET** Softkey).
2) Press the **TERRAIN** Softkey to display terrain and obstacle data.

When Terrain Proximity is selected on maps other than the Terrain Proximity Page, an icon to indicate the feature is enabled for display and a legend for Terrain Proximity colors are shown (Figure 6-136).

The Navigation Map Page Setup Menu provides a means in addition to the softkey for enabling/disabling display of terrain and obstacles. The setup menu also controls the map range settings above which terrain and obstacle data are decluttered from the display. If a map range larger than the map range setting is selected, the data is removed from the map.

Terrain data can be selected for display independently of obstacle data; however, obstacles recognized by Terrain Proximity as yellow or red are shown when terrain is selected for display and the map range is within the setting limit.

Maps besides the Terrain Proximity Page use settings based on those selected for the Navigation Map Page. The maximum display ranges for obstacles on each map are dependent on the range setting made for the Navigation Map. If the maximum range for obstacle display on the Navigation Map is adjusted to below 20 nm, the highest obstacle display range settings on the other applicable maps are also adjusted proportionally.

Customizing terrain and obstacle display on the Navigation Map Page:

1) Select the Navigation Map Page.
2) Press the **MENU** Key.
3) With 'Map Setup' highlighted, press the **ENT** Key (Figure 6-133).
4) Turn the small **FMS** Knob to select the 'Map' Group and press the **ENT** Key (Figure 6-134).
5) Turn the large **FMS** Knob or press the **ENT** Key to scroll through product selections (Figure 6-135).
   - TERRAIN DATA – Turns the display of terrain data on or off and sets maximum range at which terrain is shown
   - OBSTACLE DATA – Turns the display of obstacle data on or off and sets maximum range at which obstacles are shown
6) Turn the small **FMS** Knob to scroll through options for each product (ON/OFF, range settings).
7) Press the **ENT** Key to select an option.
8) Press the **FMS** Knob or **CLR** Key to return to the Navigation Map Page with the changed settings.

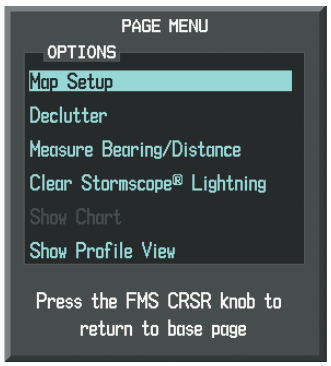


Figure 6-133 Navigation Map Page Menu



Figure 6-134 Navigation Map Page Setup Menu



Figure 6-135 Navigation Map Page Setup Menu, Map Group

Additional information about obstacles can be displayed by panning over the display on the map. The map panning feature is enabled by pressing the **Joystick**. The map range is adjusted by turning the **Joystick**. If the map range is adjusted while panning is enabled, the map is re-centered on the Map Pointer.

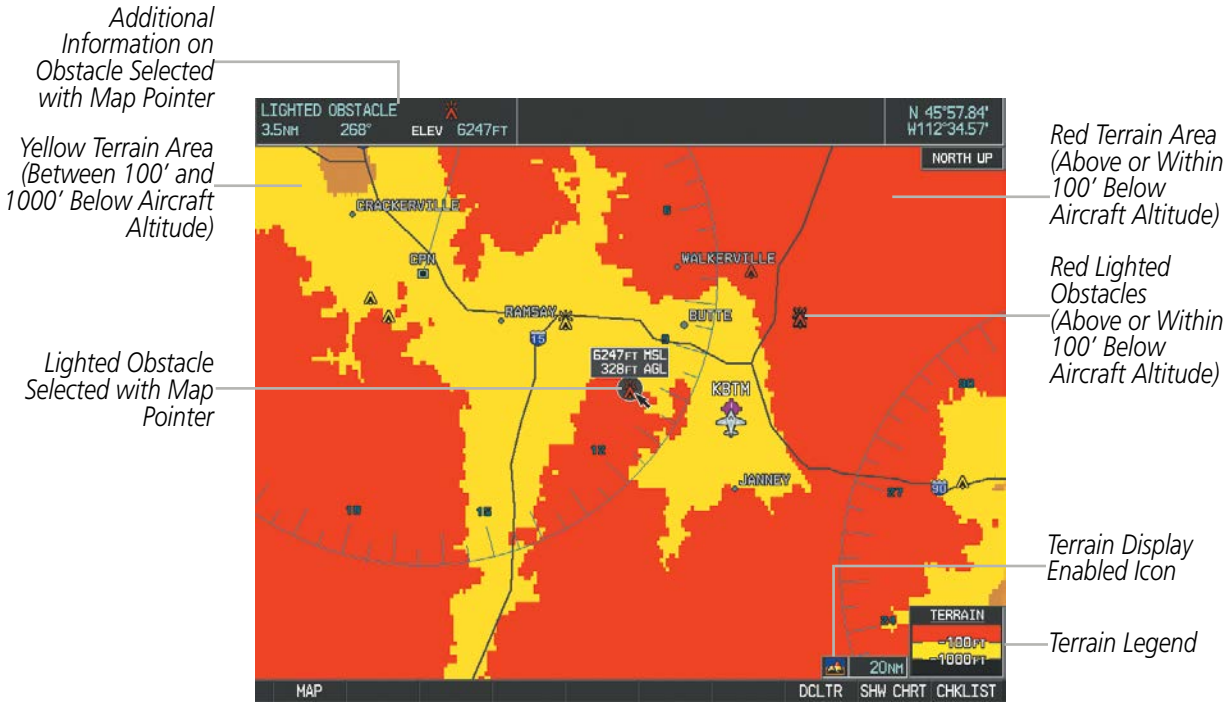


Figure 6-136 Terrain Information on the Navigation Map Page

TERRAIN PROXIMITY PAGE

The Map - Terrain Proximity Page is the principal map page for showing terrain and obstacle data in relation to the aircraft's current altitude, without clutter from the basemap. Aviation information (airports, VORs, and other NAVAIDs) can be displayed for reference.

Aircraft orientation on this map is always heading up unless there is no valid heading. Two views are available relative to the position of the aircraft: the 360° default display and the radar-like ARC (120°) display. Map range is adjustable with the **Joystick** from 1 to 200 nm, as indicated by the map range rings (or arcs).

Displaying the Terrain Proximity Page:

1) Turn the large **FMS** Knob to select the Map Page Group.

2) Turn the small **FMS** Knob to select the Terrain Proximity Page.

3) To change the view,

a) Press the **VIEW** Softkey.

b) Press the **360** or **ARC** Softkey to select the desired view.

Or:

a) Press the **MENU** Key.

b) Select 'View Arc' or 'View 360°' (choice dependent on current state) and press the **ENT** Key to change the view.

Showing/hiding aviation information on the Terrain Proximity Page:

1) Press the **MENU** Key.
2) Select 'Show Aviation Data' or 'Hide Aviation Data' (choice dependent on current state) and press the **ENT** Key.

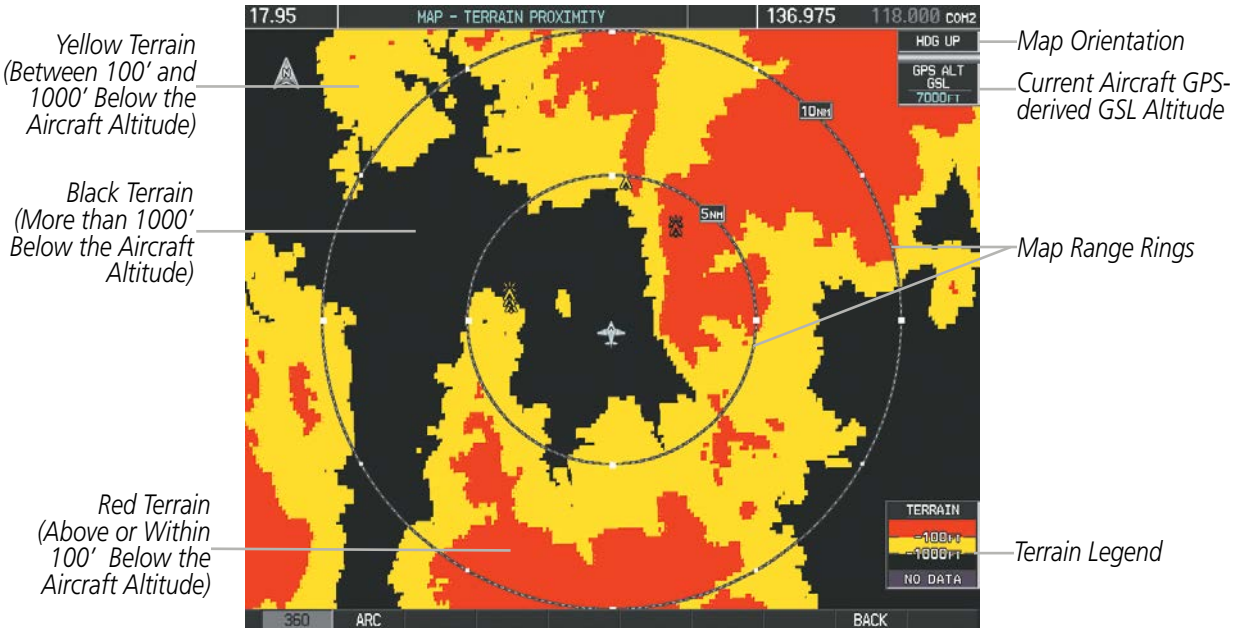


Figure 6-137 Terrain Proximity Page (360 View)

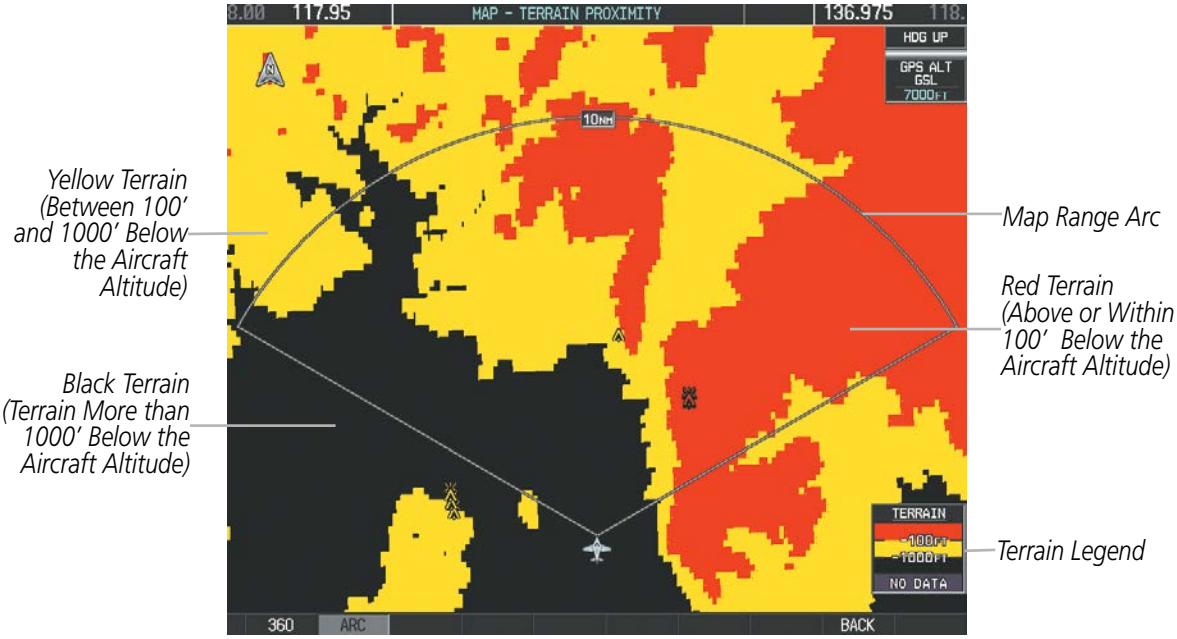


Figure 6-138 Terrain Proximity Page (ARC View)

6.6 TERRAIN-SVS

WARNING: *Do not use Terrain-SVS information for primary terrain avoidance. Terrain-SVS is intended only to enhance situational awareness.*

NOTE: *Terrain-SVS is included with the Synthetic Vision Technology (SVT) system option. If the TAWS-B option is also installed, it will take precedence over Terrain-SVS.*

NOTE: *Terrain-SVS is information is not displayed if the aircraft is outside of the installed terrain database coverage area.*

Terrain-SVS is a terrain awareness system integrated with the optional Synthetic Vision Technology (SVT) system. Terrain-SVS provides visual and auditory alerting to indicate the presence of threatening terrain or obstacles relevant to the projected flight path. For detailed information regarding SVT, refer to the Additional Features section.

Terrain-SVS does not comply with TSO-C151b certification standards. It increases situational awareness and aids in reducing controlled flight into terrain (CFIT). Do not confuse Terrain-SVS with the optional Terrain Awareness and Warning System (TAWS). TAWS is more sophisticated and robust, and it is TSO-C151b certified. Although the terrain and obstacle color map displays are the same, TAWS uses more sophisticated algorithms to assess aircraft distance from terrain and obstacles and provides additional alerting capabilities.

Terrain-SVS does not provide the following:

- Premature Descent Alerting (PDA)
- Excessive Descent Rate (EDR)
- Negative Climb Rate (NCR)
- Descent to 500 Feet Callout (DFC)

Terrain-SVS requires the following components to operate properly:

- Valid 3-D GPS position
- Valid terrain/obstacle database

Terrain-SVS displays altitudes of terrain and obstructions relative to the aircraft position and altitude with reference to a database that may contain inaccuracies. Terrain and obstructions are shown only if they are in the database. Terrain and obstacle information should be used as an aid to situational awareness. They should never be used to navigate or maneuver around terrain.

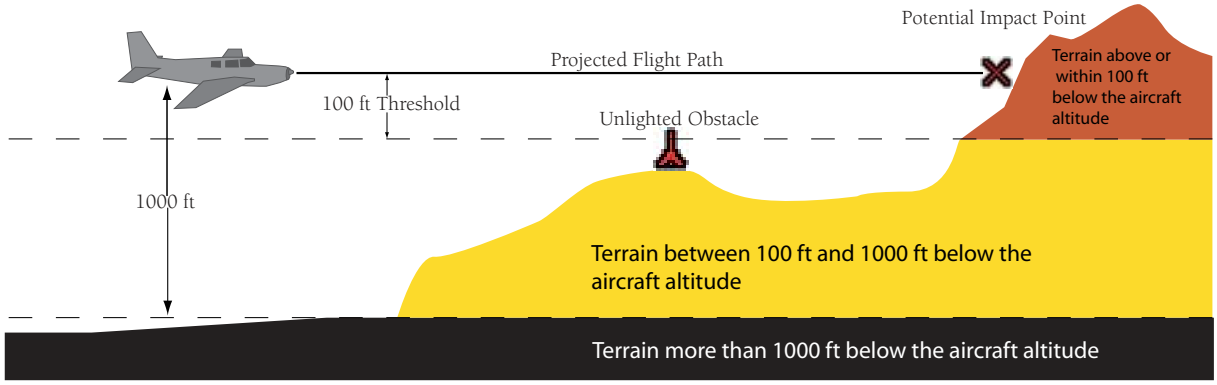
Note that all obstructions may not be available in the terrain and obstacle database. No terrain and obstacle information is shown without a valid 3-D GPS position.

The GPS receiver provides the horizontal position and altitude. GPS altitude is derived from satellite position. GPS altitude is then converted to the height above geodetic sea level (GSL), which is the height above mean sea level calculated geometrically. GSL altitude is used to determine terrain and obstacle proximity. GSL altitude accuracy is affected by satellite geometry, but is not subject to variations in pressure and temperature that normally affect pressure altitude sensors. GSL altitude does not require local altimeter settings to determine MSL altitude. It is a widely-used MSL altitude source.

Terrain and obstacle databases are referenced to GSL. Using the GPS position and altitude, the Terrain-SVS feature portrays a 3-D picture of the surrounding terrain and obstacles relative to the position and altitude of the aircraft. GPS position and GSL altitude are used to calculate and predict the aircraft's flight path in relation to the surrounding terrain and obstacles. In this way, the pilot can view predicted dangerous terrain and obstacle conditions.

DISPLAYING TERRAIN-SVS DATA

Terrain-SVS uses yellow (caution) and red (warning) to depict terrain and obstacles (with heights greater than 200 feet above ground level, AGL) alerts relative to aircraft altitude. Colors are adjusted automatically as the aircraft altitude changes. The colors and symbols in Figure 6-139 and Table 6-16 and Table 6-17 are used to represent terrain, obstacles, and potential impact points.



On the Terrain-SVS Page only, a gray shade of purple indicates no terrain data is available.

Figure 6-139 Terrain Altitude/Color Correlation for Terrain-SVS

Unlighted Obstacle		Lighted Obstacle		Obstacle Location
< 1000' AGL	> 1000' AGL	< 1000' AGL	> 1000' AGL	
				Red obstacle is above or within 100' below current aircraft altitude
				Yellow obstacle is between 100' and 1000' below current aircraft altitude
				Gray obstacle is more than 1000 ft below aircraft altitude

Table 6-16 Terrain-SVS Obstacle Colors and Symbology

Potential Impact Point Symbol	Alert Type	Example Annunciation
	Warning	TERRAIN
	Caution	TERRAIN

Table 6-17 Terrain-SVS Potential Impact Point Symbols with Alert Types

Terrain-SVS information can be displayed on the following maps:

- PFD Inset Map
- Navigation Map Page
- Terrain-SVS Page
- Trip Planning Page
- Flight Plan Pages
- AUX - Video Page

Displaying terrain and obstacle information (maps other than the Terrain-SVS Page):

1) Press the **MAP** Softkey (for the PFD Inset Map, press the **INSET** Softkey).
2) Press the **TERRAIN** Softkey to display terrain and obstacle data.

When Terrain-SVS is selected on maps other than the Terrain-SVS Page, an icon to indicate the feature is enabled for display and a legend for Terrain-SVS terrain colors are shown (Figure 6-146).

The Navigation Map Page Setup Menu provides a means in addition to the softkeys for enabling/disabling the display of terrain and obstacles. The setup menu also controls the map range settings above which terrain and obstacle data are decluttered from the display. If a map range larger than the map range setting is selected, the data is removed from the map. For terrain data, the enable/disable function applies only to the MFD, while the range setting also affects the PFD Inset Map.

Terrain data can be selected for display independently of obstacle data; however, obstacles for which warnings and cautions are issued are shown when terrain is selected for display and the map range is within the setting limit.

Maps besides the Terrain-SVS Page use settings based on those selected for the Navigation Map Page. The maximum display ranges for obstacles on each map are dependent on the range setting made for the Navigation Map. If the maximum range for obstacle display on the Navigation Map is adjusted to below 20 nm, the highest obstacle display range settings on the other applicable maps are also adjusted proportionally.

Customizing terrain and obstacle display on the Navigation Map Page:

1) Select the Navigation Map Page.
2) Press the **MENU** Key.
3) With 'Map Setup' highlighted, press the **ENT** Key (Figure 6-140).
4) Turn the small **FMS** Knob to select the 'Map' Group and press the **ENT** Key (Figure 6-141).
5) Turn the large **FMS** Knob or press the **ENT** Key to scroll through product selections (Figure 6-142).
   - TERRAIN DATA – Turns the display of terrain data on or off and sets maximum range at which terrain is shown
   - OBSTACLE DATA – Turns the display of obstacle data on or off and sets maximum range at which obstacles are shown
6) Turn the small **FMS** Knob to scroll through options for each product (ON/OFF, range settings).
7) Press the **ENT** Key to select an option.
8) Press the **FMS** Knob or **CLR** Key to return to the Navigation Map Page with the changed settings.

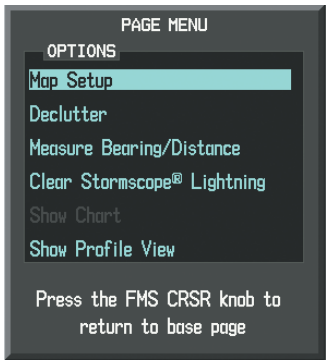


Figure 6-140 Navigation Map Page Menu



Figure 6-141 Navigation Map Page Setup Menu



Figure 6-142 Navigation Map Page Setup Menu, Map Group

TERRAIN-SVS PAGE

The Map - Terrain-SVS Page is the principal map page for viewing terrain, obstacle, and potential impact point data in relation to the aircraft's current altitude, without clutter from the basemap. Aviation information (airports, VORs, and other NAVAIDs) can be displayed for reference. If an obstacle and the projected flight path of the aircraft intersect, the display automatically zooms in to the closest potential point of impact on the Terrain-SVS Page.

Aircraft orientation on this map is always heading up unless there is no valid heading. Two views are available relative to the position of the aircraft: the 360° default display and the radar-like ARC (120°) display. Map range is adjustable with the **Joystick** from 1 to 200 nm, as indicated by the map range rings (or arcs).

Displaying the Terrain-SVS Page:

1) Turn the large **FMS** Knob to select the Map Page Group.
2) Turn the small **FMS** Knob to select the Terrain-SVS Page.

Changing the Terrain-SVS Page view:

1) Press the **VIEW** Softkey.
2) Press the **360** or **ARC** Softkey to select the desired view.

Or:

1) Press the **MENU** Key.
2) Select 'View Arc' or 'View 360°' (choice dependent on current state) and press the **ENT** Key to change the view

Showing/hiding aviation information on the Terrain-SVS Page:

1) Press the **MENU** Key.
2) Select 'Show Aviation Data' or 'Hide Aviation Data' (choice dependent on current state) and press the **ENT** Key.

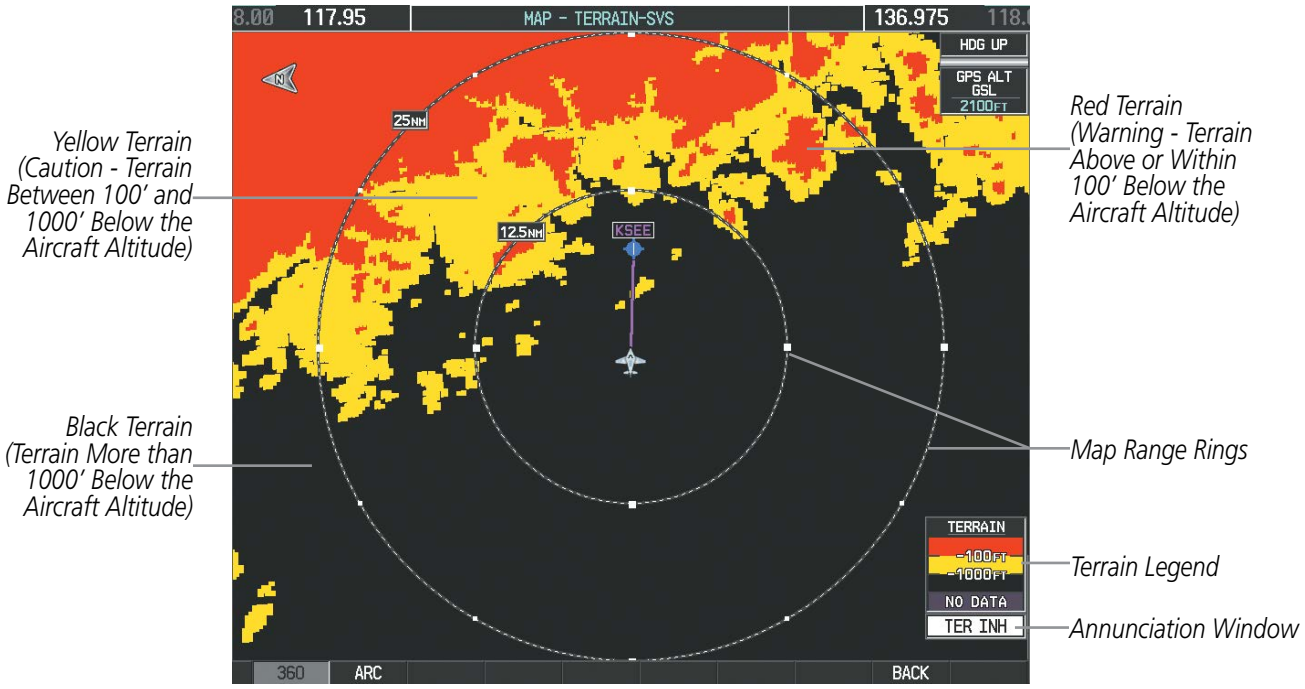


Figure 6-143 Terrain-SVS Page

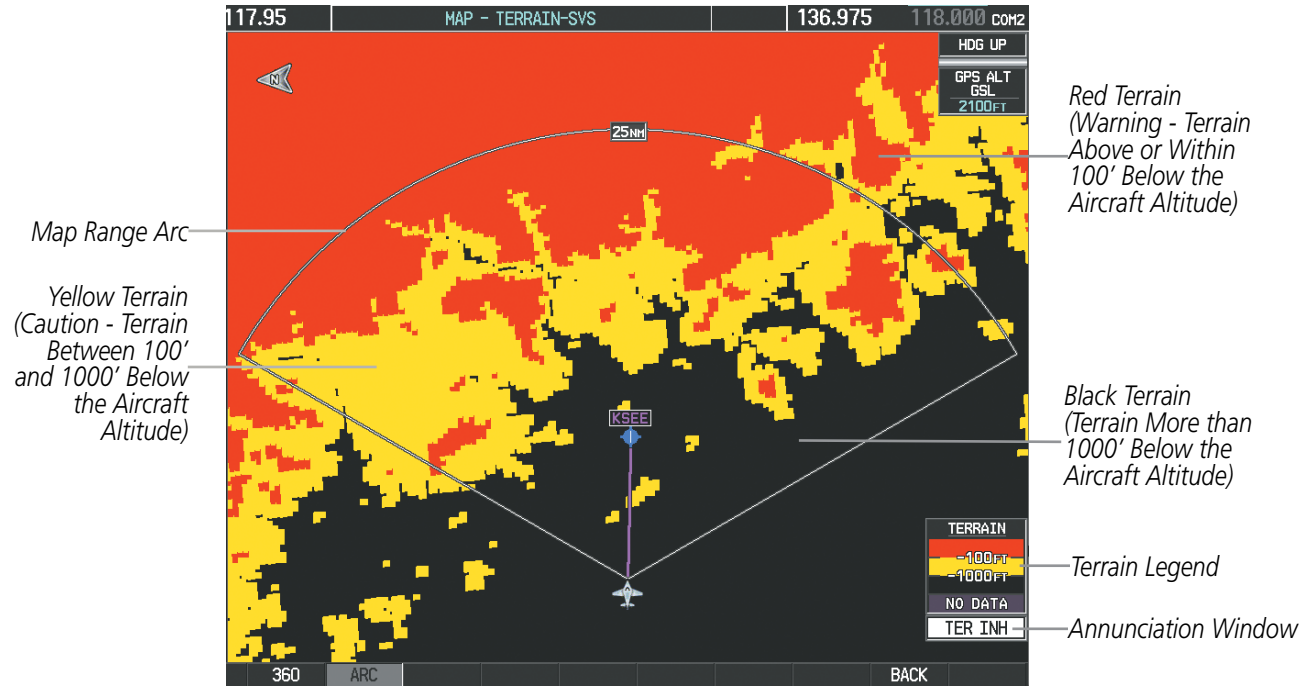


Figure 6-144 Terrain-SVS Page (ARC View)

TERRAIN-SVS ALERTS

Alerts are issued when flight conditions meet parameters that are set within Terrain-SVS software algorithms. Terrain-SVS alerts typically employ a CAUTION or a WARNING alert severity level, or both. When an alert is issued, the system provides visual annunciations and voice alerts. Table 6-18 shows Terrain-SVS alert types with corresponding annunciations and voice messages.

When an alert is issued, annunciations appear on the PFD and MFD. The Terrain-SVS Alert Annunciation is shown to the upper left of the Altimeter on the PFD and below the Terrain Legend on the MFD. If the Terrain-SVS Page is not displayed at the time, a pop-up alert appears on the MFD. To acknowledge the pop-up alert:

- Press the **CLR** Key (returns to the currently viewed page), or
- Press the **ENT** Key (accesses the Terrain-SVS Page)

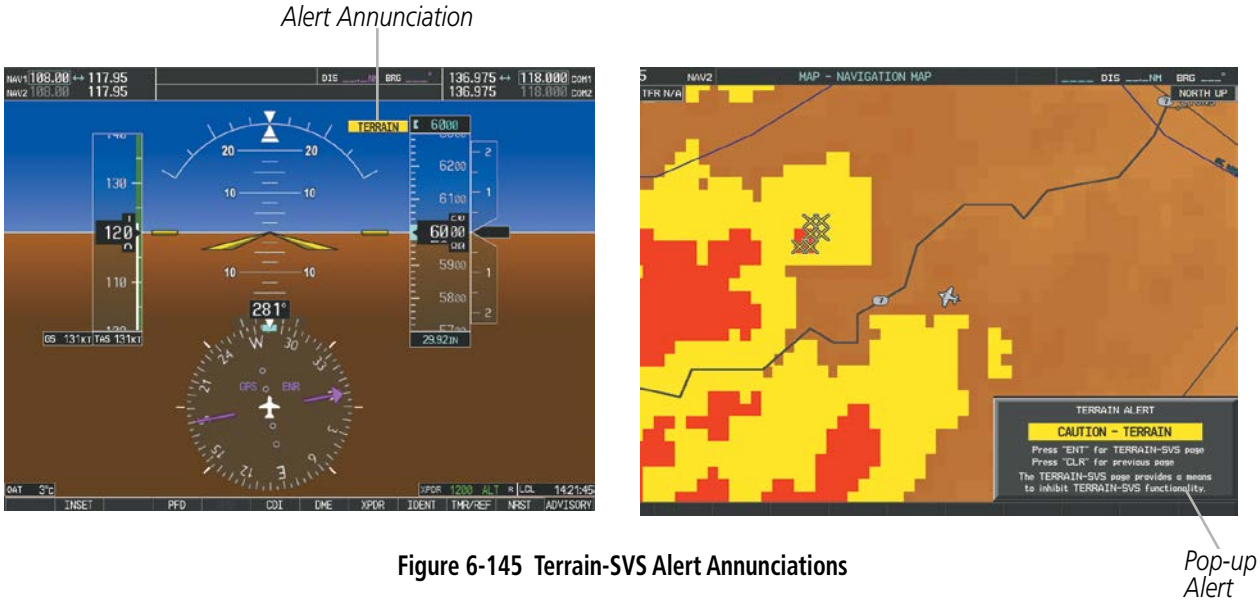


Figure 6-145 Terrain-SVS Alert Annunciations

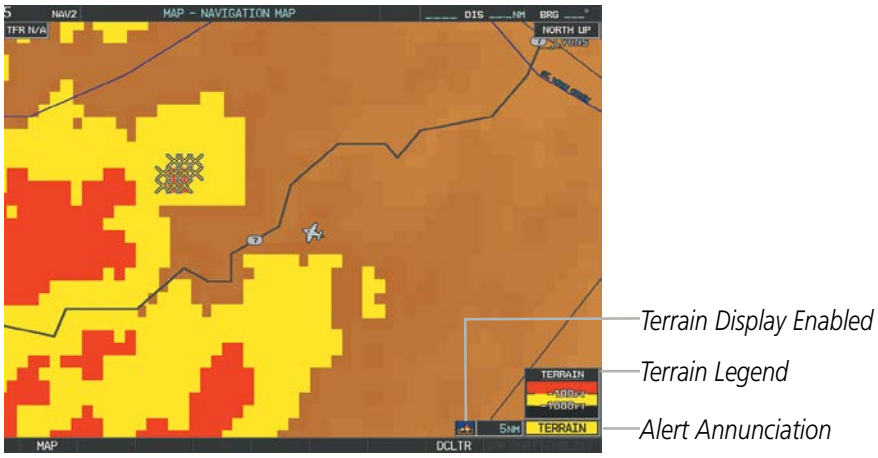


Figure 6-146 Navigation Map Page (After Terrain-SVS Pop-up Alert Acknowledgment)

Alert Type	PFD/MFD* Alert Annunciation	MFD Pop-Up Alert (except Terrain-SVS Page)	Voice Alert
Reduced Required Terrain Clearance Warning (RTC)	TERRAIN	WARNING - TERRAIN	"Warning; Terrain, Terrain"
Imminent Terrain Impact Warning (ITI)	TERRAIN	WARNING - TERRAIN	"Warning; Terrain, Terrain"
Reduced Required Obstacle Clearance Warning (ROC)	TERRAIN	WARNING - OBSTACLE	"Warning; Obstacle, Obstacle"
Imminent Obstacle Impact Warning (IOI)	TERRAIN	WARNING - OBSTACLE	"Warning; Obstacle, Obstacle"
Reduced Required Terrain Clearance Caution (RTC)	TERRAIN	CAUTION - TERRAIN	"Caution; Terrain, Terrain"
Imminent Terrain Impact Caution (ITI)	TERRAIN	CAUTION - TERRAIN	"Caution; Terrain, Terrain"
Reduced Required Obstacle Clearance Caution (ROC)	TERRAIN	CAUTION - OBSTACLE	"Caution; Obstacle, Obstacle"
Imminent Obstacle Impact Caution (IOI)	TERRAIN	CAUTION - OBSTACLE	"Caution; Obstacle, Obstacle"

** Annunciation is displayed on the MFD when terrain display is enabled.*

Table 6-18 Terrain-SVS Alerts Summary

FORWARD LOOKING TERRAIN AVOIDANCE

The Forward Looking Terrain Avoidance (FLTA) feature of Terrain-SVS compares the projected flight path as derived from GPS data with terrain features and obstacles from the terrain and obstacle databases. The system issues visual annunciations and voice alerts when the projected flight path conflicts with terrain or obstacles.

The projected flight path is a calculated area ahead of, to the sides, and below the aircraft. The size of the projected flight path varies based on factors including ground speed (the path ahead is larger when the ground speed is higher), whether the aircraft is level, turning, or descending, and the proximity to the nearest runway along the current track. As the aircraft approaches the runway, the projected flight path becomes narrower until the system automatically disables FLTA alerts or the pilot manually inhibits them.

There are two types of FLTA alerts, Reduced Required Terrain/Obstacle Clearance (RTC or ROC respectively) and Imminent Terrain/Obstacle Impact (ITI or IOI respectively).

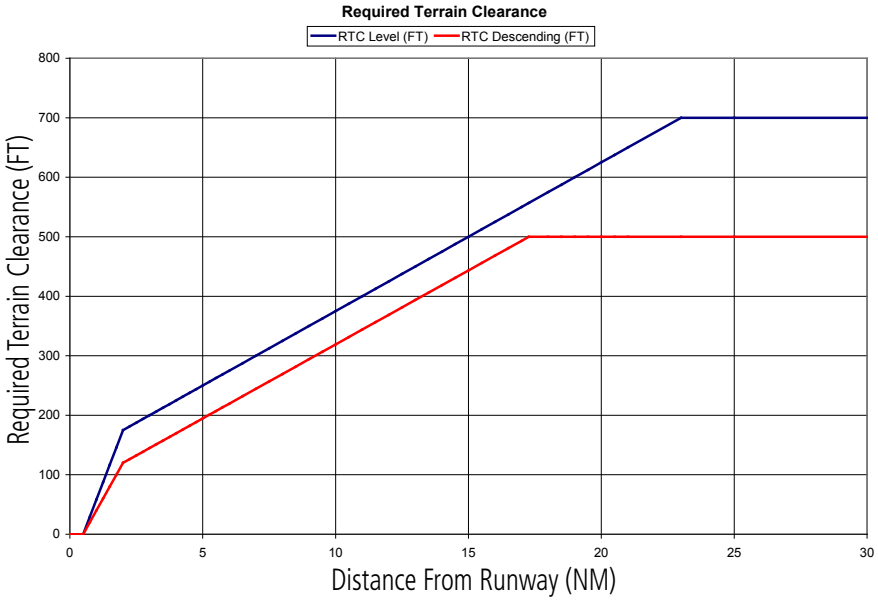


Figure 6-147 FLTA Alert Minimum Terrain and Obstacle Clearance Values

The system automatically disables FLTA alerts when the aircraft is less than 200 feet above the destination runway elevation while within 0.5 nm of the approach runway or the aircraft is between runway ends.

The pilot manually inhibit FLTA alerts. Discretion should be used when inhibiting FLTA alerts. When Terrain-SVS alerts are inhibited, the system displays the 'TER INH' annunciation on the PFD and in the MFD terrain annunciation window.

TER INH

Figure 6-148 Terrain-SVS Alerting Disabled (Terrain-SVS Inhibited) Annunciation

Inhibiting/enabling Terrain-SVS alerting:

1) Select the Terrain-SVS Page.
2) Select the **INHIBIT** Softkey to inhibit or enable Terrain-SVS (choice dependent on current state).

   Or:

   a) Press the **MENU** Key.

   b) Select 'Inhibit Terrain' or 'Enable Terrain' (choice dependent on current state) and press the **ENT** Key.

While Terrain-SVS alerting is manually inhibited (or the Terrain-SVS system is not available or has failed), the system may display a 'LOW ALT' annunciation if the following conditions are met:

- The aircraft is on a GPS SBAS approach.
- The Final Approach Fix is the active waypoint.
- The aircraft is at least 164 feet below the prescribed altitude at the Final Approach Fix.

See the Flight Instruments Section for more details about the 'LOW ALT' annunciation.

SYSTEM STATUS

During power-up, the Terrain-SVS system conducts a test of its alerting capabilities. The system issues a voice alert when the test has completed.

System Status	PFD/MFD Alert Annunciation	Audio/Voice Alert
System Test in Progress	TER TEST	None
System Test Pass	None	"Terrain System Test Passed"
Terrain System Test Fail	TER FAIL	"Terrain System Failure"

Table 6-19 Terrain-SVS System Test Status Annunciations

Terrain-SVS continually monitors several system-critical items such as database validity, hardware status, and GPS status. If the terrain/obstacle database is not available, the voice alert ***"Terrain System Failure"*** is generated along with the 'TER FAIL' alert annunciation.

Terrain-SVS requires a 3-D GPS navigation solution along with specific vertical accuracy minimums. Should the navigation solution become degraded or if the aircraft is out of the database coverage area, the annunciation 'TER N/A' is generated in the annunciation window and on the Terrain-SVS Page. The voice alert ***"Terrain System Not Available"*** is generated. When the GPS signal integrity returns and the and the aircraft is within the database coverage area, the voice alert "***Terrain System Available***" is generated.

Alert Cause	PFD/ MFD Alert Annunciation	Terrain-SVS Page Annunciation	Voice Alert
MFD Terrain or Obstacle database unavailable or invalid. Terrain-SVS operating with PFD Terrain or Obstacle databases	None	TERRAIN DATABASE FAILURE	None
Terrain or Obstacle database unavailable or invalid, invalid software configuration, audio fault	TER FAIL	TERRAIN FAIL	"Terrain System Failure"
No GPS position	TER N/A	NO GPS POSITION	"Terrain System Not Available" "Terrain System Available" when GPS position is available
Excessively degraded GPS signal	TER N/A	None	"Terrain System Not Available" "Terrain System Available" when sufficient GPS signal is received
Out of database coverage area	TER N/A	None	"Terrain System Not Available" "Terrain System Available" when aircraft re-enters database coverage area.

Table 6-20 Terrain-SVS Abnormal Annunciations

6.7 TAWS-B

WARNING: *Do not use TAWS information for primary terrain avoidance. TAWS is intended only to enhance situational awareness.*

NOTE: *The data contained in the TAWS databases comes from government agencies. Garmin accurately processes and cross-validates the data but cannot guarantee the accuracy and completeness of the data.*

NOTE: *Terrain data is not displayed if the aircraft is outside of the installed terrain database coverage area.*

TAWS-B (Terrain Awareness and Warning System - Class B) is an optional feature to increase situational awareness and aid in reducing controlled flight into terrain (CFIT). TAWS-B provides visual annunciations and voice alerts when terrain and obstacles are within the given altitude threshold from the aircraft. The displayed alerts and warnings are advisory in nature only.

TAWS-B satisfies TSO-C151b Class B requirements for certification. TAWS-B requires the following to operate properly:

- A valid terrain/obstacle/airport terrain database
- A valid 3-D GPS position solution

TAWS-B uses terrain and obstacle information supplied by government sources. Terrain information is based on terrain elevation information in a database that may contain inaccuracies. Individual obstructions may be shown if available in the database. The data undergoes verification by Garmin to confirm accuracy of the content, per TSO-C151b. However, the displayed information should never be understood as being all-inclusive and data may be inaccurate.

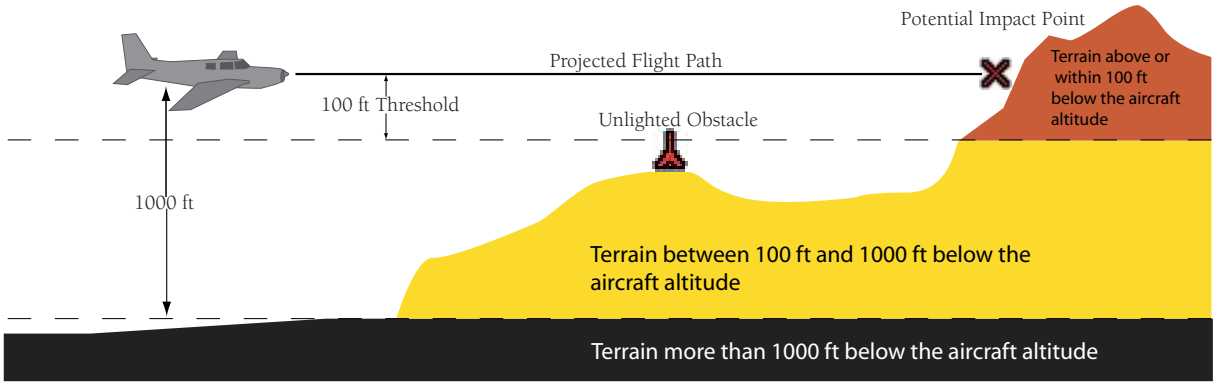
TAWS-B uses information provided from the GPS receiver to provide a horizontal position and altitude. GPS altitude is derived from satellite measurements. GPS altitude is then converted to the height above geodetic sea level (GSL), which is the height above mean sea level (MSL) calculated geometrically. GSL altitude is used to determine TAWS-B alerts. GSL altitude accuracy is affected by satellite geometry, but is not subject to variations in pressure and temperature that normally affect pressure altitude sensors. GSL altitude does not require local altimeter settings to determine MSL altitude. It is a widely-used MSL altitude source. Therefore, GSL altitude provides a highly accurate and reliable MSL altitude source to calculate terrain and obstacle alerts.

The terrain and obstacle databases used by TAWS-B are referenced to MSL. Using the GPS position and GSL altitude, TAWS-B displays a 2-D picture of the surrounding terrain and obstacles relative to the position and altitude of the aircraft. Furthermore, the GPS position and GSL altitude are used to calculate and "predict" the aircraft's flight path in relation to the surrounding terrain and obstacles. In this manner, TAWS-B can provide advanced alerts of predicted dangerous terrain conditions.

Baro-corrected altitude (or indicated altitude) is derived by adjusting the altimeter setting for local atmospheric conditions. The most accurate baro-corrected altitude can be achieved by frequently updating the altimeter setting to the nearest reporting station along the flight path. However, because actual atmospheric conditions seldom match the standard conditions defined by the International Standard Atmosphere (ISA) model (where pressure, temperature, and lapse rates have fixed values), it is common for the baro-corrected altitude (as read from the altimeter) to differ from the GSL altitude. This variation results in the aircraft's GSL altitude differing from the baro-corrected altitude.

DISPLAYING TAWS-B DATA

TAWS-B uses yellow (caution) and red (warning) to depict terrain and obstacles (with heights greater than 200 feet above ground level, AGL) alerts relative to aircraft altitude. Colors are adjusted automatically as the aircraft altitude changes. The colors and symbols in Figure 6-149 and Tables 6-21 and 6-22 are used to represent terrain, obstacles, and potential impact points.



On the TAWS-B Page only, a gray shade of purple indicates no terrain data is available.

Figure 6-149 Terrain Altitude/Color Correlation for TAWS-B

Unlighted Obstacle		Lighted Obstacle		Obstacle Location
< 1000' AGL	> 1000' AGL	< 1000' AGL	> 1000' AGL	
				Red obstacle is above or within 100' below current aircraft altitude
				Yellow obstacle is between 100' and 1000' below current aircraft altitude
				Gray obstacle is more than 1000 ft below aircraft altitude

Table 6-21 TAWS-B Obstacle Colors and Symbology

Potential Impact Point Symbol	Alert Type	Example Annunciation
	Warning	PULL UP
	Caution	TERRAIN

Table 6-22 TAWS-B Potential Impact Point Symbols with Alert Types

TAWS-B information can be displayed on the following maps:

- PFD Inset Map
- Navigation Map Page
- TAWS-B Page
- Trip Planning Page
- Flight Plan Page
- AUX - Video Page

Displaying terrain and obstacle information (maps other than the TAWS-B Page):

1) Press the **MAP** Softkey (for the PFD Inset Map, press the **INSET** Softkey).
2) Press the **TERRAIN** Softkey to display terrain and obstacle data.

When TAWS-B is selected on maps other than the TAWS-B Page, an icon to indicate the feature is enabled for display and a legend for TAWS-B terrain colors are shown (Figure 6-156).

The Navigation Map Page Setup Menu provides a means in addition to the softkey for enabling/disabling display of terrain and obstacles. The setup menu also controls the map range settings above which terrain and obstacle data are decluttered from the display. If a map range larger than the map range setting is selected, the data is removed from the map. For terrain data, the enable/disable function applies only to the MFD, while the range setting also affects the PFD Inset Map.

Terrain data can be selected for display independently of obstacle data; however, obstacles for which warnings and cautions are issued are shown when terrain is selected for display and the map range is within the setting limit.

Maps besides the TAWS-B Page use settings based on those selected for the Navigation Map Page. The maximum display ranges for obstacles on each map are dependent on the range setting made for the Navigation Map. If the maximum range for obstacle display on the Navigation Map is adjusted to below 20 nm, the highest obstacle display range settings on the other applicable maps are also adjusted proportionally.

Customizing terrain and obstacle display on the Navigation Map Page:

1) Select the Navigation Map Page.
2) Press the **MENU** Key.
3) With 'Map Setup' highlighted, press the **ENT** Key (Figure 6-150).
4) Turn the small **FMS** Knob to select the 'Map' Group and press the **ENT** Key (Figure 6-151).
5) Turn the large **FMS** Knob or press the **ENT** Key to scroll through product selections (Figure 6-152).
   - TERRAIN DATA – Turns the display of terrain data on or off and sets maximum range at which terrain is shown
   - OBSTACLE DATA – Turns the display of obstacle data on or off and sets maximum range at which obstacles are shown
6) Turn the small **FMS** Knob to scroll through options for each product (ON/OFF, range settings).
7) Press the **ENT** Key to select an option.
8) Press the **FMS** Knob or **CLR** Key to return to the Navigation Map Page with the changed settings.

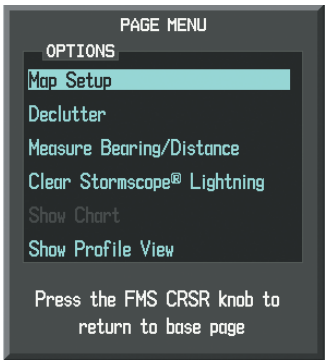


Figure 6-150 Navigation Map Page Menu



Figure 6-151 Navigation Map Page Setup Menu



Figure 6-152 Navigation Map Page Setup Menu, Map Group

TAWS-B PAGE

The Map - TAWS-B Page is the principal map page for viewing terrain, obstacle, and potential impact point data in relation to the aircraft's current altitude, without clutter from the basemap. Aviation information (airports, VORs, and other NAVAIDs) can be displayed for reference. If an obstacle and the projected flight path of the aircraft intersect, the display automatically zooms in to the closest potential point of impact on the TAWS-B Page.

Aircraft orientation on this map is always heading up unless there is no valid heading. Two views are available relative to the position of the aircraft: the 360° default display and the radar-like ARC (120°) display. Map range is adjustable with the **Joystick** from 1 to 200 nm, as indicated by the map range rings (or arcs).

Displaying the TAWS-B Page:

1) Turn the large **FMS** Knob to select the Map Page Group.
2) Turn the small **FMS** Knob to select the TAWS-B Page.

Changing the TAWS-B Page view:

1) Press the **VIEW** Softkey.
2) Press the **360** or **ARC** Softkey to select the desired view.

Or:

1) Press the **MENU** Key.
2) Select 'View Arc' or 'View 360°' (choice dependent on current state) and press the **ENT** Key to change the view.

Showing/hiding aviation information on the TAWS-B Page:

1) Press the **MENU** Key.
2) Select 'Show Aviation Data' or 'Hide Aviation Data' (choice dependent on current state) and press the **ENT** Key.

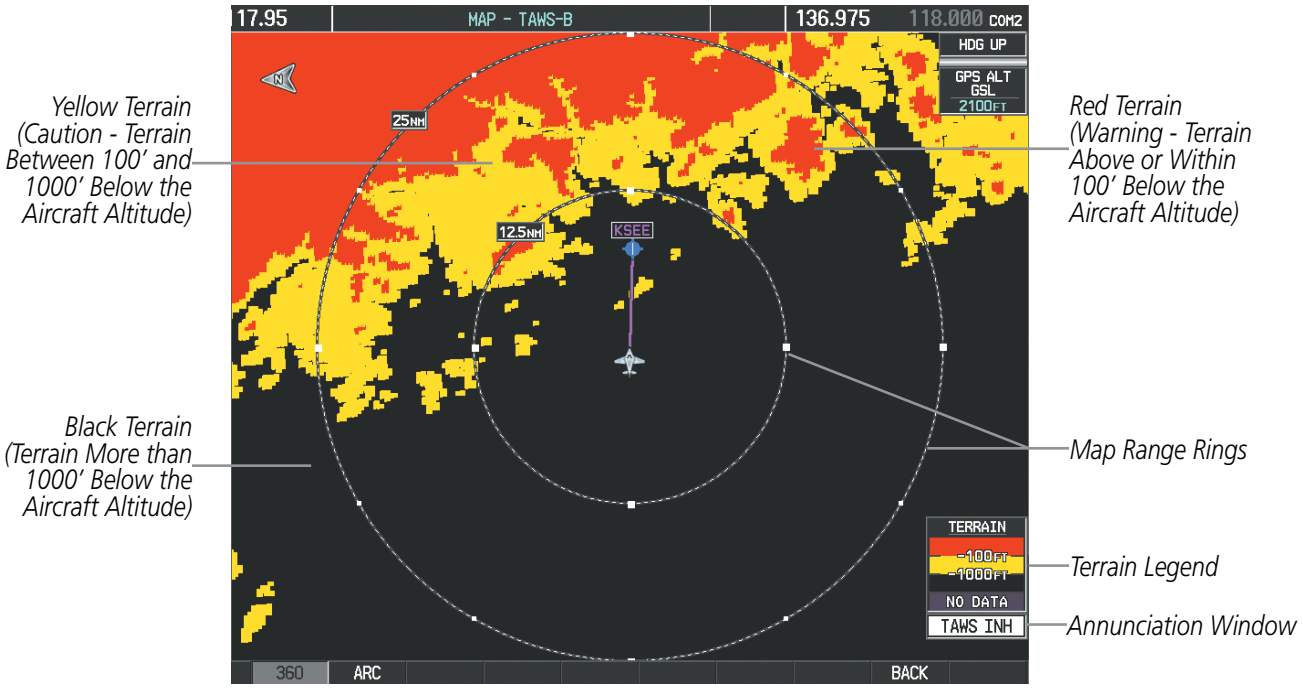


Figure 6-153 TAWS-B Page (360 View)

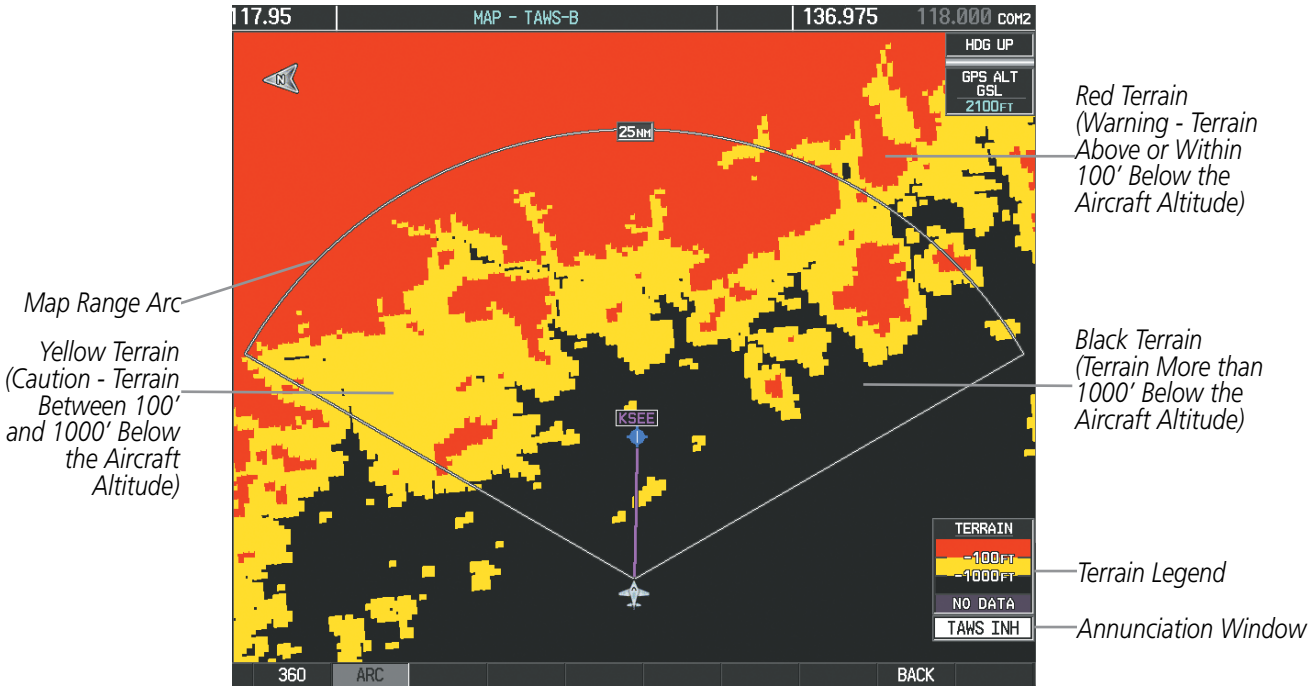


Figure 6-154 TAWS-B Page (ARC View)

TAWS-B ALERTS

Alerts are issued when flight conditions meet parameters that are set within TAWS-B software algorithms. TAWS-B alerts typically employ a CAUTION or a WARNING alert severity level, or both. When an alert is issued, the system displays visual annunciations with voice alerts. Table 6-23 shows TAWS-B alert types with corresponding annunciations and voice alerts.

When an alert is issued, annunciations appear on the PFD and MFD. The TAWS-B Alert Annunciation is shown to the upper left of the Altimeter on the PFD and below the Terrain Legend on the MFD. If the TAWS-B Page is not displayed at the time, a pop-up alert appears on the MFD. To acknowledge the pop-up alert:

- Press the **CLR** Key (returns to the currently viewed page), or
- Press the **ENT** Key (accesses the TAWS-B Page)

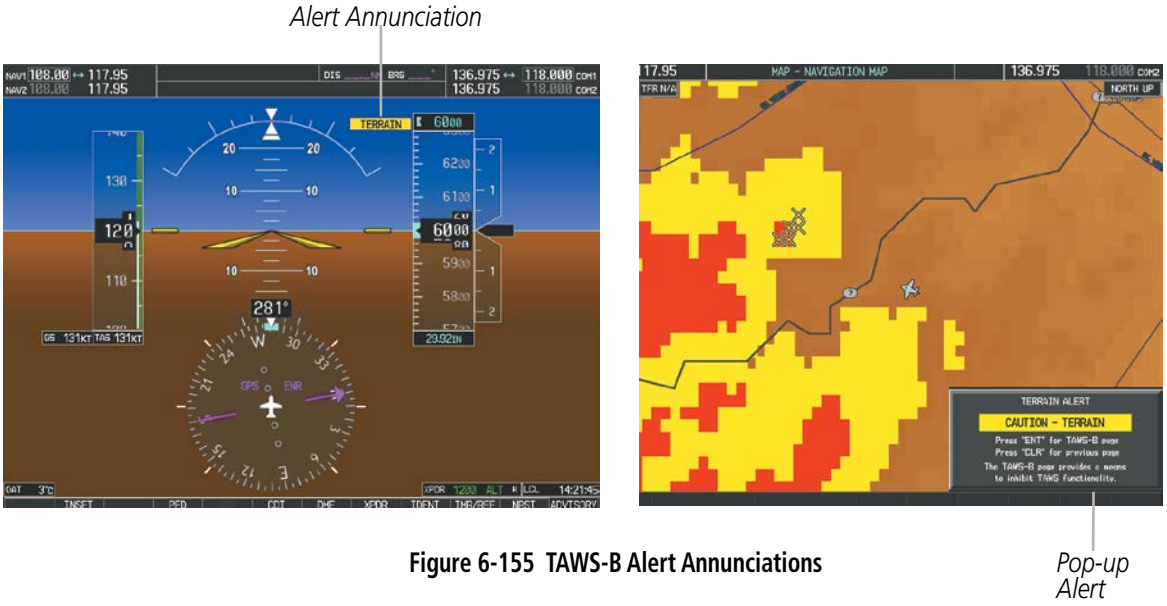


Figure 6-155 TAWS-B Alert Annunciations

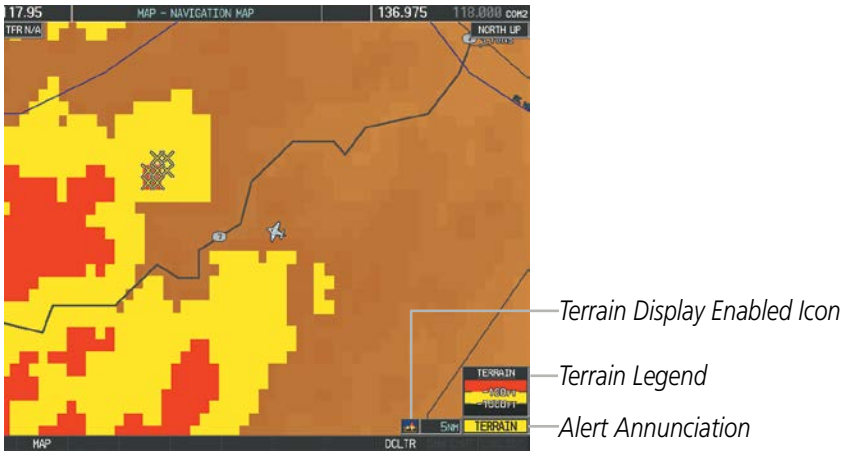


Figure 6-156 Navigation Map Page (After TAWS-B Pop-up Alert Acknowledgment)

Alert Type	PFD/MFD** Alert Annunciation	MFD Pop-Up Alert (except TAWS-B Page)	Voice Alert
Excessive Descent Rate Warning (EDR)	PULL UP	PULL-UP	"Pull Up"
Reduced Required Terrain Clearance Warning (RTC)	PULL UP	TERRAIN - PULL-UP * or TERRAIN AHEAD - PULL-UP	"Terrain, Terrain; Pull Up, Pull Up"* or "Terrain Ahead, Pull Up; Terrain Ahead, Pull Up"
Imminent Terrain Impact Warning (ITI)	PULL UP	TERRAIN - PULL-UP * or TERRAIN AHEAD - PULL-UP	"Terrain, Terrain; Pull Up, Pull Up"* or "Terrain Ahead, Pull Up; Terrain Ahead, Pull Up"
Reduced Required Obstacle Clearance Warning (ROC)	PULL UP	OBSTACLE - PULL-UP * or OBSTACLE AHEAD - PULL-UP	"Obstacle, Obstacle; Pull Up, Pull Up"* or "Obstacle Ahead, Pull Up; Obstacle Ahead, Pull Up"
Imminent Obstacle Impact Warning (IOI)	PULL UP	OBSTACLE - PULL-UP * or OBSTACLE AHEAD - PULL-UP	"Obstacle, Obstacle; Pull Up, Pull Up"* or "Obstacle Ahead, Pull Up; Obstacle Ahead, Pull Up"
Reduced Required Terrain Clearance Caution (RTC)	TERRAIN	CAUTION - TERRAIN * or TERRAIN AHEAD	"Caution, Terrain; Caution, Terrain"* or "Terrain Ahead; Terrain Ahead"
Imminent Terrain Impact Caution (ITI)	TERRAIN	CAUTION - TERRAIN * or TERRAIN AHEAD	"Caution, Terrain; Caution, Terrain"* or "Terrain Ahead; Terrain Ahead"
Reduced Required Obstacle Clearance Caution (ROC)	TERRAIN	CAUTION - OBSTACLE * or OBSTACLE AHEAD	"Caution, Obstacle; Caution, Obstacle"* or "Obstacle Ahead; Obstacle Ahead"
Imminent Obstacle Impact Caution (IOI)	TERRAIN	CAUTION - OBSTACLE * or OBSTACLE AHEAD	"Caution, Obstacle; Caution, Obstacle"* or "Obstacle Ahead; Obstacle Ahead"
Premature Descent Alert Caution (PDA)	TERRAIN	TOO LOW - TERRAIN	"Too Low, Terrain"
Altitude Callout (VCO) "500"	None	None	"Five-Hundred"
Excessive Descent Rate Caution (EDR)	TERRAIN	SINK RATE	"Sink Rate"
Negative Climb Rate Caution (NCR)	TERRAIN	DON'T SINK * or TOO LOW - TERRAIN	"Don't Sink"* or "Too Low, Terrain"

** Alerts with multiple messages are configurable at installation and are installation-dependent. Alerts for the default configuration when more than one option is available are indicated with asterisks.*
*** Annunciation is displayed on the MFD when terrain display is enabled.*

Table 6-23 TAWS-B Alerts Summary

EXCESSIVE DESCENT RATE ALERT

The purpose of the **Excessive Descent Rate (EDR)** alert is to provide notification when the aircraft is determined to be closing (descending) upon terrain a rate that is calculated to be excessive relative to height above terrain. Figure 6-157 shows the parameters for the alert as defined by TSO-C151b.

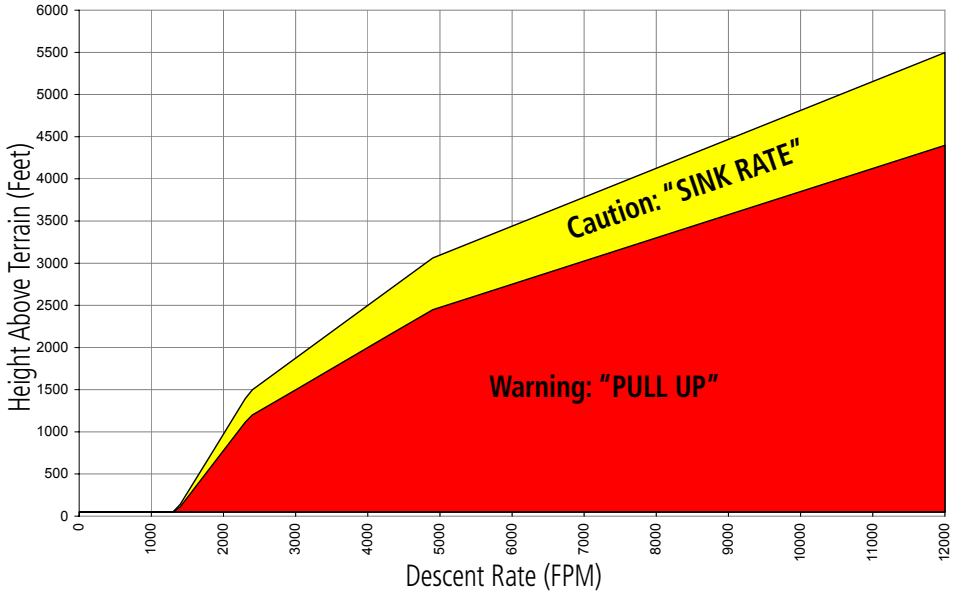


Figure 6-157 Excessive Descent Rate Alert Criteria

FORWARD LOOKING TERRAIN AVOIDANCE

The Forward Looking Terrain Avoidance (FLTA) feature of TAWS-B compares the projected flight path as derived from GPS data with terrain features and obstacles from the terrain and obstacle databases. The system issues visual and voice alerts when the projected flight path conflicts with terrain or obstacles.

The projected flight path is a calculated area ahead of, to the sides, and below the aircraft. The size of the projected flight path varies based on factors including ground speed (the path ahead is larger when the ground speed is higher), whether the aircraft is level, turning, or descending, and the proximity to the nearest runway along the current track. As the aircraft approaches the runway, the projected flight path becomes narrower until the system automatically disables FLTA alerts or the pilot manually inhibits them.

There are two types of FLTA alerts, Reduced Required Terrain/Obstacle Clearance (RTC or ROC respectively) and Imminent Terrain/Obstacle Impact (ITI or IOI respectively).

Reduced Required Terrain Clearance (RTC) and **Reduced Required Obstacle Clearance (ROC)** alerts are issued when the aircraft flight path is above terrain, yet is projected to come within the minimum clearance values in Figure 6-158. When an RTC alert is issued, a potential impact point is displayed on the TAWS-B Page.

Imminent Terrain Impact (ITI) and **Imminent Obstacle Impact (IOI)** alerts are issued when the aircraft is below the elevation of a terrain or obstacle in the aircraft's projected path. ITI and IOI alerts are accompanied by a potential impact point displayed on the TAWS-B Page. The alert is annunciated when the projected vertical flight path is calculated to come within minimum clearance altitudes in Figure 6-158.

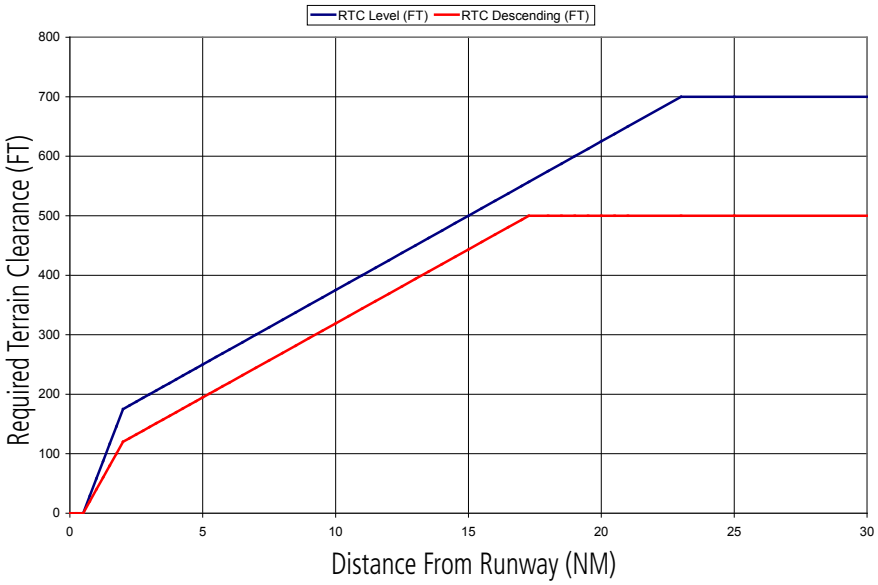


Figure 6-158 FLTA Alert Minimum Terrain and Obstacle Clearance Values

FLTA alerts are automatically inhibited when the aircraft is less than 200 feet above the destination runway elevation while within 0.5 nm of the approach runway or the aircraft is between runway ends.

PREMATURE DESCENT ALERTING

A **Premature Descent Alert (PDA)** is issued when the system detects that the aircraft is significantly below the normal approach path to a runway (Figure 6-159).

PDA alerting begins when the aircraft is within 15 nm of the destination airport and ends when the aircraft is either 0.5 nm from the runway threshold or is at an altitude of 125 feet AGL while within 1.0 nm of the threshold.

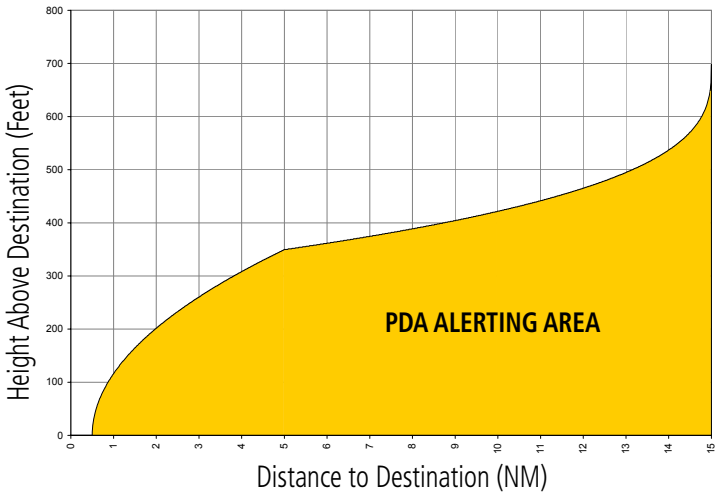


Figure 6-159 PDA Alerting Threshold

The pilot can manually inhibit PDA and FLTA visual annunciations and voice alerts. Discretion should be used when inhibiting TAWS-B alerts, and the system should be enabled when appropriate. When the TAWS-B system is manually inhibited, the alert annunciation 'TAWS INH' is shown on the PFD and MFD (Figure 6-160).



Figure 6-160 TAWS-B Alerting Disabled (TAWS-B Inhibited) Annunciation

Inhibiting/enabling TAWS-B alerting:

1) Select the TAWS-B Page.

2) Press the **INHIBIT** Softkey to inhibit or enable TAWS-B (choice dependent on current state).

Or:

a) Press the **MENU** Key.

b) Select 'Inhibit TAWS' or 'Enable TAWS' (choice dependent on current state) and press the **ENT** Key.

While TAWS-B alerting is manually inhibited (or the TAWS-B system is not available or has failed), the system may display a 'LOW ALT' annunciation if the following conditions are met:

- The aircraft is on a GPS SBAS approach.
- The Final Approach Fix is the active waypoint.
- The aircraft is at least 164 feet below the prescribed altitude at the Final Approach Fix.

See the Flight Instruments Section for more details about the 'LOW ALT' annunciation.

FIVE-HUNDRED VOICE ALERT

The purpose of the voice alert message ***"Five-hundred"*** is to provide an advisory alert of when the aircraft descends to within 500 feet above the terrain or runway threshold. When the aircraft is within 5 nm of an airport, the ***"Five Hundred"*** voice alert is based on the nearest runway threshold elevation. When the aircraft is more than 5 nm of the nearest airport, the ***"Five Hundred"*** voice alert is based on the height above terrain as determined using the GSL altitude and terrain database.

NEGATIVE CLIMB RATE AFTER TAKEOFF ALERT (NCR)

The **Negative Climb Rate (NCR) After Takeoff** alert (also referred to as "Altitude Loss After Takeoff") provides alerts when the system determines the aircraft is losing altitude (closing upon terrain) after takeoff. The voice alert "Don't Sink" is given for NCR alerts, accompanied by an annunciation and a pop-up terrain alert on the display. NCR alerting is only active when departing from an airport and when the following conditions are met:

- Height above the terrain is less than 700 feet
- Distance from the departure airport is 5 nm or less
- Heading change from the departure heading is less than 110 degrees

Figures 6-161 and 6-162 shows the NCR alerting parameters as defined by TSO-C151b based on Altitude Loss and Sink Rate respectively.

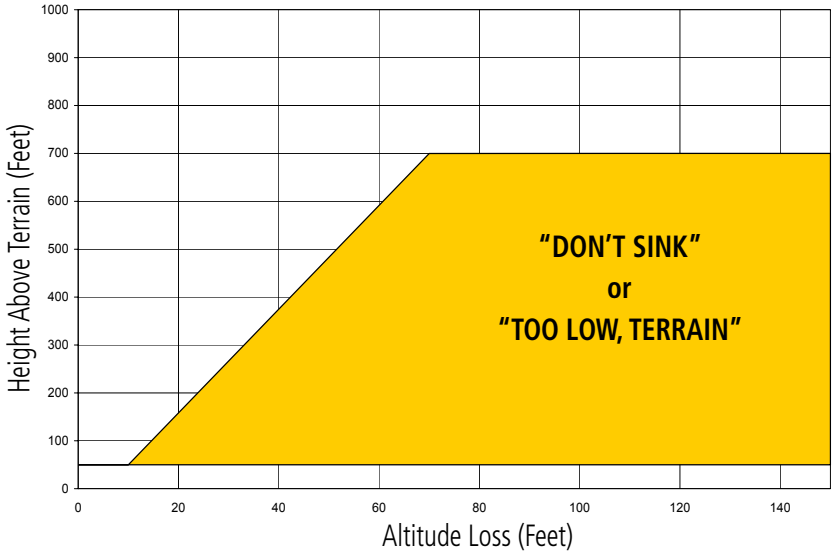


Figure 6-161 Negative Climb Rate (NCR) Altitude Loss

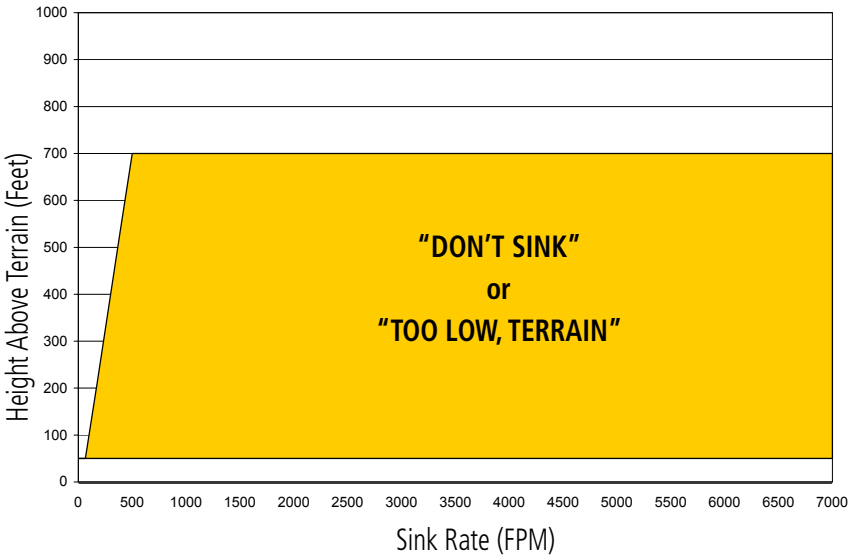


Figure 6-162 Negative Climb Rate (NCR) Sink Rate

SYSTEM STATUS

During power-up, TAWS-B conducts a system test of its alerting capabilities. The system test can also be manually initiated. A voice alert occurs when the test concludes. TAWS-B system testing is disabled when ground speed exceeds 30 knots.

System Condition	PFD/MFD Alert Annunciation	TAWS-B Page Annunciation	Voice Alert
System Test in Progress	TAWS TEST	TAWS TEST	None
System Test Pass	None	None	"TAWS System Test Passed"
TAWS System Test Fail	TAWS FAIL	TAWS FAIL	"TAWS System Failure"

Table 6-24 TAWS-B System Test Status Annunciations

Manually testing the TAWS-B System:

1) Select the TAWS-B Page.
2) Press the **MENU** Key (Figure 6-163).
3) Select 'Test TAWS System' and press the **ENT** Key to confirm the selection.



Figure 6-163 TAWS-B Page Menu

TAWS-B continually monitors several system-critical items such as database validity, hardware status, and GPS status. If the terrain/obstacle database is not available, the voice alert ***"TAWS System Failure"*** is generated along with the 'TAWS FAIL' alert annunciation.

TAWS-B requires a 3-D GPS navigation solution along with specific vertical accuracy minimums. Should the navigation solution become degraded or if the aircraft is out of the database coverage area, the annunciation 'TAWS N/A' is generated in the annunciation window and on the TAWS-B Page. The voice alert ***"TAWS Not Available"*** is generated. When the GPS signal integrity is restored and the aircraft is within the database coverage area, the voice alert ***"TAWS Available"*** is generated.

Alert Cause	PFD/MFD Annunciation	TAWS-B Page Annunciation	Voice Alert
MFD Terrain or Obstacle database unavailable or invalid. TAWS operating with PFD Terrain or Obstacle databases	None	TERRAIN DATABASE FAILURE	None
Terrain or Obstacle database unavailable or invalid on all displays, invalid software configuration, TAWS audio fault	TAWS FAIL	TAWS FAIL	"TAWS System Failure"
No GPS position	TAWS N/A	NO GPS POSITION	"TAWS Not Available" "TAWS Available" when GPS position returns.
Excessively degraded GPS signal	TAWS N/A	None	"TAWS Not Available" "TAWS Available" when sufficient GPS signal is received.
Out of database coverage area	TAWS N/A	None	"TAWS Not Available" "TAWS Available" when aircraft enters database coverage area.

Table 6-25 TAWS-B Abnormal Conditions

6.8 PROFILE VIEW TERRAIN

The system offers a Profile View of terrain and obstacles relative to the aircraft's current flight path and altitude on the Navigation Map Page of the MFD. Profile View does not provide terrain or obstacle caution or warning annunciations or voice alerts, nor does it display potential impact points inside the Profile View. The colors and symbols in Figure 6-164 and Table 6-26 are used to represent terrain and obstacles.

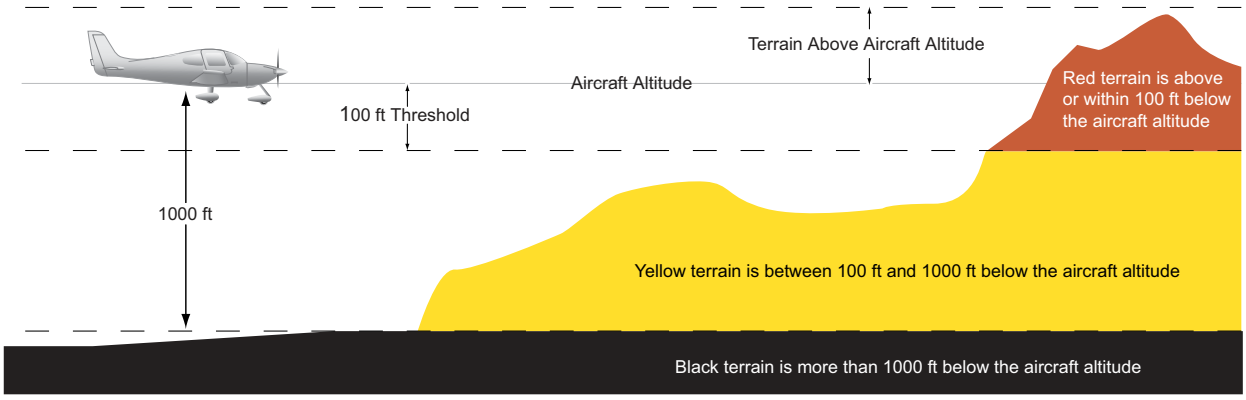


Figure 6-164 Terrain Altitude/Color Correlation for Profile View

Unlighted Obstacle		Lighted Obstacle		Obstacle Location
< 1000' AGL	> 1000' AGL	< 1000' AGL	> 1000' AGL	
				Red obstacle is above or within 100 ft below the aircraft altitude
				Yellow obstacle is between 100 ft and 1000 ft below the aircraft altitude
				Gray obstacle is more than 1000 ft below aircraft altitude

Table 6-26 Profile View Obstacle Colors and Symbology

Enabling/Disabling Profile View:

1) Select the Navigation Map Page.
2) Press the **MAP** Softkey.
3) Press the **PROFILE** Softkey to enable or disable Profile View.

Or:

1) Press the **MENU** Key.
2) Select 'Show Profile View' or 'Hide Profile View' (choice dependent on current state) and press the **ENT** Key.

Enabling/Disabling Terrain on the Profile View

1) Select the Navigation Map Page.
2) Press the **MAP** Softkey.
3) Press the **TERRAIN** Softkey.

PROFILE VIEW DISPLAY

When the Profile View is enabled, it is displayed in a window below the Navigation Map. Altitude is shown along a vertical scale, with an aircraft icon positioned at the current altitude. Distance is represented horizontally along the bottom of the Profile View, and increases from left (present position) to right.

When the Navigation Map range is adjusted with the **Joystick**, the horizontal distance of the Profile View is adjusted proportionately to be 1/2 of the Navigation Map range distance down to 1 nm, at which point Profile View is no longer available ('PROFILE NOT AVAILABLE' is displayed). When Navigation Map range is adjusted to remove altitude-correlated colored terrain data (as shown in the Terrain Legend) or obstacles from the Navigation Map, these items are also removed from the Profile View; only an outline of the terrain will be displayed in black in the Profile View window. Refer to the applicable Terrain Proximity, Terrain-SVS, or TAWS-B discussions for more information about displaying terrain or obstacles on the Navigation Map Page.

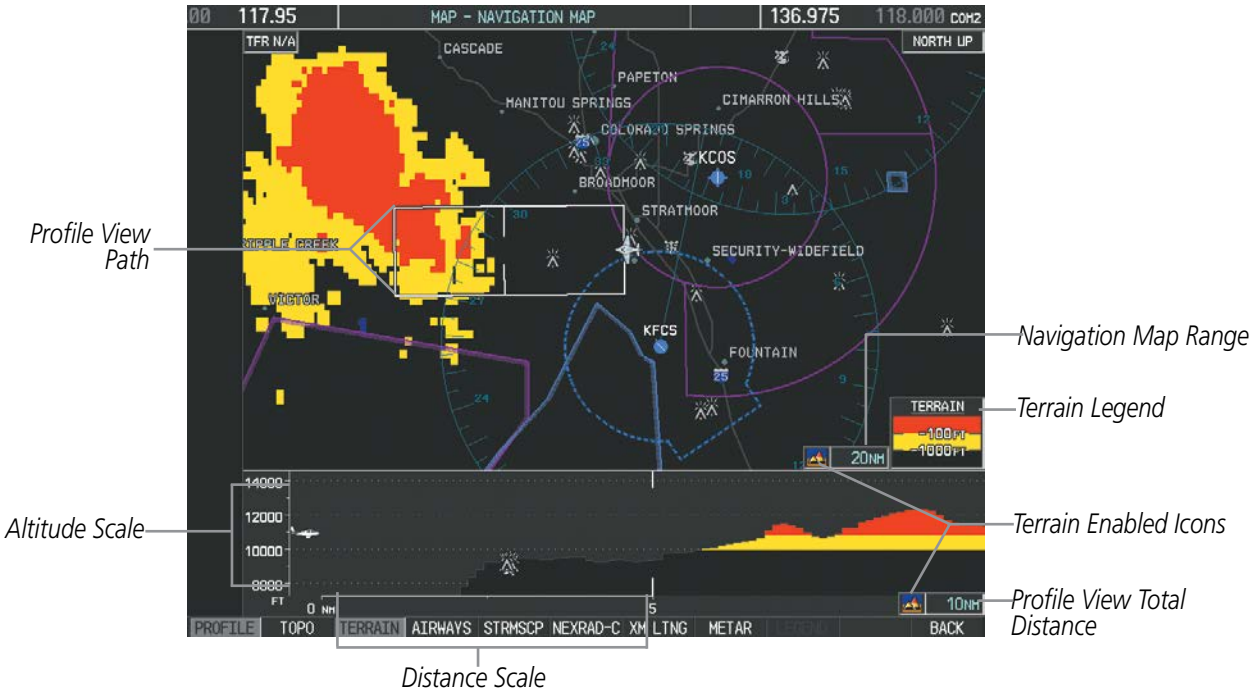


Figure 6-165 Navigation Map Page with Profile View and Terrain Enabled

Obstacles with heights greater than 200 feet AGL appear relative to aircraft altitude along the altitude scale. The top of the obstacle symbol on the scale represents the obstacle's height AGL. If the obstacle's height AGL is higher than can be represented by the obstacle symbol itself (e.g. for unusually tall obstacles), a vertical line appears below the obstacle symbol in order to depict the top of the obstacle symbol at its height AGL, as shown in Figure 6-166.

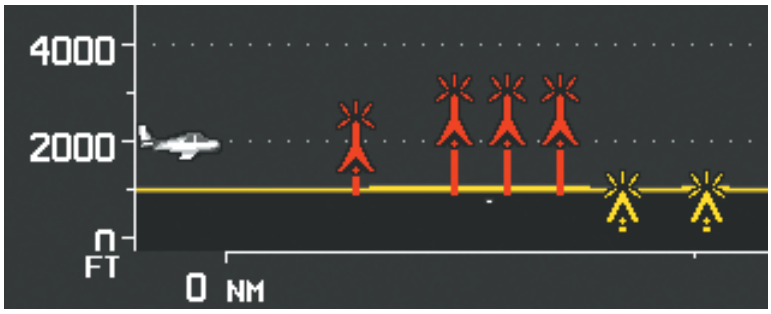


Figure 6-166 Profile View with Tall Obstacles

The Profile View is based on the current aircraft track (or heading if track is unavailable) and shows the *highest* known terrain or obstacles within a predetermined width from the present aircraft position to the end of the profile range. The width of the Profile View (Table 6-27) is determined by the phase of flight, as annunciated on the HSI. Refer to the Flight Instruments section for more information about flight phases.

Flight Phase	Total Profile View Width
Approach	0.6 nm
Departure	0.6 nm
Terminal	2.0 nm
Enroute	4.0 nm
Oceanic	4.0 nm

Table 6-27 Profile View Width Scale

PROFILE PATH

The Profile Path displays the horizontal and lateral boundaries of the Profile View. The path is shown as a white rectangle on the Navigation Map Page (Figure 6-165) and is only available when Profile View is enabled. White range markers appearing on both edges of the Profile Path rectangle match the range markers along the distance scale inside the Profile View display window whenever the profile range is at least 4 nm (or 7.5 km if configured for metric units).

The Profile Path rectangle may be configured on or off, and the Navigation Map range at which the Profile Path is removed from map display can be changed.

Customizing the Profile Path display on the Navigation Map Page:

1) Select the Navigation Map Page.
2) Press the **MENU** Key.
3) With 'Map Setup' highlighted, press the **ENT** Key (Figure 6-167).
4) Turn the small **FMS** Knob to select the 'Profile' Group and press the **ENT** Key (Figure 6-168).
5) Turn the large **FMS** Knob or press the **ENT** Key to scroll through product selections (Figure 6-169).
   - PROFILE PATH – Turns the display of the Profile Path on or off and sets maximum map range at which the Profile Path is shown
6) Turn the small **FMS** Knob to scroll through options (ON/OFF, range settings).
7) Press the **ENT** Key to select an option.
8) Press the **FMS** Knob or **CLR** Key to return to the Navigation Map Page with the changed settings.

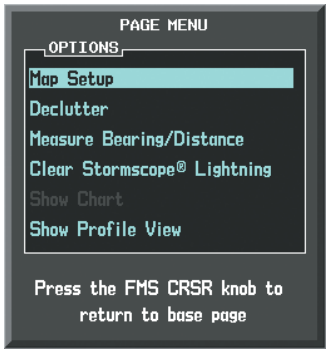


Figure 6-167 Navigation Map Page Menu



Figure 6-168 Navigation Map Page Setup Menu



Figure 6-169 Navigation Map Page Setup Menu, Profile Group

6.9 TRAFFIC INFORMATION SERVICE (TIS)

WARNING: *Do not rely solely upon the display of traffic information to accurately depict all of the traffic information within range of the aircraft. Due to lack of equipment, poor signal reception, and/or inaccurate information from other aircraft, traffic may be present but not represented on the displays.*

WARNING: *Do not rely solely upon the display of traffic information for collision avoidance maneuvering. The traffic display does not provide collision avoidance resolution advisories and does not under any circumstances or conditions relieve the pilot's responsibility to see and avoid other aircraft.*

NOTE: *TIS is available only when the aircraft is within the service volume of a TIS-capable terminal radar site. Aircraft without an operating transponder are invisible to Traffic Advisory Systems (TAS), Traffic Alert and Collision Avoidance Systems (TCAS), and to TIS. Aircraft without altitude reporting capability are shown without altitude separation data or climb descent indication.*

NOTE: *TIS is disabled if another traffic system is installed.*

Traffic Information Service (TIS) is designed to help in detection and avoidance of other aircraft. TIS uses the Mode S transponder for the traffic data link. TIS receives traffic information from ground stations, and is updated every five seconds. The system displays up to eight traffic targets within a 7.5-nm radius, from 3000 feet below to 3500 feet above the requesting aircraft. Traffic is displayed using the symbology shown in Table 6-28.

TIS Symbol	Description
	Non-Threat Traffic
	Traffic Advisory (TA)
	Traffic Advisory Off Scale

Table 6-28 TIS Traffic Symbols

A Traffic Advisory (TA) indicates that the current track of the intruder could result in a collision. When traffic meets the advisory criteria for the TA, a solid amber circle symbol appears on the display. A TA which is detected, but is outside the range of the navigation map, is indicated with a banner message in the lower left corner of the map and a half TA symbol at the relative bearing of the intruder on the Traffic Map Page or Traffic Inset Map.

TIS also provides a vector line showing the direction in which the traffic is moving, to the nearest 45°. Traffic information for which TIS is unable to determine the bearing (non-bearing traffic) is displayed in the center of the Traffic Map Page (Figure 6-174), the Traffic Inset Map, or in a banner at the lower left corner of navigation maps with the traffic overlay enabled (Figure 6-170).

The altitude difference between the requesting aircraft and other intruder aircraft is displayed above/below the traffic symbol in hundreds of feet. If the other aircraft is above the requesting aircraft, the altitude separation appears above the traffic symbol; if below, the altitude separation appears below. Altitude trend is displayed as an up/down arrow (for speeds greater than 500 fpm in either direction) to the right of the target symbol. Traffic symbols for aircraft without altitude reporting capability appear without altitude separation or climb/descent information.

DISPLAYING TRAFFIC DATA

The Map - Traffic Map Page is the principal page for viewing traffic information. Additional displays of traffic information are available as map overlays while TIS is operating, and serve as additional reference to the Traffic Map Page. Traffic information can be displayed on the following maps and pages:

- PFD Inset Map
- Navigation Map Page
- Traffic Map Page
- Trip Planning Page
- Nearest Pages
- Active Flight Plan Page
- AUX - Video Page (optional)

Displaying traffic information (MFD navigation maps):

1) Press the **MAP** Softkey.
2) Press the **TRAFFIC** Softkey.

When traffic is selected on maps other than the Traffic Map Page, an icon is shown to indicate the feature is enabled for display.



Figure 6-170 TIS Traffic on the Navigation Map Page

Displaying traffic information (PFD Inset Map):

1) Press the **INSET** Softkey.
2) Press the **TRAFFIC** Softkey to display traffic data on the inset map (TRFC-1).
3) Press the softkey again to display the traffic-only inset (TRFC-2).
4) Press the softkey again to remove traffic data.

The Navigation Map Page Setup Menu provides a means in addition to the softkey for enabling/disabling display of traffic. The setup menu also controls the map range settings above which traffic data (symbols and labels) are decluttered from the display. If a map range larger than the map range setting is selected, the data is removed from the map. Maps besides the Traffic Map Page use settings based on those selected for the Navigation Map Page.

Customizing traffic display on the Navigation Map Page:

1) Select the Navigation Map Page.
2) Press the **MENU** Key.
3) With 'Map Setup' highlighted, press the **ENT** Key (Figure 6-171).
4) Turn the small **FMS** Knob to select the 'Traffic' Group and press the **ENT** Key (Figure 6-172).
5) Turn the large **FMS** Knob or press the **ENT** Key to scroll through product selections (Figure 6-173).
   - TRAFFIC – Turns the display of traffic data on or off
   - TRAFFIC MODE – Selects the traffic mode for display; select from:
     - All Traffic - Displays all traffic
     - TA/PA - Displays Traffic Advisories and Proximity Advisories
     - TA ONLY - Displays Traffic Advisories only
   - TRAFFIC SMBL – Selects the maximum map range at which traffic symbols are shown
   - TRAFFIC LBL – Selects the maximum map range at which traffic labels are shown (with the option to turn off)
6) Turn the small **FMS** Knob to scroll through options for each product (ON/OFF, range settings, etc.).
7) Press the **ENT** Key to select an option.
8) Press the **FMS** Knob or **CLR** Key to return to the Navigation Map Page with the changed settings.

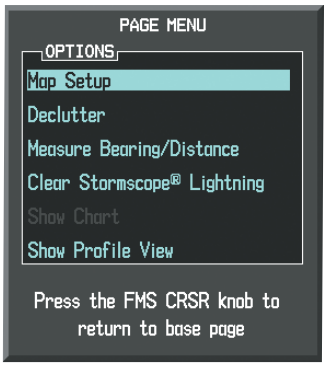


Figure 6-171 Navigation Map Page Menu

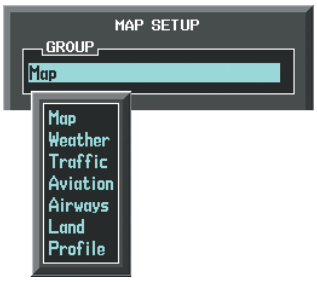


Figure 6-172 Navigation Map Page Setup Menu

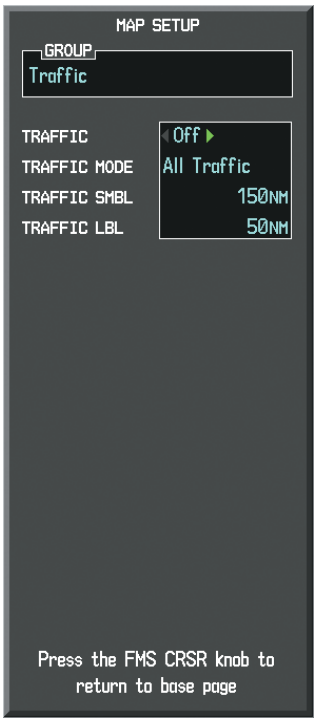


Figure 6-173 Navigation Map Page Setup Menu, Traffic Group

TRAFFIC MAP PAGE

The Traffic Map Page is specialized to show surrounding TIS traffic data in relation to the aircraft's current position and altitude, without clutter from the basemap. It is the principal page for viewing TIS data. Aircraft orientation on this map is always heading up unless there is no valid heading. Map range is adjustable with the **Joystick** from 2 to 12 nm, as indicated by the map range rings.

The traffic mode is annunciated in the upper left corner of the Traffic Map Page. When the aircraft is on the ground, TIS automatically enters Standby Mode. Once the aircraft is airborne, TIS switches from Standby to Operating Mode and the system begins to display traffic information. Refer to the System Status discussion for more information.

Controlling the display of traffic on the Traffic Map Page:

1) Turn the large **FMS** Knob to select the Map Page Group.
2) Turn the small **FMS** Knob to select the Traffic Map Page.
3) Select the desired TIS Mode:

   Press the **OPERATE** Softkey to display traffic, or press the **STANDBY** Softkey to remove traffic and place the traffic system into Standby Mode.

   Or:

   a) Press the **MENU** Key.

   b) Select 'Operate Mode' or 'Standby Mode' and press the **ENT** Key.

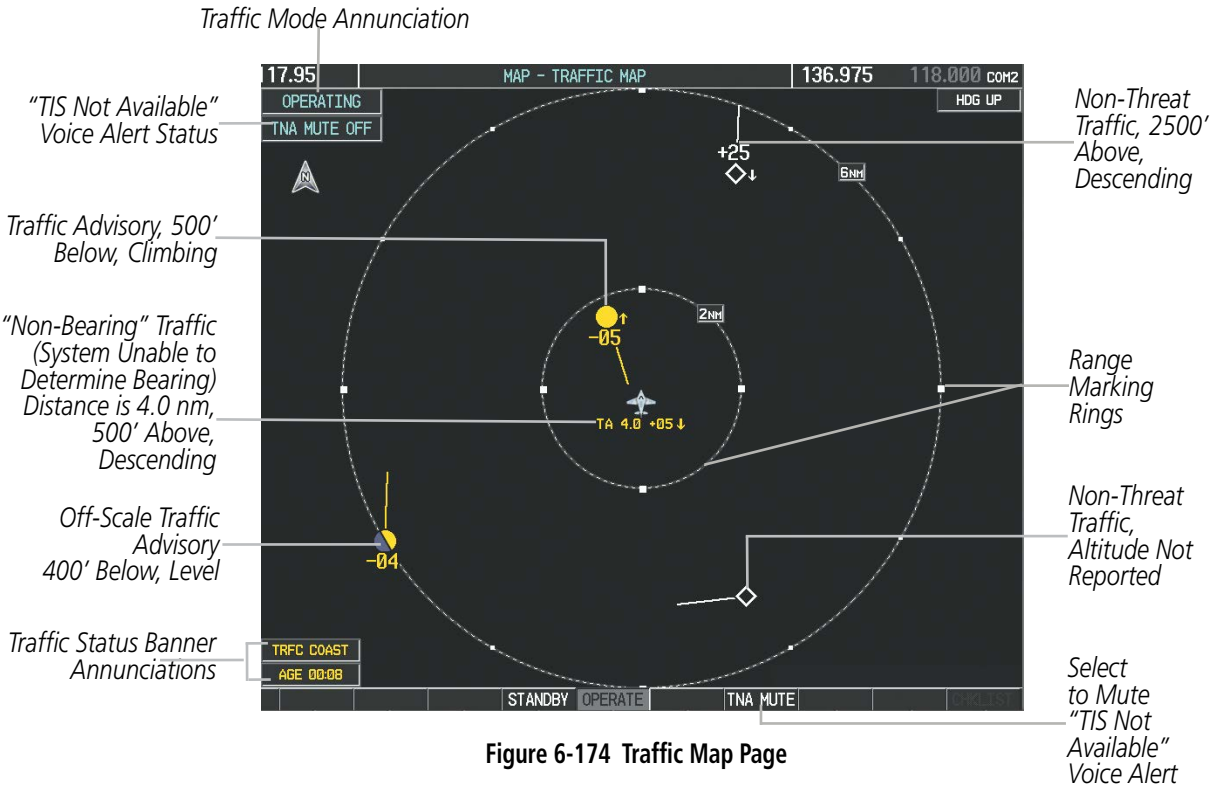


Figure 6-174 Traffic Map Page

TIS ALERTS

When the number of TAs on the Traffic Map Page increases from one scan to the next, the following occur:

- A single ***"Traffic"*** voice alert is generated.
- A 'TRAFFIC' Annunciation appears to the top left of the Attitude Indicator on the PFD, flashes for five seconds, and remains displayed until no TAs are detected in the area.
- The PFD Inset Map is automatically displayed with traffic.

To reduce the number of nuisance alerts due to proximate aircraft, the ***"Traffic"*** voice alert is generated only when the number of TAs increases. For example, when the first TA is displayed, a voice and visual annunciation are generated. As long as a single TA remains on the display, no additional voice alerts are generated. If a second TA appears on the display or if the number of TAs initially decreases and then subsequently increases, another voice alert is generated.



Figure 6-175 Traffic Annunciation (PFD)

The system issues a ***"TIS Not Available"*** (TNA) voice alert when the TIS service becomes unavailable or is out of range. TIS may be unavailable in the radar coverage area due to the following:

- Radar site TIS Mode S sensor is not operational or is out of service
- Traffic or requesting aircraft is beyond the maximum range of the TIS-capable Mode S radar site.
- Traffic or requesting aircraft is above the radar site in the cone of silence and out of range of an adjacent site.
- Traffic or requesting aircraft is below radar coverage. In flat terrain, the coverage extends from about 3000 feet upward at 55 miles. Terrain and obstacles around the radar site can further decrease radar coverage in all directions.
- Traffic does not have an operating transponder.

The ***"TIS Not Available"*** (TNA) voice alert can be manually muted to reduce nuisance alerting. TNA muting status is shown in the upper left corner of the traffic map displays.

Muting the "TIS Not Available" voice alert:

1) Select the Traffic Map Page.

2) Press the **TNA MUTE** Softkey. 'TNA MUTE ON' appears in the upper left corner of the Traffic Map Page.

Or:

a) Press the **MENU** Key.

b) Select "'Not Available" Mute On' (shown if TNA muting is currently off) and press the **ENT** Key.

SYSTEM STATUS

The system performs an automatic test of TIS during power-up. If TIS passes the test, TIS enters Standby Mode (on the ground) or Operating Mode (in the air). If TIS fails the power up test, an annunciation is shown in the center of the Traffic Map Page.

Traffic Map Page Annunciation	Description
NO DATA	Data is not being received from the transponder*
DATA FAILED	Data is being received from the transponder, but a failure is detected in the data stream*
FAILED	The transponder has failed*
UNAVAILABLE	TIS is unavailable or out of range

** Contact a service center or Garmin dealer for corrective action*

Table 6-29 TIS Failure Annunciations

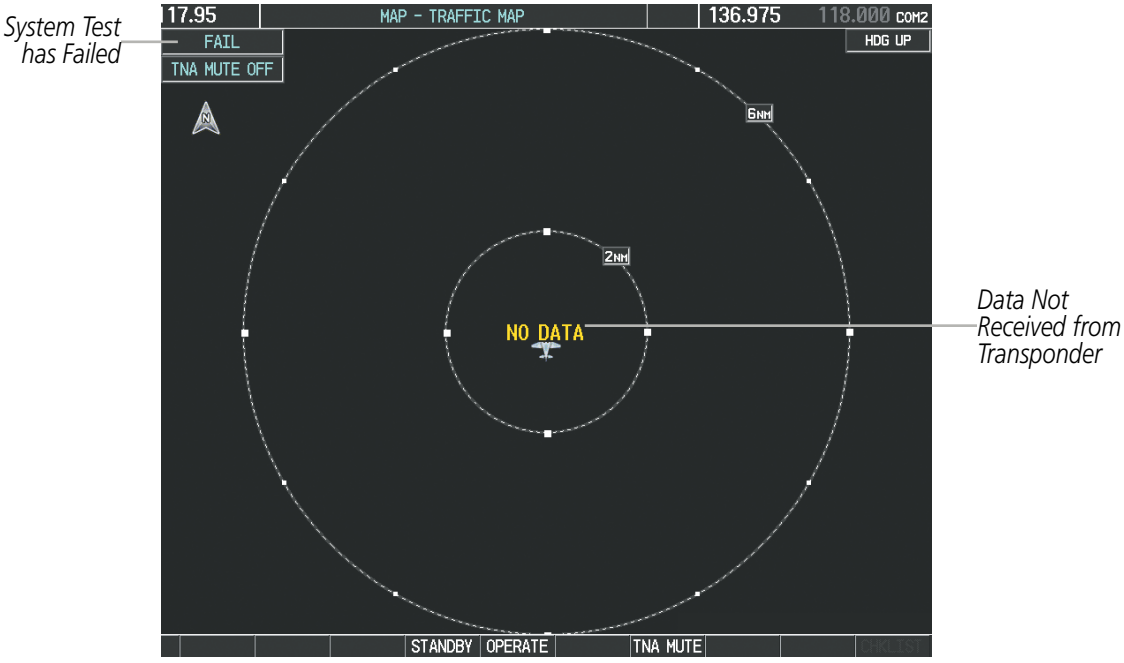


Figure 6-176 TIS Power-up Test Failure

The traffic mode is annunciated in the upper left corner of the Traffic Map Page. When the aircraft is on the ground, TIS automatically enters Standby Mode. If traffic is selected for display on another map while Standby Mode is selected, the traffic display enabled icon is crossed out (also the case whenever TIS has failed). Once the aircraft is airborne, TIS switches to Operating Mode and traffic information is displayed. The mode can be changed manually using softkeys or the page menu.

Mode	Traffic Mode Annunciation (Traffic Map Page)	Traffic Display Enabled Icon (Other Maps)
TIS Operating	OPERATING	
TIS Standby	STANDBY (also shown in white in center of page)	
TIS Failed*	FAIL	

** See Table 6-31 for additional failure annunciations*

Table 6-30 TIS Modes

Selecting a TIS mode:

1) Select the Traffic Map Page.

2) Press the **STANDBY** or **OPERATE** Softkey. The mode is displayed in the upper left corner of the Traffic Map Page.

Or:

a) Press the **MENU** Key.

b) Select 'Operate Mode' or 'Standby Mode' (choice dependent on current state) and press the **ENT** Key. The annunciations to indicate the status of traffic information appear in a banner at the lower left corner of maps on which traffic can be displayed (Table 6-31).

Traffic Status Banner Annunciation	Description
TA OFF SCALE	A Traffic Advisory is outside the selected display range* Annunciation is removed when traffic comes within the selected display range
TA X.X ± XX ↕	System cannot determine bearing of Traffic Advisory** Annunciation indicates distance in nm, altitude separation in hundreds of feet, and altitude trend arrow (climbing/descending)
AGE MM:SS	Appears if traffic data is not refreshed within 6 seconds If after another 6 seconds data is not received, traffic is removed from the display The quality of displayed traffic information is reduced as the age increases
TRFC COAST	The displayed data is not current (6 to 12 seconds since last message) The quality of displayed traffic information is reduced when this message is displayed
TRFC RMVD	Traffic is removed because it is too old for coasting (12 to 60 seconds since last message) Traffic may exist within the selected display range, but it is not displayed
TRFC FAIL	Traffic data has failed
NO TRFC DATA	Traffic data has not been detected
TRFC UNAVAIL	The traffic service is unavailable or out of range

**Shown as symbol on Traffic Map Page*
***Shown in center of Traffic Map Page*

Table 6-31 TIS Traffic Status Banner Annunciations

6.10 GARMIN TAS TRAFFIC

WARNING: *Do not rely solely upon the display of traffic information for collision avoidance maneuvering. The traffic display does not provide collision avoidance resolution advisories and does not under any circumstances or conditions relieve the pilot's responsibility to see and avoid other aircraft.*

WARNING: *Do not rely solely upon the display of traffic information to accurately depict all of the traffic within range of the aircraft. Due to lack of equipment, poor signal reception, and/or inaccurate information from aircraft or ground stations, traffic may be present that is not represented on the display.*

NOTE: *Pilots should be aware of TAS system limitations. TAS systems require transponders of other aircraft to respond to system interrogations. If the transponders do not respond to interrogations due to phenomena such as antenna shading or marginal transponder performance, traffic may be displayed intermittently, or not at all. Aircraft without altitude reporting capability are shown without altitude separation data or climb descent indication. Pilots should remain vigilant for traffic at all times.*

The optional Garmin GTS 800/825 is a Traffic Advisory System (TAS). The system enhances flight crew situational awareness by displaying traffic information for detected transponder-equipped aircraft. The system also provides visual annunciations and voice traffic alerts to assist the pilot in visually acquiring traffic.

The traffic system is capable of tracking a total of 45 intruding aircraft equipped with Mode A, C, or S transponders. The system can display a maximum of 30 aircraft with the highest threat potential simultaneously.

THEORY OF OPERATION

When the system is in Operating Mode, the traffic unit interrogates the transponders of intruding aircraft while monitoring transponder replies. The system uses this information to derive the distance, relative bearing, and if reported, the altitude and vertical trend for each aircraft within its surveillance range.

The system then calculates a closure rate to each intruder based on the projected Closest Point of Approach (CPA). If the closure rate meets the threat criteria for a Traffic Advisory (TA), visual and voice alerting is provided.

TRAFFIC SURVEILLANCE VOLUME AND SYMBOLOGY

The traffic system monitors the airspace within ±10,000 feet of own altitude. Under ideal conditions, the GTS 800 detects transponder traffic up to 12 nm in the forward direction; the GTS 825 detects transponder traffic up to 22 miles in the forward direction. TAS range is somewhat reduced to the sides and aft of own aircraft due to the directional interrogation signal patterns. The system displays TAS-detected traffic using the symbology shown in Table 6-32.

In addition, if a 1090 MHz extended squitter transponder is installed, and the GTS 800/825 detects airborne traffic providing 1090 MHz Automatic Dependent Surveillance - Broadcast (ADS-B) information, the system will display the TAS traffic using the ADS-B symbology shown in Table 6-33.

NOTE: *Do not confuse this functionality with full ADS-B capability, which can provide traffic information from ADS-B Ground-Based Transceivers (GBTs) and ADS-B traffic outside of the TAS surveillance volume. This system is limited to displaying ADS-B information from suitably equipped airborne aircraft within the TAS surveillance volume.*

TAS Symbol	Description
	Non-Threat Traffic
	Proximity Advisory (PA)
	Traffic Advisory (TA)
	Traffic Advisory Off Scale

Table 6-32 TAS Symbol Description

Symbol	Description
	Traffic Advisory with ADS-B directional information. Points in the direction of the intruder aircraft track.
	Proximity Advisory with ADS-B directional information. Points in the direction of the aircraft track.
	Non-threat traffic with ADS-B directional information. Points in the direction of the intruder aircraft track.
	Traffic with ADS-B directional information, but positional accuracy is degraded. Points in the direction of the aircraft track.

Table 6-33 TAS Traffic with ADS-B Symbology

A Traffic Advisory (TA), displayed as an amber circle or triangle, alerts the crew to a potentially hazardous intruding aircraft, if the closing rate, distance, and vertical separation meet TA criteria. A Traffic Advisory that is beyond the selected display range (off scale) is indicated by a half TA symbol at the edge of the screen at the relative bearing of the intruder.

A Proximity Advisory (PA), displayed as a solid white diamond or triangle, indicates the intruding aircraft is within ±1200 feet and is within a 6 nm range, but is still not considered a TA threat.

A Non-threat Advisory, shown as an open white diamond or triangle, is displayed for all other traffic beyond 6 nm that is neither a TA or PA.

Relative altitude, when available, is displayed above or below the corresponding intruder symbol in hundreds of feet. When this altitude is above own aircraft, it is preceded by a '+' symbol; a minus sign '-' indicates traffic is below own aircraft.

A vertical trend arrow to the right of the intruder symbol indicates traffic is climbing or descending at least 500 feet per minute with an upward or downward-pointing arrow respectively.

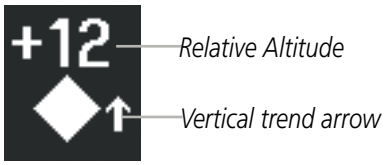


Figure 6-177 Intruder Altitude and Vertical Trend Arrow

If the intruding aircraft is providing ADS-B track information, this is displayed as a vector line extending beyond the traffic symbol in the direction of the track.

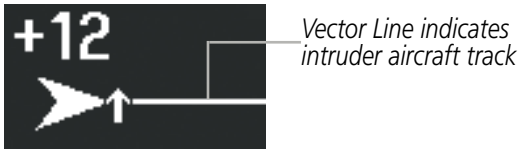


Figure 6-178 Intruder Traffic with ADS-B Directional Information and Track

The traffic system automatically suppresses the display of on-ground aircraft equipped with Mode S transponders.

TA ALERTING CONDITIONS

The traffic system automatically adjusts its TA sensitivity level to reduce the likelihood of nuisance TA alerting during flight phases likely to be near airports. Level A (less) TA sensitivity is used when the aircraft's groundspeed is below 120 knots or when the flaps are down. In all other conditions while the traffic system is providing surveillance, Level B (greater) TA sensitivity is used to assess TA threats.

Sensitivity Level	Intruder Altitude Available	TA Alerting Conditions
A	Yes	Intruder closing rate provides less than 20 seconds of vertical and horizontal separation. Or: Intruder closing rate provides less than 20 seconds of horizontal separation and vertical separation is within 600 feet. Or: Intruder range is within 0.2 nm and vertical separation is within 600 feet.
A	No	Intruder closing rate provides less than 15 seconds of separation.
B	Yes	Intruder closing rate provides less than 30 seconds of vertical and horizontal separation. Or: Intruder closing rate provides less than 30 seconds of horizontal separation and vertical separation is within 800 feet. Or: Intruder range is within 0.55 nm and vertical separation is within 800 feet.
B	No	Intruder range is less than 20 seconds.

Table 6-34 TA Sensitivity Level and TA Alerting Criteria

TAS ALERTS

NOTE: *Voice traffic alerts do not occur when the flaps are down. Only visual traffic annunciations are issued under this condition.*

When the traffic system detects a new TA, the following occur:

- A single ***"Traffic!"*** voice alert is generated, followed by additional voice information about the bearing, relative altitude, and approximate distance from the intruder that triggered the TA (Table 6-35). The announcement "***Traffic! 12 o'clock, high, four miles***," would indicate the traffic is in front of own aircraft, above own altitude, and approximately four nautical miles away.
- A TRAFFIC Annunciation appears at the top right of the airspeed on the PFD, flashing for five seconds and remains displayed until no TAs are detected in the area (Figure 6-179).
- The PFD Inset Map is automatically displayed with TA traffic.

  If the bearing of TA traffic cannot be determined (Figures 6-181 and 6-184), an amber text banner will be displayed in the center of the Traffic Map Page and in the lower-left of the PFD inset map instead of a TA symbol. The text will indicate "TA" followed by the distance, relative altitude, and vertical trend arrow for the TA traffic, if known.

  A TA will be displayed for at least eight seconds, even if the condition(s) that initially triggered the TA are no longer present.



Figure 6-179 Traffic Annunciation (PFD)

Bearing	Relative Altitude	Distance (nm)
"One o'clock" through "Twelve o'clock" or "No Bearing"	"High", "Low", "Same Altitude" (if within 200 feet of own altitude), or "Altitude not available"	"Less than one mile", "One Mile" through "Ten Miles", or "More than ten miles"

Table 6-35 TA Descriptive Voice Announcements

SYSTEM TEST

NOTE: *Traffic surveillance is not provided during the system test. Use caution when performing a system test during flight.*

The traffic system provides a system test mode to verify the TAS system is operating normally. The test takes approximately ten seconds to complete. When the system test is initiated, a test pattern of traffic symbols is displayed on the Traffic Map Page (Figure 6-180). If the system test passes, the system announces ***"TAS System Test Passed"***, otherwise the system announces ***"TAS System Test Failed."*** When the system test is complete, the unit enters Standby Mode.

Testing the Traffic System:

1) Turn the large **FMS** Knob to select the Map Page Group.
2) Turn the small **FMS** Knob to select the Traffic Map Page.
3) Turn the **Joystick** to set the range to 2/6 nm to allow for full test pattern display as shown in the figure below.
4) Press the **TEST** Softkey.

Or:

1) Press the **MENU** Key and turn the small **FMS** knob to select 'Test Mode'.
2) Press the **ENT** Key.

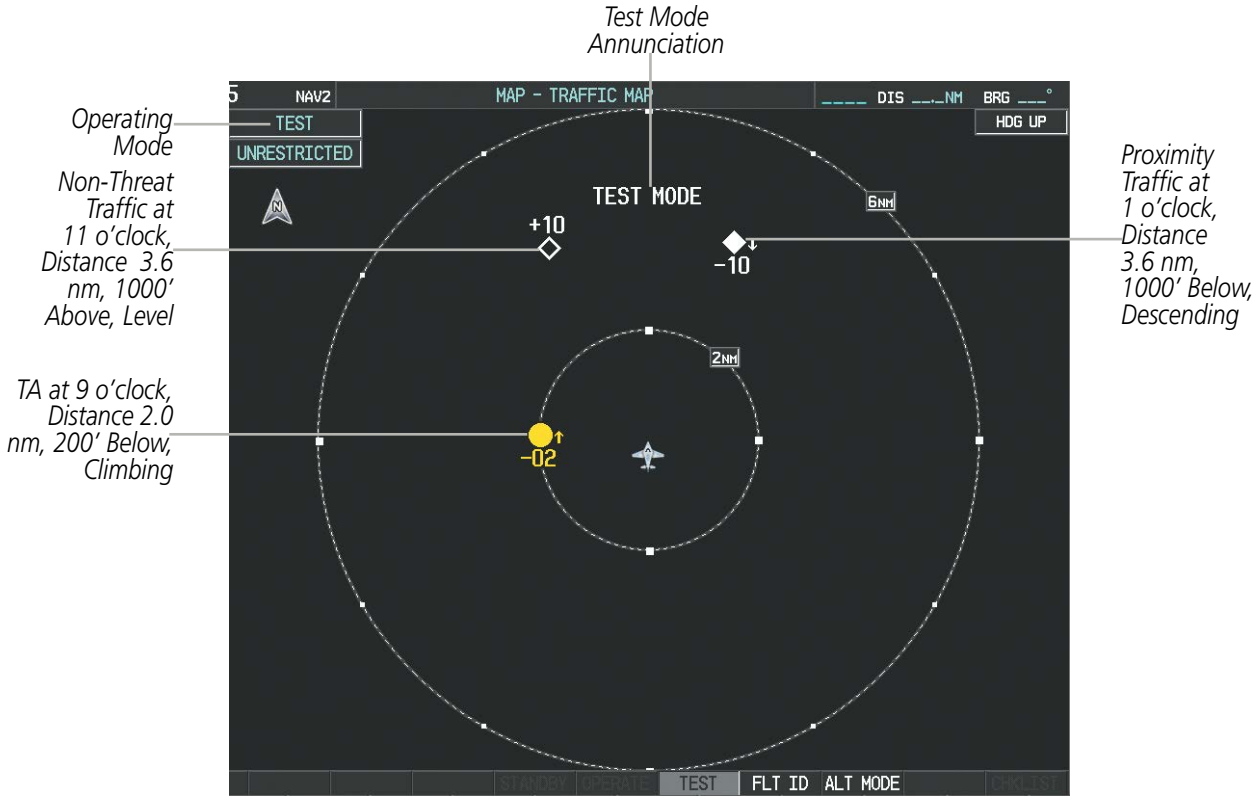


Figure 6-180 System Test in Progress with Test Pattern

OPERATION

NOTE: *The traffic unit automatically transitions from **STANDBY** to **OPERATE** mode eight seconds after takeoff. The unit also automatically transitions from **OPERATE** to **STANDBY** mode 24 seconds after landing.*

After power-up, the traffic system is in Standby Mode. The traffic unit must be in Operating Mode for traffic to be displayed and for TAs to be issued.

Pressing the **OPERATE** Softkey allows the system to switch from Standby Mode to Operating Mode as necessary. Pressing the **STANDBY** Softkey forces the unit into Standby Mode.

Switching from operating mode to standby mode:

On the Traffic Page, press the **STANDBY** Softkey

Or:

1) Press the **MENU** Key and turn the small **FMS** knob to select 'Standby Mode'.
2) Press the **ENT** Key.

Switching from standby mode to operating mode:

On the Traffic Page, press the **OPERATE** Softkey

Or:

1) Press the **MENU** Key and turn the small **FMS** knob to select 'Operate Mode'.
2) Press the **ENT** Key. The traffic system switches from Standby Mode to Operating Mode as necessary.

TRAFFIC MAP PAGE

The Traffic Map Page (Figure 6-181) shows surrounding TAS traffic data in relation to the aircraft's current position and altitude, without basemap clutter. Aircraft orientation is always heading up unless there is no valid heading. Map range is adjustable with the **Joystick** up to 12 mn, as indicated by the map range rings.

The traffic mode and altitude display mode are annunciated in the upper left corner of the page.

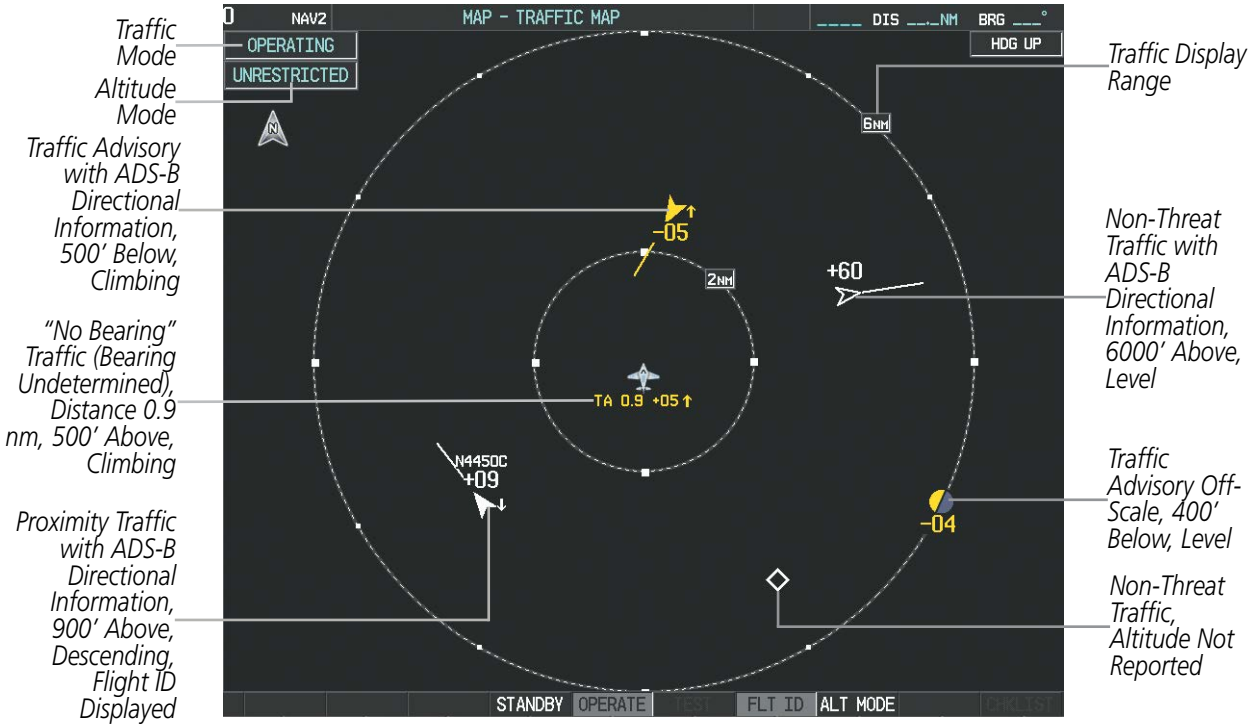


Figure 6-181 Traffic Map Page

Displaying traffic on the Traffic Map Page:

1) Turn the large **FMS** Knob to select the Map Page Group.
2) Turn the small **FMS** Knob to select the Traffic Map Page.
3) Press the **OPERATE** Softkey to begin displaying traffic. 'OPERATING' is displayed in the Traffic mode field.
4) Press the **STANDBY** Softkey to place the system in the Standby mode. 'STANDBY' is displayed in the Traffic Mode field.
5) Turn the **Joystick** clockwise to display a larger area or counter-clockwise to display a smaller area.

Altitude Display

The pilot can select the volume of airspace in which non-threat and proximity traffic is displayed. If the system issues a TA occurring outside of this airspace, it will always be shown.

Changing the altitude range:

1) On the Traffic Map Page, press the **ALT MODE** Softkey.
2) Press one of the following softkeys:
   - **ABOVE:** Displays non-threat and proximity traffic from 9900 feet above the aircraft to 2700 feet below the aircraft. Typically used during climb phase of flight.
   - **NORMAL:** Displays non-threat and proximity traffic from 2700 feet above the aircraft to 2700 feet below the aircraft. Typically used during enroute phase of flight.
   - **BELOW:** Displays non-threat and proximity traffic from 2700 feet above the aircraft to 9900 feet below the aircraft. Typically used during descent phase of flight.
   - **UNREST** (unrestricted)**:** All traffic is displayed from 9900 feet above and 9900 feet below the aircraft.
3) To return to the Traffic Map Page, press the **BACK** Softkey.

Or:

1) Press the **MENU** Key.
2) Turn the small **FMS** Knob to select one of the following (see Softkey description in previous step 2):
   - ABOVE
   - NORMAL
   - BELOW
   - UNRESTRICTED
3) Press the **ENT** Key.

Flight ID Display

The Flight IDs of other aircraft (when available) can be enabled for display on the Traffic Map Page (Figure 6-182). When a flight ID is received, it will appear above or below the corresponding traffic symbol on the Traffic Map Page when this option is enabled.

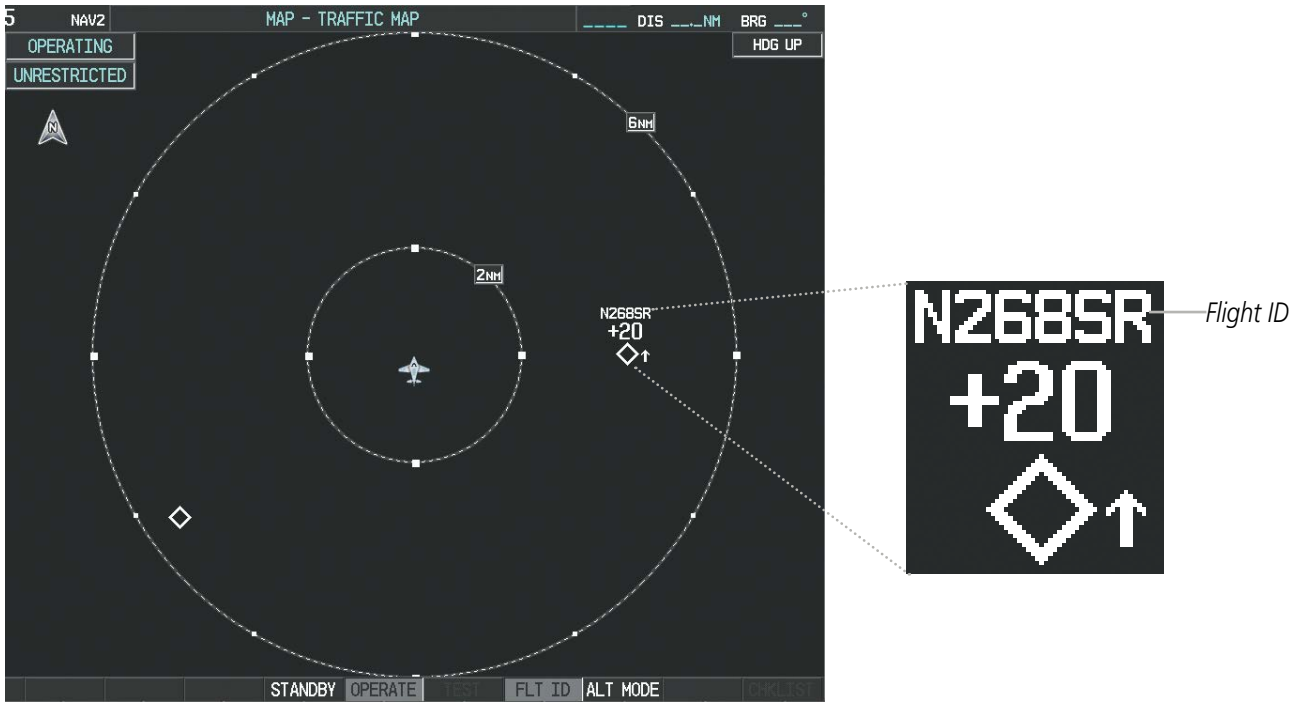


Figure 6-182 Traffic Map Page with Flight IDs Enabled

Enabling/Disabling Flight ID Display:

On the Traffic Map Page, press the **FLT ID** Softkey.

Or:

1) Press the **MENU** Key.
2) Turn the small **FMS** Knob to select 'Show Flight IDs' or 'Hide Flight IDs' (choice dependent on current state) (Figure 6-183).
3) Press the **ENT** Key.

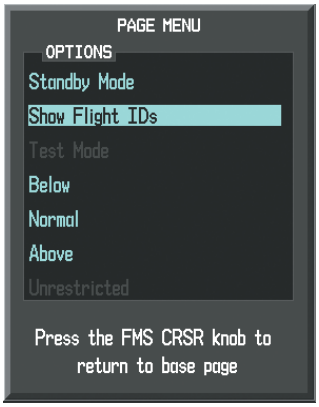


Figure 6-183 Traffic Map Page Menu

Traffic Map Page Display Range

The display range on the Traffic Map Page can be changed at any time. Map range is adjustable with the **Joystick**, as indicated by the map range rings.

Changing the display range on the Traffic Map Page:

1) Turn the **Joystick**
2) The following range options are available:
   - 2 nm
   - 2 and 6 nm
   - 6 and 12 nm
   - 12 and 24 nm (GTS 825 only)
   - 24 and 40 nm (GTS 825 only)

ADDITIONAL TRAFFIC DISPLAYS

The Traffic Map Page is the principal map page for viewing traffic information. Traffic information is also available on the following other MFD maps and pages as an additional reference to the Traffic Map Page:

- Navigation Map Page
- Trip Planning Page
- AUX - Video Page
- Nearest Pages
- Active Flight Plan Page

Traffic information can also be displayed on the PFD when the Synthetic Vision Technology (SVT) system option is installed and enabled. See the Additional Features Section for details.

Displaying traffic information (MFD maps other than the Traffic Map Page):

1) Press the **MAP** Softkey.
2) Press the **TRAFFIC** Softkey. Traffic is now displayed on the map.

When traffic is selected on navigation maps, a traffic icon is shown to indicate traffic is enabled for display (Figure 6-184).

Displaying traffic on the Navigation Map:

1) Ensure the TAS system is operating. With the Navigation Map displayed, press the **MAP** Softkey.
2) Press the **TRAFFIC** Softkey. Traffic is now displayed on the map as shown in Figure 6-184.

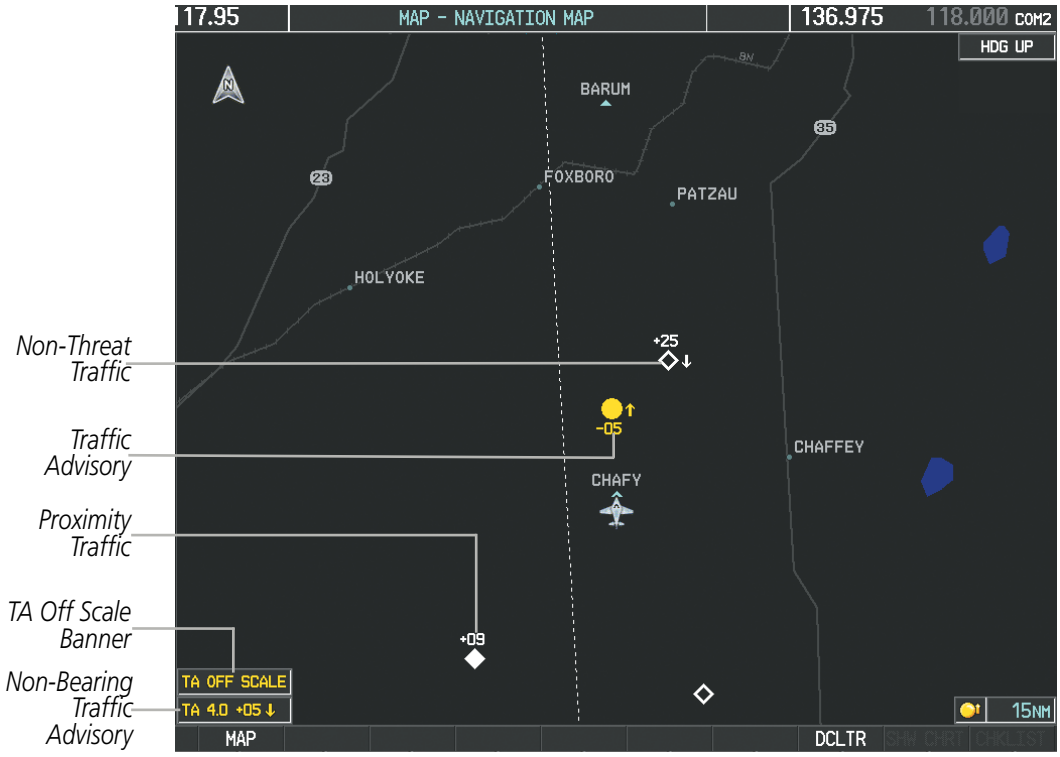


Figure 6-184 TAS Traffic on Navigation Map

Customizing the traffic display on the Navigation Map Page:

1) Select the Navigation Map Page.
2) Press the **MENU** Key.
3) With Map Setup highlighted, press the **ENT** Key (Figure 6-185).
4) Turn the small **FMS** Knob to select the Traffic Group and press the **ENT** Key (Figure 6-186).
5) Turn the large **FMS** Knob or press the **ENT** Key to scroll through the selections (Figure 6-187).
   - TRAFFIC – Turns the display of traffic data on or off
   - TRAFFIC MODE – Selects the traffic mode for display; select from:
     - All Traffic - Displays all traffic
     - TA/PA - Displays Traffic Advisories and Proximity Advisories
     - TA ONLY - Displays Traffic Advisories only
   - TRAFFIC SMBL – Selects the maximum range at which traffic symbols are shown
   - TRAFFIC LBL – Selects the maximum range at which traffic labels are shown with the option to turn off
6) Turn the small **FMS** Knob to scroll through options (ON/OFF, range settings, etc.).
7) Press the **ENT** Key to select an option.
8) Press the **FMS** Knob or **CLR** Key to return to the Navigation Map Page.

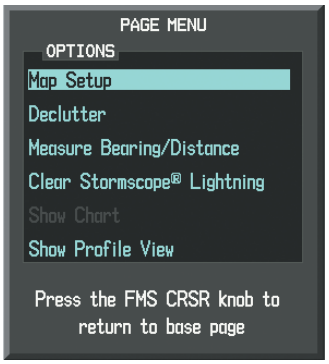


Figure 6-185 Navigation Map Page Menu



Figure 6-186 Navigation Map Page Setup Menu

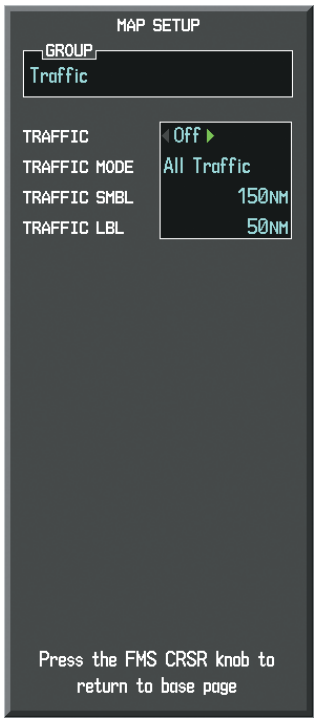


Figure 6-187 Navigation Map Page Setup Menu, Traffic Group

The Navigation Map Page Setup Menu also controls the display of traffic. The setup menu controls the map range settings. Traffic data symbols and labels can be decluttered from the display. If a map range larger than the map range setting is selected, the data is removed from the map. Maps besides the Traffic Map Page use settings based on those selected for the Navigation Map Page.

A traffic inset map may be displayed on the PFD. Traffic information can also be overlaid with navigation, topographic and optional weather data on the PFD inset navigation map

Displaying traffic information (PFD Inset Map):

1) Press the **INSET** Softkey.
2) Press the **TRAFFIC** Softkey to display traffic data on the inset map (TRFC-1).
3) Press the softkey again to display the traffic-only inset (TRFC-2).
4) Press the softkey again to remove traffic data.

SYSTEM STATUS

The traffic mode is annunciated in the upper left corner of the Traffic Map Page.

Traffic Mode	Traffic Mode Annunciation (Traffic Map Page)	Traffic Display Status Icon (Other Maps)
TAS System Test Initiated	TEST (also shown in white in center of page)	
TAS Operating	OPERATING	
TAS Standby	STANDBY (also shown in white in center of page)	
TAS Failed*	FAIL	

** See Table 6-37 for additional failure annunciations*

Table 6-36 TAS Modes

If the traffic unit fails, an annunciation as to the cause of the failure is shown in the center of the Traffic Map Page. During a failure condition, the Operating Mode cannot be selected.

Traffic Map Page Annunciation	Description
NO DATA	Data is not being received from the TAS unit
DATA FAILED	Data is being received from the TAS unit, but the unit is self-reporting a failure
FAILED	Incorrect data format received from the TAS unit

Table 6-37 TAS Failure Annunciations

The annunciations to indicate the status of traffic information appear in a banner at the lower left corner of maps on which traffic can be displayed.

Traffic Status Banner Annunciation	Description
TA OFF SCALE	A Traffic Advisory is outside the selected display range*. Annunciation is removed when traffic comes within the selected display range.
TA X.X ± XX ↕	System cannot determine bearing of Traffic Advisory**. Annunciation indicates distance in nm, altitude separation in hundreds of feet, and altitude trend arrow (climbing/descending).
TRFC FAIL	TAS unit has failed (unit is self-reporting a failure or sending incorrectly formatted data)
NO TRFC DATA	Data is not being received from the TAS unit

**Shown as symbol on Traffic Map Page*
***Shown in center of Traffic Map Page*

Table 6-38 TAS Traffic Status Annunciations

6.11 GARMIN GDL 88 ADS-B TRAFFIC

WARNING: *Do not rely solely upon the display of traffic information for collision avoidance maneuvering. The traffic display does not provide collision avoidance resolution advisories and does not under any circumstances or conditions relieve the pilot's responsibility to see and avoid other aircraft.*

WARNING: *Do not rely solely upon the display of traffic information to accurately depict all of the traffic information within range of the aircraft. Due to lack of equipment, poor signal reception, and/or inaccurate information from other aircraft, traffic may be present but not represented on the display.*

The optional Garmin GDL 88 is a dual-link Universal Access Transceiver (UAT). It sends and receives Automatic Dependent Surveillance-Broadcast (ADS-B) traffic information on the 978 MHz UAT frequency. It also receives data link weather information on the UAT frequency. As a dual-link transceiver, the GDL 88 also receives ADS-B traffic information with its 1090 MHz Extended Squitter (1090 ES) receiver. The system provides visual annunciations and voice traffic alerts to help the pilot visually acquire potentially conflicting traffic. This discussion covers the traffic features of the GDL 88; refer to the Flight Information Service-Broadcast (FIS-B) Weather discussion for more information about the UAT data link weather features of the GDL 88.

ADS-B SYSTEM OVERVIEW

ADS-B is a core technology in the FAA NextGen air traffic control system and is comprised of three segments: ADS-B (Broadcast), ADS-R (Rebroadcast), and Traffic Information Service-Broadcast (TIS-B).

ADS-B is the automatic broadcast of position reports by aircraft, surface vehicles, and transmitters on fixed objects. These broadcasts contain information such as GPS position, identity (Flight ID, Call Sign, Tail Number, ICAO registration number, etc.), ground track, ground speed, pressure altitude, and emergency status.

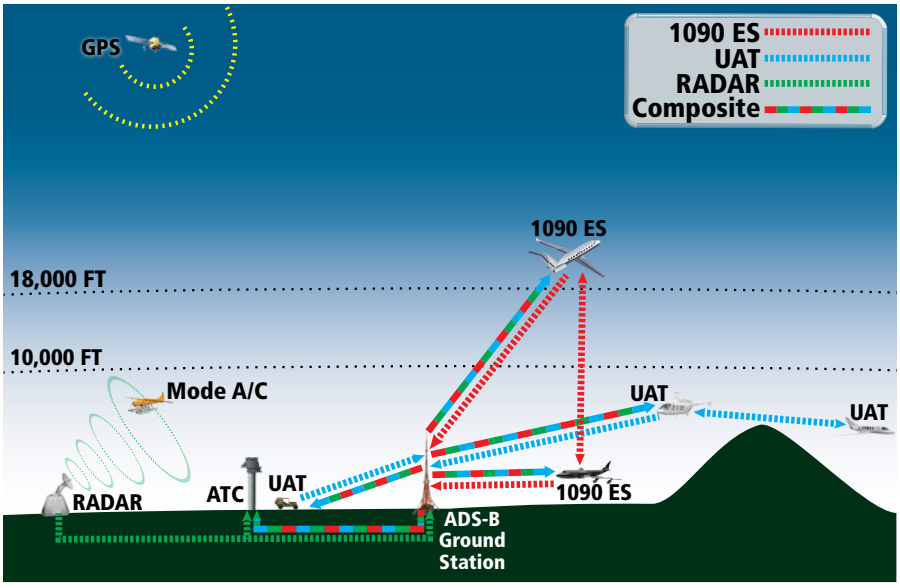


Figure 6-188 ADS-B System

For the purpose of distinguishing between levels of ADS-B service, there are three classifications of aircraft or system capability: ADS-B In, ADS-B Out, and ADS-B participating. ADS-B In refers to the capability to receive ADS-B information. ADS-B Out refers to the capability to transmit ADS-B information. ADS-B participating refers to the capability to both send and receive ADS-B information. Aircraft lacking either ADS-In, ADS-B Out, or both ADS-B capabilities may also be referred to as ADS-B nonparticipating aircraft.

AUTOMATIC DEPENDENT SURVEILLANCE-REBROADCAST (ADS-R)

Because it is not required that ADS-B In capable aircraft be able to receive ADS-B data on both the 1090 MHz and 978 MHz data links, a method exists to get data from one data link to the other. ADS-R is the rebroadcast of ADS-B data by FAA ground stations, which provide this service by taking data from one link and rebroadcasting it on the other link. For example, two aircraft are in the service volume for a ground station, and one is transmitting on 1090 MHz and the other on 978 MHz, the ground station retransmits the data from each aircraft on the other link to ensure the two aircraft can "see" each other.

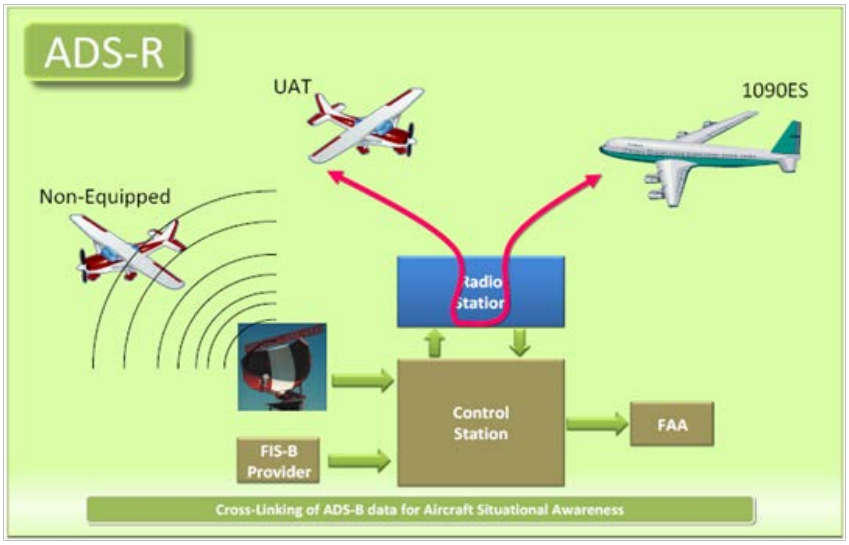


Figure 6-189 ADS-R Operation - FAA Illustration

The GDL 88 is capable of receiving ADS-B traffic reports directly on the 1090 MHz ES data link in addition to the 978 MHz UAT data link. This allows the GDL 88 to receive ADS-B position reports on both frequencies from aircraft in the vicinity, without relying on ADS-R ground station coverage.

TRAFFIC INFORMATION SERVICE-BROADCAST (TIS-B)

TIS-B provides the bridge between the radar-based ATC system and the ADS-B-based system. When an ADS-B In or Out capable aircraft is within the service volume of an FAA ADS-B ground station, the ground station broadcasts a portion of the ATC radar data to the aircraft. This aircraft is then included in the list of aircraft being provided TIS-B service and is then considered a "TIS-B participant."

TIS-B coverage is available when the aircraft is within ground station coverage, in Secondary Surveillance Radar coverage, and the other aircraft is also in Secondary Surveillance Radar coverage, and is transmitting its altitude.

The ground station provides ATC radar information for other aircraft within ±3,500 feet and 15 NM of the participant, to include altitude, position, ground speed, and ground track. TIS-B broadcasts occur once every three to thirteen seconds, depending on the characteristics of the ground station providing the TIS-B service.

The following table describes the aircraft that are observed by a GDL 88-equipped aircraft according to the level of equipment installed in the other aircraft.

Other Aircraft Equipment	Viewable by GDL 88 UAT Equipped Aircraft
1090ES Out Equipped	Yes
UAT Receive Only Capable	No
UAT Transmit Equipped	Yes
No Transponder, No ADS-B	No
Non ADS-B Equipped, but with Mode C or S Transponder	Yes*

** Only when in ADS-B ground station coverage and when the other aircraft is in ATC radar coverage.*

Table 6-39 Aircraft Available for Viewing by an ADS-B Equipped Own Aircraft

ADS-B WITH TAS

When an optional Traffic Advisory System (TAS) is also installed and operating with the UAT, the UAT receives traffic from the active traffic system and attempts to match (or "correlate") this traffic with ADS-B traffic the UAT is tracking. When a correlation is made, only the traffic with the most accurate information is displayed to the flight crew. Any traffic that is not correlated (i.e., only detected by one system but not the other) is also displayed for the flight crew. This correlation of traffic by the UAT improves the accuracy of the traffic displayed, while reducing the occurrence of the same aircraft being displayed twice.

NOTE: *When operating on the edges of ATC radar coverage or when using an optional active traffic system providing intromittent traffic data, a single aircraft may be briefly or periodically depicted as two aircraft on the display.*

Either the TAS or the UAT can issue a traffic alert. If both systems determine an alert is necessary, and the traffic is correlated, only the TAS-generated alert is issued. If traffic is not correlated, and both systems determine an alert is necessary, the TAS-generated alert occurs first, followed by the UAT-generated alert.

CONFLICT SITUATIONAL AWARENESS & ALERTING

Conflict Situational Awareness (CSA) is an alerting algorithm which provides ADS-B traffic alerting similar to the TAS systems discussed previously.

The UAT issues a voice alert when a Traffic Advisory (TA) is displayed, for example "Traffic! Two O'clock, Low, Two Miles."

The own aircraft altitude above terrain determines the sensitivity of the CSA algorithm to minimize nuisance alerts. Radar Altitude (if available), Height Above Terrain, and Geodetic Sea Level (GSL) altitude are used to adjust the sensitivity of the CSA algorithm in accordance with the following table:

Sensitivity Level	Radar Altitude (Feet)	Height Above Terrain (HAT)	GPS Phase of Flight	Own Altitude (Feet)	Look-ahead time (sec)	Vertical Threshold for Alert (feet)	Protected Volume (NM)
4	Up to 1000 (RA or HAT)	Any	Any	Any	20	850	0.20
4	Unavailable	Any	Any	Any	20	850	0.20
4	Unavailable	Unavailable	Approach	Any	20	850	0.20
5	>1000 <=2350	Any	Any	Any	25	850	0.20
5	Unavailable	>1000 <=2350	Any	Any	25	850	0.20
5	Unavailable	Unavailable	Terminal	Any	25	850	0.20
6	Unavailable or >2350	Unavailable or >2350	Not approach and not Terminal (including unavailable)	<=5000	30	850	0.35
7	Unavailable or >2350	Unavailable or >2350	Not approach and not Terminal (including unavailable)	>5000 <=10,000	40	850	0.55
8	Unavailable or >2350	Unavailable or >2350	Not approach and not Terminal (including unavailable)	>10,000 <=20,000	45	850	0.80
9	Unavailable or >2350	Unavailable or >2350	Not approach and not Terminal (including unavailable)	>20,000 <=42,000	48	850	1.10
10	Unavailable or >2350	Unavailable or >2350	Not approach and not Terminal (including unavailable)	> 42,000	48	1200	1.10

Table 6-40 CSA Alerting Thresholds for ADS-B Traffic

When the system detects a new Traffic Advisory (TA), the following occur:

- The system issues a single ***"Traffic!"*** voice alert, followed by additional voice information about the bearing, relative altitude, and approximate distance from the intruder that triggered the TA (Table 6-41). For example, the announcement "***Traffic! 12 o'clock, high, four miles***," would indicate the traffic is in front of own aircraft, above own altitude, and approximately four nautical miles away.
- A 'TRAFFIC' annunciation appears at the top right of the airspeed on the PFD, flashes for five seconds, and remains displayed until no TAs are detected in the area (Figure 6-190).
- The PFD Inset Map is automatically displayed with TA traffic.

  If the bearing of TA traffic cannot be determined, an amber text banner will be displayed in the center of the Traffic Map Page and in the lower-left of the PFD inset map instead of a TA symbol. The text will indicate 'TA' followed by the distance, relative altitude, and vertical trend arrow for the TA traffic, if known.

A TA will be displayed for at least eight seconds, even if the condition(s) that initially triggered the TA are no longer a factor.



Figure 6-190 Traffic Annunciation (PFD)

Bearing	Relative Altitude	Approximate Distance (nm)
"One o'clock" through "Twelve o'clock" or "No Bearing"	"High", "Low", "Same Altitude" (if within 200 feet of own altitude), or "Altitude not available"	"Zero miles", "Less than one mile", "One Mile" through "Ten Miles", or "More than ten miles"

Table 6-41 TA Descriptive Voice Announcements

NOTE: *ADS-B traffic voice alerts are suppressed when below 500 feet.*

AIRBORNE AND SURFACE APPLICATIONS

The UAT can help the pilot visually acquire traffic both in the air and on-the-ground. There are two ADS-B applications or modes: Airborne Situational Awareness (AIRB) and Surface Situational Awareness (SURF). The system automatically selects the appropriate application based on conditions.

The AIRB application is on when the aircraft is more than five nautical miles and 1,500 feet above the nearest airport. When the AIRB application is active, the system only displays traffic which is airborne.

The SURF application is on when the aircraft is within five nautical miles of the nearest airport and less than 1,500 feet above field elevation. When the SURF applications is on, the system displays airborne and on the ground traffic. At a Traffic Map Page range of two nautical miles or less, the airport environment (including taxiways and runways) appears in addition to traffic. The airport displays are derived from the SafeTaxi database. Refer to the Additional Features section for more information about SafeTaxi displays.

NOTE: *Do not rely on the solely on the traffic display to determine the runway alignment of traffic, especially when runways are in close proximity to each other.*

Due to the varying precision of the data received via ADS-B, ADS-R, and TIS-B, all traffic targets may not be depicted on the traffic display. Because higher data precision is required for display in the SURF environment, some traffic eligible for AIRB will not be displayed while SURF is on. Individual eligibility for AIRB and SURF is depicted on the AUX-ADS-B Status Page, discussed later in this section.

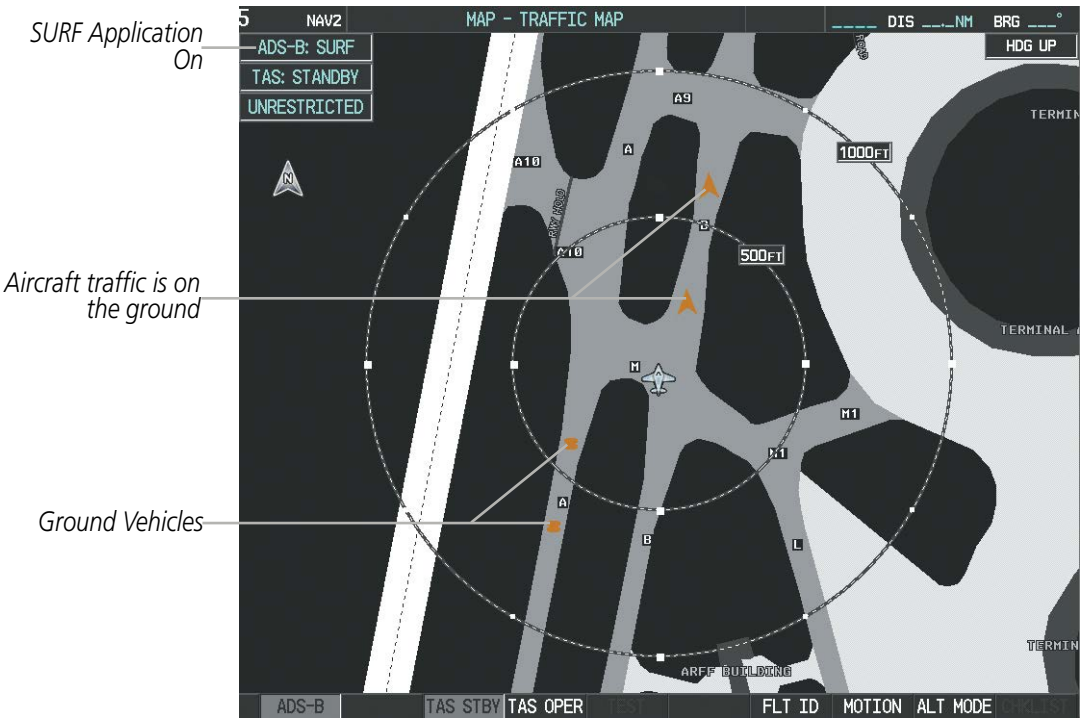


Figure 6-191 Traffic Map Page with SURF Mode On

TRAFFIC DESCRIPTION

The symbols used to display ADS-B traffic are shown in Table 6-42. Above or below the traffic symbol is the traffic identifier, and altitude. A small up or down arrow next to the traffic symbol indicates that the traffic is climbing or descending at a rate of at least 500 feet per minute, otherwise no arrow appears.

Symbol	Description
	Traffic Advisory with directional information. Points in the direction of the intruder aircraft track.
	Traffic Advisory without directional information.
	Traffic Advisory out of the selected display range. Displayed at outer range ring at proper bearing.
	Proximity Advisory with directional information. Points in the direction of the aircraft track.
	Proximity Advisory without directional information.
	Non-threat traffic with directional information. Points in the direction of the intruder aircraft track.
	Non-threat traffic without directional information.
	Traffic located on the ground with directional information. Points in the direction of the aircraft track. Ground traffic is only displayed when ADS-B is in Surface (SURF) Mode or own aircraft is on the ground.
	Ground traffic without directional information. Ground traffic is only displayed when ADS-B is in Surface (SURF) Mode or own aircraft is on the ground.
	Non-aircraft ground traffic. Ground traffic is only displayed when ADS-B is in Surface (SURF) Mode or own aircraft is on the ground.

Table 6-42 ADS-B Traffic Symbology

OPERATION

TRAFFIC MAP PAGE

The Traffic Map Page shows surrounding traffic data in relation to the aircraft's current position and altitude, without basemap clutter. Aircraft orientation is always heading up unless there is no valid heading. Map range is adjustable with the **Joystick**, as indicated by the map range rings.

The traffic mode and altitude display mode are annunciated in the upper left corner of the page.

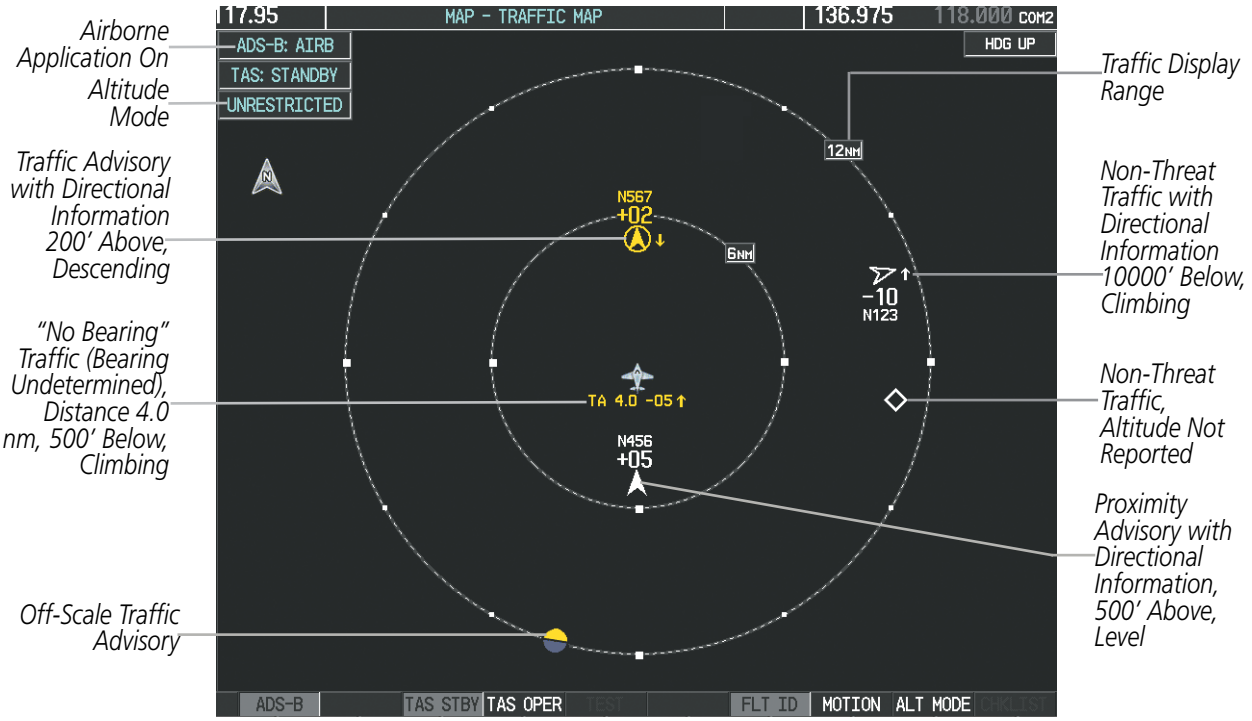


Figure 6-192 Traffic Map Page

Enabling/disabling the display of ADS-B traffic.

1) Select the Traffic Map Page.
2) Press the **ADS-B** Softkey.

   Or:

   a) Press the **MENU** Key and turn the small **FMS** Knob to highlight 'ADS-B On' or 'ADS-B Off'.

   b) Press the **ENT** Key.

Testing the display of ADS-B traffic:

1) Select the Traffic Map Page.
2) If necessary, turn the Joystick to select a map range of 2 and 6 nm to ensure full test pattern display.
3) Ensure the **ADS-B** Softkey is disabled.

4) If an optional TAS is installed, ensure the **TAS STBY** Softkey is enabled.

5) Press the **TEST** Softkey.

   Or:

   a) Press the **MENU** Key.

   b) Turn the small **FMS** Knob to highlight 'Test Mode'.

   c) Press the **ENT** Key.

A test pattern of traffic symbols appears during the test, and a 'TRAFFIC' annunciation appears on the PFDs. At the conclusion of the test, the system issues the voice alert "Traffic System Test". If the test pattern is displayed and the voice alert is heard, the system has passed the test.

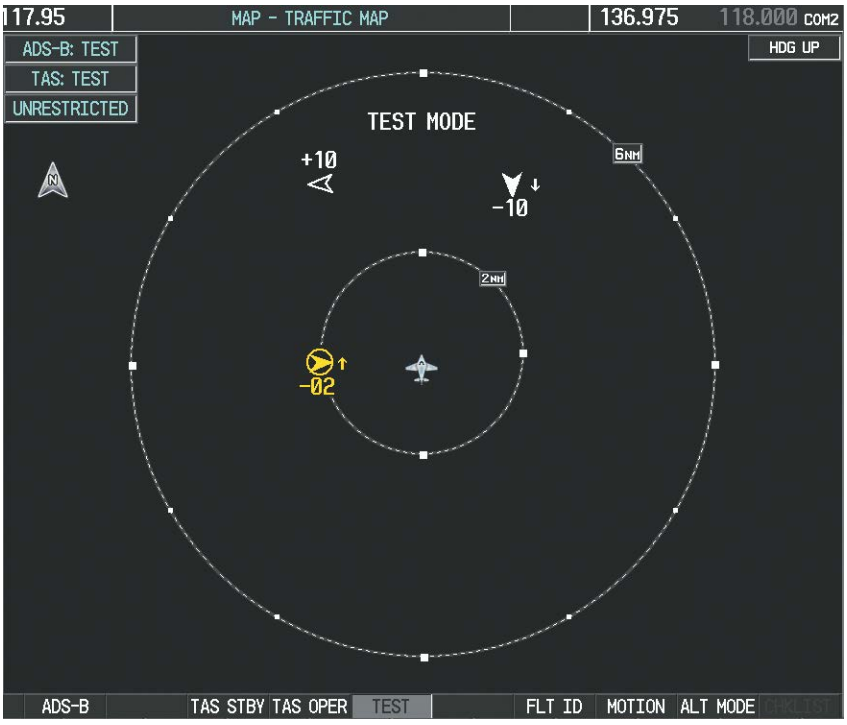


Figure 6-193 Traffic Map Page with Test Mode Enabled

The pilot can select the volume of airspace in which non-threat and proximity traffic is displayed. TAs occurring outside of these limits will always be shown.

Changing the altitude range:

1) On the Traffic Map Page, press the **ALT MODE** Softkey.

2) Press one of the following Softkeys:

- **ABOVE:** Displays non-threat and proximity traffic from 9900 feet above the aircraft to 2700 feet below the aircraft. Typically used during climb phase of flight.
- **NORMAL:** Displays non-threat and proximity traffic from 2700 feet above the aircraft to 2700 feet below the aircraft. Typically used during enroute phase of flight.

- **BELOW:** Displays non-threat and proximity traffic from 2700 feet above the aircraft to 9900 feet below the aircraft. Typically used during descent phase of flight.
- **UNREST** (unrestricted)**:** All traffic is displayed from 9900 feet above and 9900 feet below the aircraft.

3) To return to the Traffic Map Page, press the **BACK** Softkey.

Or:

1) Press the **MENU** Key.
2) Turn the small **FMS** Knob to select one of the following (see softkey description in step 2 above):
   - ABOVE
   - NORMAL
   - BELOW
   - UNRESTRICTED
3) Press the **ENT** Key.

DISPLAYING MOTION VECTORS

When Absolute Motion Vectors are selected, the vectors extending from the traffic symbols depict the traffic's reported track and speed over the ground. When Relative Motion Vectors are selected, the vectors extending from the traffic symbols display how the traffic is moving relative to own aircraft. These vectors are calculated using the traffic's track and ground speed and own aircraft's track and ground speed. These two values are combined to depict where the traffic is moving purely with respect to own aircraft, and provide a forecast of where the traffic will be, relative to own aircraft, in the near future.

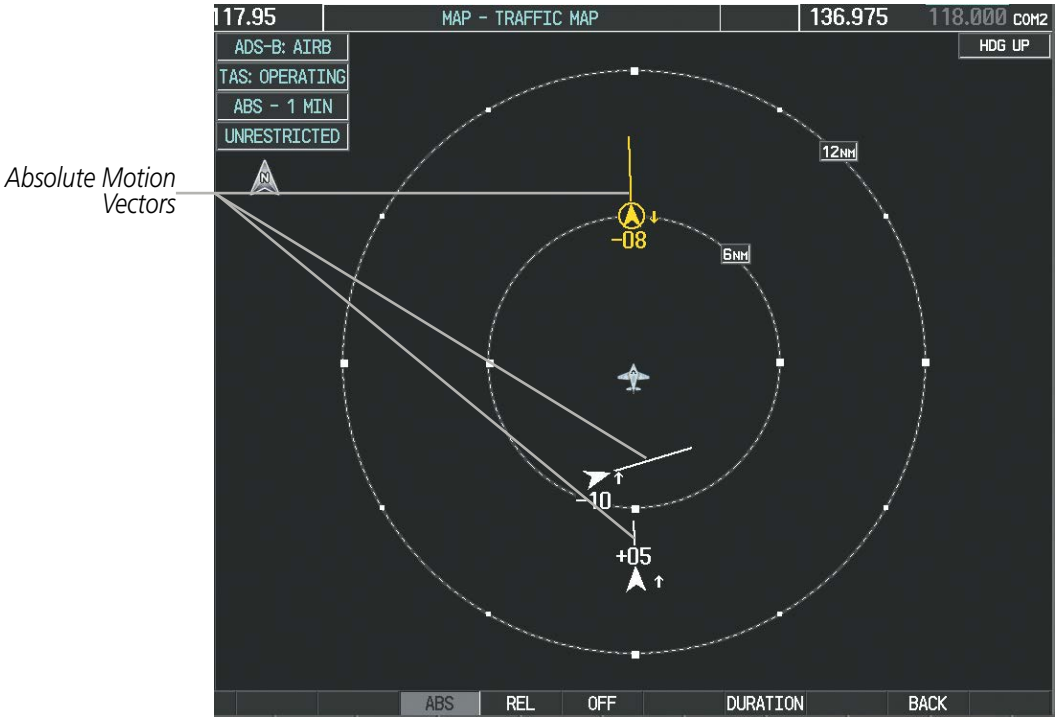


Figure 6-194 Traffic Map Page with Absolute Motion Vectors Enabled

Enabling/disabling the Motion Vector display:

1) Select the Traffic Map Page.
2) Select the **MOTION** Softkey.
3) Press one of the following softkeys:
   - **ABS:** Displays the motion vector pointing in the absolute direction.
   - **REL**: Displays the motion vector relative to own aircraft
   - **OFF**: Disables the display of the motion vector.

Or:

1) Select the Traffic Map Page.
2) Press the **MENU** Key.
3) Turn the small **FMS** Knob to highlight 'Relative Motion', 'Absolute Motion' or 'Motion Vector Off'.
4) Press the **ENT** Key.

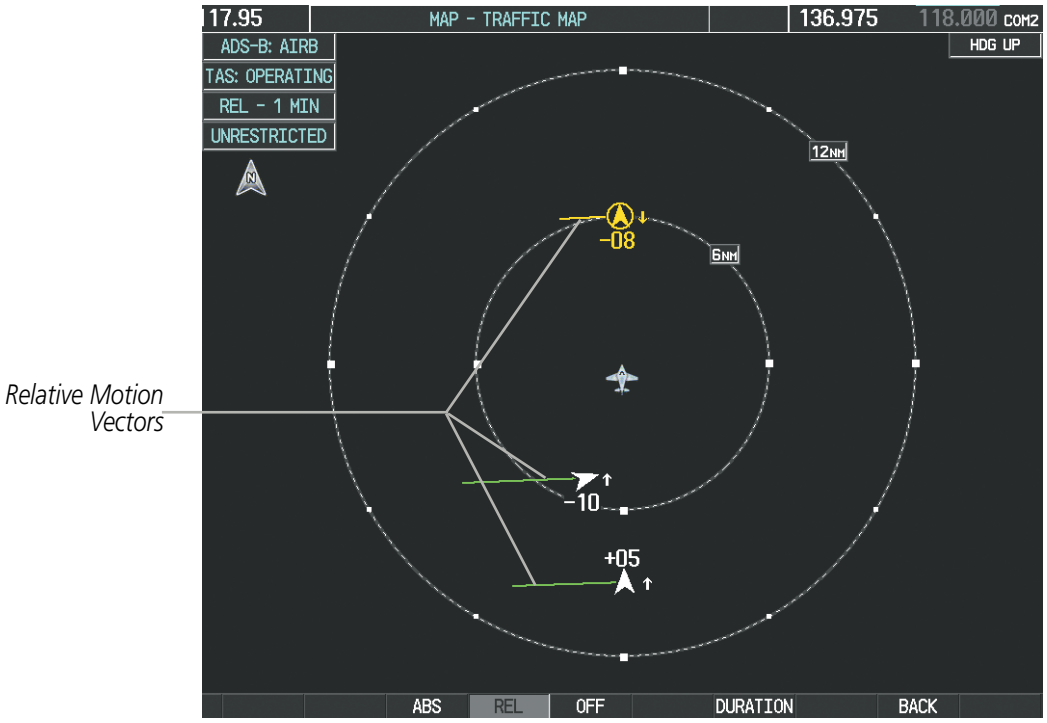


Figure 6-195 Traffic Map Page with Relative Motion Vectors Enabled

Adjusting the duration for the Motion Vector projected time:

1) Select the Traffic Map Page.
2) Press the **MOTION** Softkey.
3) Press the **DURATION** Softkey.
4) Press a softkey for the desired duration (**30 SEC**, **1 MIN**, **2 MIN**, **5 MIN**).

5) When finished, press the **BACK** Softkey to return to the Traffic Map Page.

Flight ID Display

The Flight IDs of other aircraft (when available) can be enabled for display on the Traffic Map Page (Figure 6-196). When a flight ID is received, it will appear above or below the corresponding traffic symbol on the Traffic Map Page when this option is enabled.

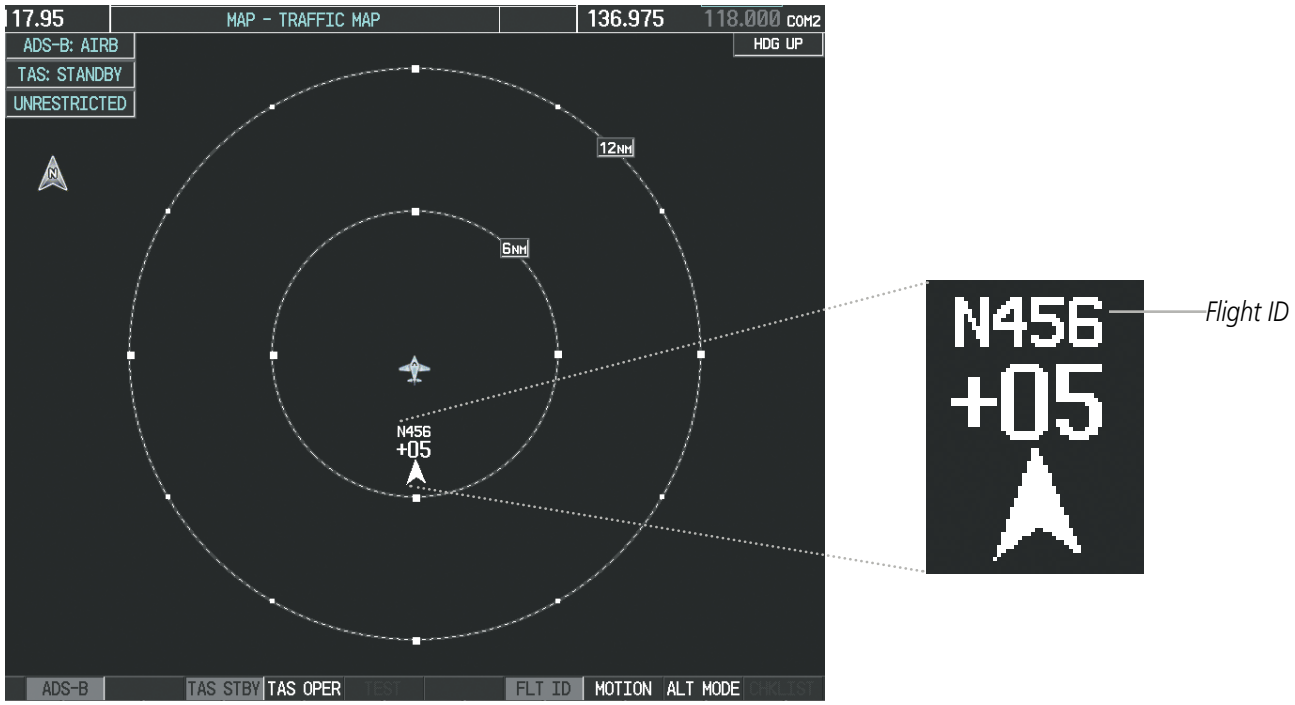


Figure 6-196 Traffic Map Page with Flight IDs Enabled

Enabling/Disabling Flight ID Display:

On the Traffic Map Page, press the **FLT ID** Softkey.

Displaying Additional Traffic Information

The Traffic Map Page can display additional information for a selected aircraft symbol. This may include the aircraft tail number/Flight ID, type of aircraft (e.g., glider, small/medium/large aircraft, service vehicle, unmanned airborne vehicle (UAV)), course, track, groundspeed), and other information.

Showing additional traffic information:

1) Select the Traffic Map Page.
2) Press the **FMS** Knob. A cyan bracket highlights the first selected traffic symbol. Additional information appears in a window in the upper-right corner of the Traffic Map Page.
3) To select a different aircraft symbol, turn the **FMS** Knob to move the cyan bracket until the selected aircraft traffic symbol is highlighted.
4) When finished, press the **FMS** Knob again to remove the cyan selection bracket.

Traffic Map Page Display Range

The display range on the Traffic Map Page can be changed at any time. Map range is adjustable with the **Joystick**, as indicated by the map range rings.

Changing the display range on the Traffic Map Page:

Turn the **Joystic**k clockwise to increase the range of the traffic map, or counter-clockwise to decrease the range.

ADDITIONAL TRAFFIC DISPLAYS

The Map - Traffic Map Page is the principal map page for viewing traffic information. Traffic information can also be displayed on the following other maps for additional reference on the MFD when the traffic unit is operating:

- Navigation Map Page
- Trip Planning Page
- Nearest Pages
- Active Flight Plan Page

Traffic information can also be displayed on the PFD when the Synthetic Vision Technology (SVT) option is installed and enabled. See the Additional Features Section for details.

Displaying traffic information (MFD maps other than the Traffic Map Page):

1) Press the **MAP** Softkey.
2) Press the **TRAFFIC** Softkey. Traffic is now displayed on the map.

When traffic is selected on maps other than the Traffic Map Page, a traffic icon is shown to indicate traffic is enabled for display (Figure 6-197).

Displaying traffic on the Navigation Map

1) Ensure the traffic system is operating. With the Navigation Map displayed, press the **MAP** Softkey.
2) Press the **TRAFFIC** Softkey. Traffic is now displayed on the map as shown in Figure 6-197.

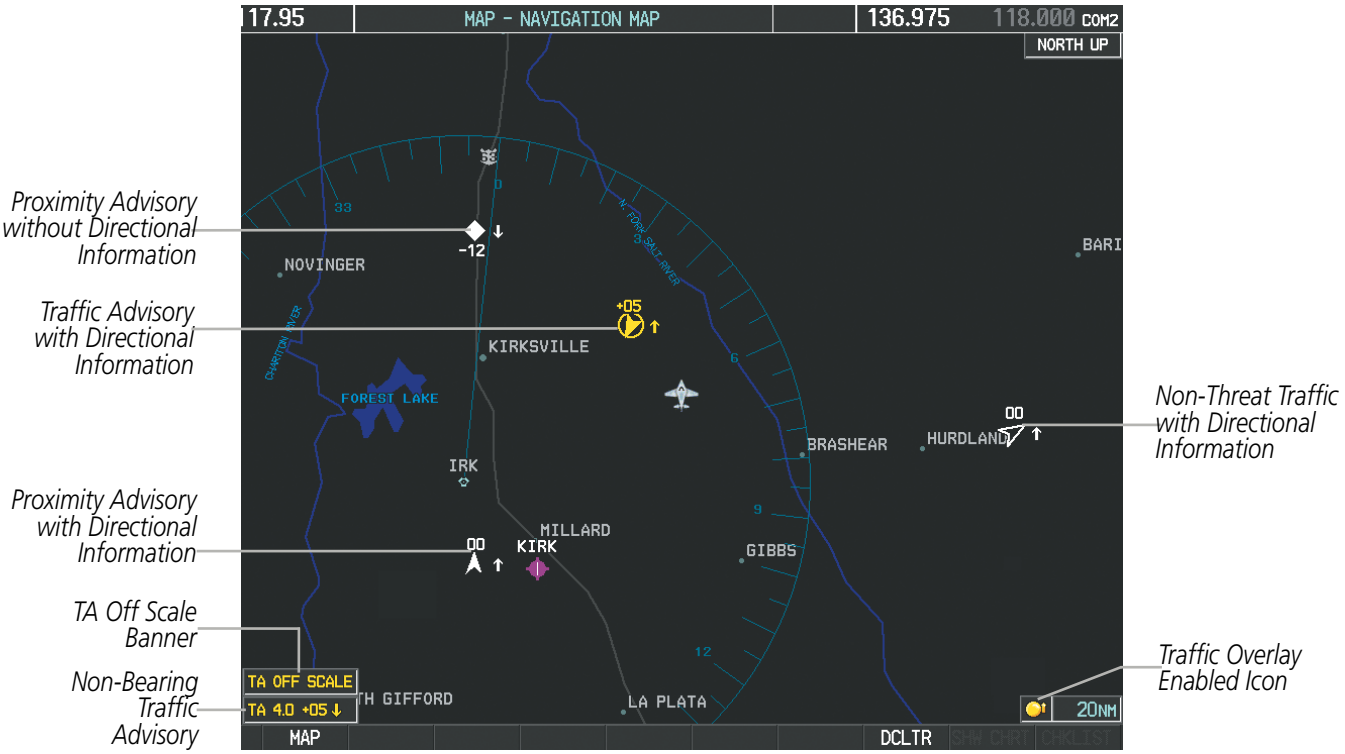


Figure 6-197 ADS-B Traffic on the Navigation Map Page

Customizing the traffic display on the Navigation Map Page:

1) Select the Navigation Map Page.
2) Press the **MENU** Key.
3) With Map Setup highlighted, press the **ENT** Key (Figure 6-198).
4) Turn the small **FMS** Knob to select the Traffic Group and press the **ENT** Key (Figure 6-199).
5) Turn the large **FMS** Knob or press the **ENT** Key to scroll through the selections (Figure 6-200).
   - TRAFFIC – Turns the display of traffic data on or off
   - TRAFFIC MODE – Selects the traffic mode for display; select from:
     - All Traffic - Displays all traffic
     - TA/PA - Displays Traffic Advisories and Proximity Advisories
     - TA ONLY - Displays Traffic Advisories only
   - TRAFFIC SMBL – Selects the maximum range at which traffic symbols are shown
   - TRAFFIC LBL – Selects the maximum range at which traffic labels are shown with the option to turn off
6) Turn the small **FMS** Knob to scroll through options (ON/OFF, range settings, etc.).
7) Press the **ENT** Key to select an option.
8) Press the **FMS** Knob or **CLR** Key to return to the Navigation Map Page.

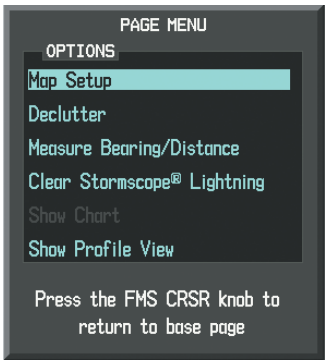


Figure 6-198 Navigation Map Page Menu



Figure 6-199 Navigation Map Page Setup Menu

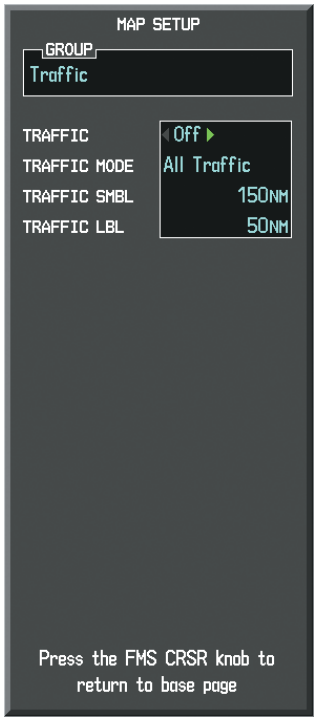


Figure 6-200 Navigation Map Page Setup Menu, Traffic Group

The Navigation Map Page Setup Menu also controls the display of traffic. The setup menu controls the map range settings. Traffic data symbols and labels can be decluttered from the display. If a map range larger than the map range setting is selected, the data is removed from the map. Maps besides the Traffic Map Page use settings based on those selected for the Navigation Map Page.

Traffic information can also be displayed on the PFD Inset Map by pressing the **INSET** Softkey. A traffic map will appear in heading up orientation. Traffic information can also be overlaid with navigation, topographic and optional data link weather information.

Displaying traffic information (PFD Inset Map):

1) Press the **INSET** Softkey.
2) Press the **TRAFFIC** Softkey to display traffic data on the inset map (TRFC-1).
3) Press the softkey again to display the traffic-only inset (TRFC-2).
4) Press the softkey again to remove traffic data.

SYSTEM STATUS

The traffic mode is annunciated in the upper left corner of the Traffic Map Page.

Mode	Traffic Mode Annunciation (Traffic Maps)	Traffic Map Center Banner Annunciation	Traffic Display Status Icon (Navigation Maps)
ADS-B System Test Initiated	ADS-B: TEST	TEST MODE	
ADS-B Operating in Airborne Mode	ADS-B: AIRB	ADS-B: AIRB	
ADS-B Operating in Surface Mode	ADS-B: SURF	ADS-B: SURF	
ABD-B Operating without own aircraft directional information	ADS-B: NO TRK/HDG	none	
ABD-B Traffic Off	ADS-B: OFF	ADS-B TRFC OFF	
ADS-B Traffic Not Available	ADS-B: N/A	ADS-B TRFC N/A	
ADS-B Failed*	ADS-B: FAIL	ADS-B TRFC FAIL	

** See Table 6-44 for additional failure annunciations*

Table 6-43 Traffic Modes

If the traffic unit fails, an annunciation as to the cause of the failure is shown in the center of the Traffic Map Page. During a failure condition, the Operating Mode cannot be selected.

Traffic Map Page Center Annunciation	Description
NO DATA	Data is not being received from the traffic unit
DATA FAILED	Data is being received from the traffic unit, but the unit is self-reporting a failure
ADS-B TRFC FAIL	Incorrect data format received from the traffic unit

Table 6-44 Traffic Failure Annunciations

The annunciations to indicate the status of traffic information appear in a banner at the lower left corner of maps on which traffic can be displayed.

Traffic Status Banner Annunciation	Description
TA OFF SCALE	A Traffic Advisory is outside the selected display range*. Annunciation is removed when traffic comes within the selected display range.
TA X.X ± XX ↕	System cannot determine bearing of Traffic Advisory**. Annunciation indicates distance in nm, altitude separation in hundreds of feet, and altitude trend arrow (climbing/descending).
TRFC FAIL	Traffic unit has failed (unit is self-reporting a failure or sending incorrectly formatted data)
NO TRFC DATA	Data is not being received from the traffic unit

*Shown as symbol on Traffic Map Page
**Shown in center of Traffic Map Page

Table 6-45 Traffic Status Annunciations

Additional information about the status of ADS-B traffic products is available on the AUX - ADS-B Status Page.

Viewing ADS-B Traffic Status:

1) Turn the large **FMS** Knob to select the AUX Page Group.
2) Turn the small **FMS** Knob to select the AUX - ADS-B Status Page.



Figure 6-201 ADS-B Traffic Status on ADS-B Status Page

ADS-B Status Page Item	Status Message	Description
Traffic Application Status: AIRBORNE (AIRB), SURFACE (SURF), AIRBORNE ALERTS (CSA)	ON	Traffic application is currently on. Required input data is available, and it meets performance requirements.
	AVAILABLE TO RUN	Traffic application is not currently active, but application is ready to run when condition(s) determine the application should be active. Required input data is available, and it meets performance requirements.
	NOT AVAILABLE	Traffic application is not available. Required input data is available, but it does not meet performance requirements.
	FAULT	Traffic application is not available. Required input data is not available or the application has failed.
	NOT CONFIGURED	Traffic application is not available, because it has not been configured. If this annunciation persists, the system should be serviced.
	----------	Traffic application status is invalid or unknown.
TIS-B/ADS-R Coverage	AVAILABLE	The system is receiving the ADS-R coverage from an FAA ground station.
	NOT AVAILABLE	The system is not receiving the ADS-R coverage from an FAA ground station.
	----------	ADS-R coverage is invalid or unknown.
GPS Status: GPS Source	External #1	The GDL 88 is using the #1 GPS receiver for the GPS position source.
	External #2	The GDL 88 is using the #2 GPS receiver for the GPS position source.
	---------	The GPS source is invalid or unknown.
Ground Uplink Status: Last uplink	Number of minutes, or '------'	Displays the number of minutes since the last uplink from a ground station occurred. If no uplink has been received, or the status is invalid, dashes appear instead of a number of minutes.

Table 6-46 AUX-ADS-B Status Page Messages for ADS-B Traffic

6.12 AVIDYNE TAS600 SERIES TRAFFIC

WARNING: *Do not rely solely upon the display of traffic information for collision avoidance maneuvering. The traffic display does not provide collision avoidance resolution advisories and does not under any circumstances or conditions relieve the pilot's responsibility to see and avoid other aircraft.*

WARNING: *Do not rely solely upon the display of traffic information to accurately depict all of the traffic within range of the aircraft. Due to lack of equipment, poor signal reception, and/or inaccurate information from aircraft or ground stations, traffic may be present that is not represented on the display.*

NOTE: *Refer to the Avidyne TAS600 Series Pilot's Operating Handbook for a detailed discussion about the traffic system.*

The optional TAS600 Series Traffic Advisory System (TAS) is designed to help in detection and avoidance of other aircraft. TAS uses an on-board interrogator-processor and an altitude reporting transponder for the air-to-air traffic data link.

TAS SYMBOLOGY

Traffic is displayed with the symbols shown below.

TAS Symbol	Description
	Non-Threat Traffic
	Proximity Advisory (PA)
	Traffic Advisory (TA)
	Traffic Advisory Off Scale

Table 6-47 TAS Symbol Description

A Non-threat Advisory, shown as an open white diamond, indicates that an intruding aircraft is at greater than ±1200 feet relative altitude or the distance is beyond five nm.

A Proximity Advisory (PA) indicates that the intruding aircraft is within ±1200 feet and is within a five nm range, but is still not considered a threat.

A Traffic Advisory (TA) alerts the crew to a potentially hazardous intruding aircraft. Closing rate, distance, and vertical separation meet TA criteria. A TA that is beyond the selected display map range is indicated on the traffic map by a half TA symbol at the edge of the traffic map at the relative bearing of the intruder.

DISPLAYING TRAFFIC INFORMATION

Traffic information is displayed on the following maps:

- PFD Inset Map
- Navigation Map Page
- Traffic Map Page
- Trip Planning Page
- Nearest Pages
- Active Flight Plan Page
- AUX - Video Page (optional)

Traffic information can also be displayed on the PFD when the Synthetic Vision Technology (SVT) system option is installed and enabled. See the Additional Features Section for details.

Displaying traffic on the Traffic Map Page:

1) Turn the large **FMS** Knob to select the Map Page Group.
2) Turn the small **FMS** Knob to select the Traffic Map Page.
3) Turn the **Joystick** clockwise to display a larger area or counter-clockwise to display a smaller area.



Figure 6-202 Traffic Map Page

The Traffic Map Page shows surrounding TAS traffic data in relation to the aircraft's current position and altitude, without basemap clutter. Aircraft orientation is always heading up unless there is no valid heading. Map range is adjustable with the **Joystick** from 2 to 24 nm, as indicated by the map range rings.

The traffic system mode and altitude display mode are annunciated in the upper left corner of the page

Displaying traffic information (maps other than the Traffic Map Page):

1) Press the **MAP** Softkey.
2) Press the **TRAFFIC** Softkey to display traffic data.

When traffic is selected on maps other than the Traffic Map Page, a traffic icon is shown to indicate TAS is enabled for display.

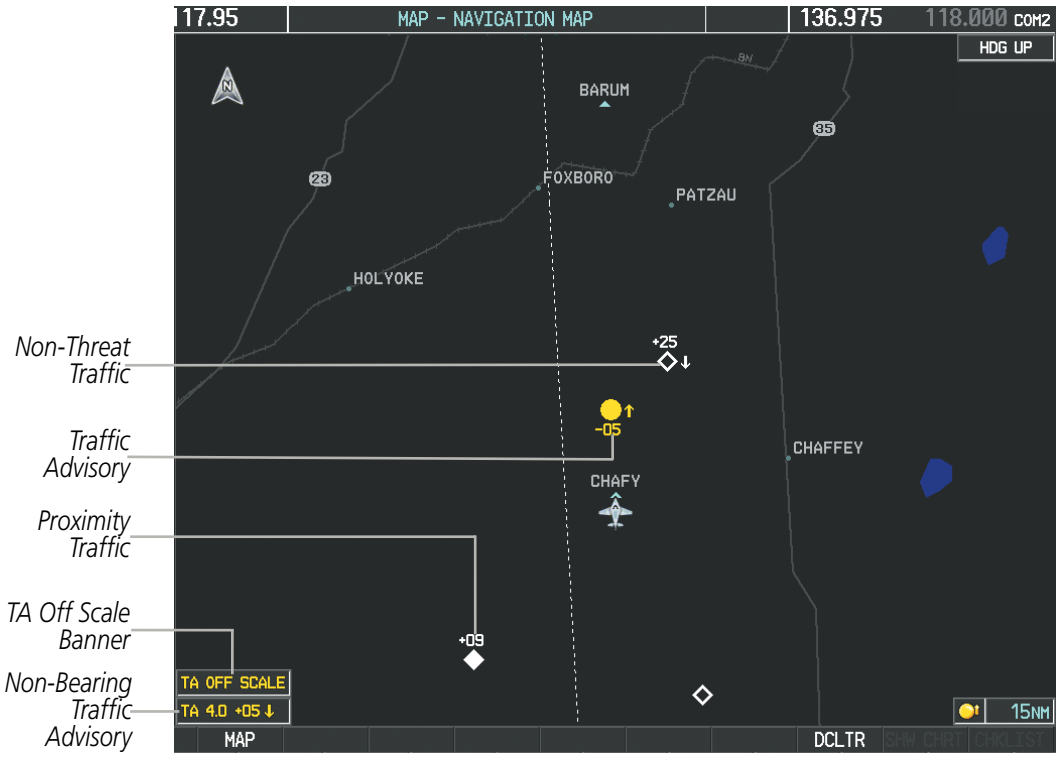


Figure 6-203 TAS Traffic on Navigation Map

Displaying traffic information (PFD Inset Map):

1) Press the **INSET** Softkey.
2) Press the **TRAFFIC** Softkey to display traffic data on the inset map (TRFC-1).
3) Press the softkey again to display the traffic-only inset (TRFC-2).
4) Press the softkey again to remove traffic data.

ALTITUDE DISPLAY

Changing the altitude display mode:

1) On the Traffic Page, press the **ALT MODE** Softkey.
2) Press one of the following softkeys:
   - **ABOVE:** Displays non-threat and proximity traffic from 9900 feet above the aircraft to 2700 feet below the aircraft. Typically used during climb phase of flight.

- **NORMAL:** Displays non-threat and proximity traffic from 2700 feet above the aircraft to 2700 feet below the aircraft. Typically used during enroute phase of flight.
- **BELOW:** Displays non-threat and proximity traffic from 2700 feet above the aircraft to 9900 feet below the aircraft. Typically used during descent phase of flight.
- **UNREST** (unrestricted)**:** All traffic is displayed from 9900 feet above and 9900 feet below the aircraft.

3) To return to the Traffic Page, press the **BACK** Softkey.

Or:

1) Press the **MENU** Key.
2) Turn the small **FMS** Knob to select one of the following:
   - **BELOW**
   - **NORMAL**
   - **ABOVE**
   - **UNREST** (unrestricted)
3) Press the **ENT** Softkey.

TRAFFIC MAP PAGE DISPLAY RANGE

The display range on the Traffic Map Page can be changed at any time. Map range is adjustable with the **Joystick** from 2 to 24 nm, as indicated by the map range rings.

Changing the display range on the Traffic Page:

1) Turn the **Joystick**.
2) The following range options are available:
   - 2 nm
   - 2 and 6 nm
   - 6 and 12 nm
   - 12 and 24 nm

The Navigation Map Page Setup Menu also controls the display of traffic. The setup menu controls the map range settings. Traffic data symbols and labels can be decluttered from the display. If a map range larger than the map range setting is selected, the data is removed from the map. Maps besides the Traffic Map Page use settings based on those selected for the Navigation Map Page.

Customizing the traffic display on the Navigation Map Page:

1) Select the Navigation Map Page.
2) Press the **MENU** Key.
3) With Map Setup highlighted, press the **ENT** Key (Figure 6-204).
4) Turn the small **FMS** Knob to select the Traffic Group and press the **ENT** Key (Figure 6-205).

5) Turn the large **FMS** Knob or press the **ENT** Key to scroll through the selections (Figure 6-206).
   - TRAFFIC – Turns the display of traffic data on or off
   - TRAFFIC MODE – Selects the traffic mode for display; select from:
     - All Traffic - Displays all traffic
     - TA/PA - Displays Traffic Alerts and Proximity Advisories
     - TA Only - Displays Traffic Alerts only
   - TRAFFIC SMBL – Selects the maximum range at which traffic symbols are shown
   - TRAFFIC LBL – Selects the maximum range at which traffic labels are shown with the option to turn off
6) Turn the small **FMS** Knob to scroll through options (ON/OFF, range settings, etc.).
7) Press the **ENT** Key to select an option.
8) Press the **FMS** Knob or **CLR** Key to return to the Navigation Map Page.

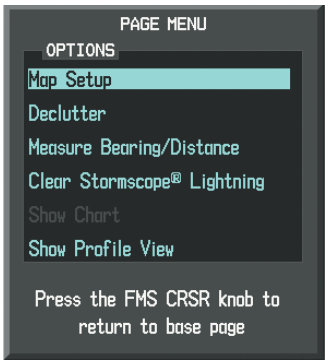


Figure 6-204 Navigation Map Page Menu



Figure 6-205 Navigation Map Page Setup Menu

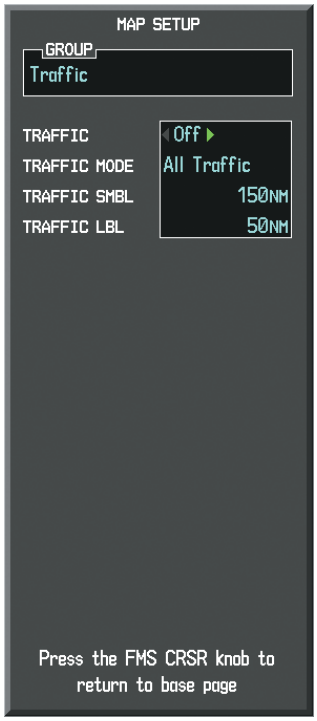


Figure 6-206 Navigation Map Page Setup Menu, Traffic Group

TAS ALERTS

NOTE: *Refer to the Avidyne TAS600 Series Pilot's Operating Handbook for information on alerts generated by the TAS equipment.*

When the number of TAs on the Traffic Map Page increases from one scan to the next, the following occur:

- The traffic system generates a voice alert.
- A 'TRAFFIC' Annunciation appears at the top right of the airspeed on the PFD, flashing for 5 seconds and remaining displayed until no TAs are detected in the area.
- The PFD Inset Map is automatically displayed with TA traffic.



Figure 6-207 Traffic Annunciation (PFD)

TAS VOICE ALERTS

To listen to an update of Traffic Advisories press the **MUTE** Softkey twice.

Muting the TAS voice alert in progress:

1) Select the Traffic Map Page.
2) Press the **MUTE** Softkey while the voice alert is playing. Subsequent voice alerts will be heard.

SYSTEM STATUS

NOTE: *Refer to the Avidyne TAS600 Series Pilot's Operating Handbook for information on the operating mode.*

The traffic mode is annunciated in the upper left corner of the Traffic Map Page.

Traffic Mode	Traffic Mode Annunciation (Traffic Map Page)	Traffic Display Status Icon (Other Maps)
TAS Operating	OPERATING	
TAS Failed*	FAIL	

** See Table 6-49 for additional failure annunciations*

Table 6-48 TAS Modes

If the unit fails, an annunciation as to the cause of the failure is shown in the center of the Traffic Map Page.

Traffic Map Page Annunciation	Description
NO DATA	Data is not being received from the TAS unit
DATA FAILED	Data is being received from the TAS unit, but the unit is self-reporting a failure
FAILED	Incorrect data format received from the TAS unit

Table 6-49 TAS Failure Annunciations

The annunciations to indicate the status of traffic information appear in a banner at the lower left corner of maps on which traffic can be displayed.

Traffic Status Banner Annunciation	Description
TA OFF SCALE	A Traffic Advisory is outside the selected display range* Annunciation is removed when traffic comes within the selected display range
TA X.X ± XX ↕	System cannot determine bearing of Traffic Advisory** Annunciation indicates distance in nm, altitude separation in hundreds of feet, and altitude trend arrow (climbing/descending)
TRFC FAIL	TAS unit has failed (unit is self-reporting a failure or sending incorrectly formatted data)
NO TRFC DATA	Data is not being received from the TAS unit

**Shown as symbol on Traffic Map Page*
***Shown in center of Traffic Map Page*

Table 6-50 TAS Traffic Status Annunciations

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SECTION 7 AUTOMATIC FLIGHT CONTROL SYSTEM

The G900X is capable of interfacing with the following third party Automatic Flight Control Systems (AFCS):

- S-TEC System Fifty Five X
- TruTrak Sorcerer
- TruTrak DFC-series
- TruTrak DigiFlight-II-series
- TruTrak Pictorial Pilot
- TruTrak Digitrak
- TruTrak ADI
- Trio Avionics EZ Pilot

Refer to the installed autopilot manual for operational instructions.

7.1 GFC 7X (LANCAIR EVOLUTION ONLY)

NOTE: *The approved Aircraft Flight Manual Supplement (AFMS) always supersedes the information in this Pilot's Guide.*

NOTE: *A failure of the primary (#1) Integrated Avionics Unit (IAU) results in loss of the flight director. Any IAU failure results in loss of the autopilot and manual electric trim.*

The GFC 7X is a digital Automatic Flight Control System (AFCS), fully integrated within the G900X System avionics architecture. The System Overview section provides a block diagram (Figure 1-1) to support this system description.

The GFC 7X AFCS can be divided into these main operating functions:

- **Flight Director (FD)** — Flight director operation takes place within the primary (#1) IAU. Flight director commands are displayed on the PFD. The flight director provides:
  - Command Bars showing pitch/roll guidance
  - Pitch/roll mode selection and processing
  - Autopilot communication

- **Autopilot (AP) —** Autopilot operation occurs within the pitch, roll, and pitch trim servo and provides servo monitoring and automatic flight control in response to flight director steering commands, AHRS attitude and rate information, and airspeed.
- **Yaw Damper (YD**) **—** The yaw servo is self-monitoring and provides Dutch roll damping and turn coordination in response to yaw rate, roll angle, vertical acceleration, and airspeed.
- **Manual Electric Trim (MET) —** The pitch trim servo provides manual electric trim capability when the autopilot is not engaged.

7.2 AFCS CONTROLS

The following dedicated AFCS keys are located on the bezel of the MFD:

1	**AP Key**	Engages/disengages the autopilot
2	**FD Key**	Activates/deactivates the flight director only Pressing once turns on the flight director in the default pitch and roll modes. Pressing again deactivates the flight director and removes the Command Bars. If the autopilot is engaged, the key is disabled.
3	**NAV Key**	Selects/deselects Navigation Mode
4	**ALT Key**	Selects/deselects Altitude Hold Mode
5	**VS Key**	Selects/deselects Vertical Speed Mode
6	**FLC Key**	Selects/deselects Flight Level Change Mode
7	**YD Key**	Engages/disengages the yaw damper
8	**HDG Key**	Selects/deselects Heading Select Mode
9	**APR Key**	Selects/deselects Approach Mode
10	**VNV Key**	Selects/deselects Vertical Path Tracking Mode for Vertical Navigation flight control
11	**NOSE UP/NOSE DN Keys**	Control the mode reference in Pitch Hold, Vertical Speed, and Flight Level Change modes

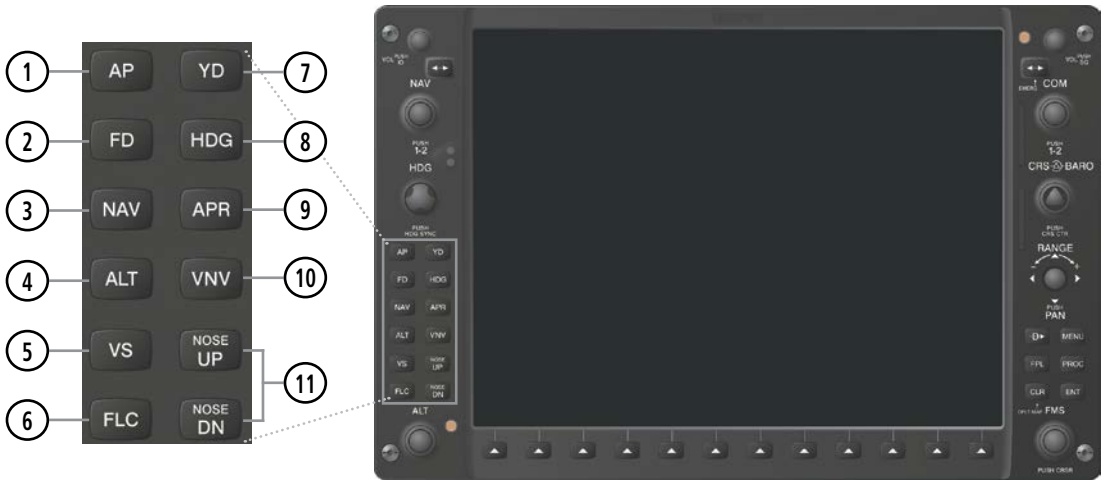


Figure 7-1 Dedicated MFD AFCS Controls (GDU 1045)

The following AFCS controls are located in the cockpit separately from the MFD:

AP DISC Switch (Autopilot Disconnect)

Disengages the autopilot and interrupts pitch trim operation

This switch may be used to mute the aural autopilot disconnect alert.

The **AP DISC** Switch is located on each control stick.

CWS Button (Control Wheel Steering)

While pressed, allows manual control of the aircraft while the autopilot is engaged and synchronizes the flight director's Command Bars with the current aircraft pitch (if not in Glideslope Mode) and roll (if in Roll Hold Mode)

Upon release of the **CWS** Button, the flight director may establish new reference points, depending on the current pitch and roll modes. CWS operation details are discussed in the flight director modes section.

The **CWS** Button is located on the top of the left control stick.

GA Button (Go Around)

Disengages the autopilot and selects flight director Go Around Mode

If an approach procedure is loaded this switch also activates the missed approach when the selected navigation source is GPS or when the navigation source is VOR/LOC and a valid frequency has been tuned.

The **GA** Button is located near the throttle handle.

AP TRIM Switch (Autopilot Trim)

Used to command manual electric trim (MET)

The **AP TRIM** Switch is located on the left control stick.

7.3 FLIGHT DIRECTOR OPERATION

The flight director function provides pitch and roll commands to the AFCS and displays them on the PFD. With the flight director activated, the aircraft can be hand-flown to follow the path shown by the Command Bars. Maximum commanded pitch (-15°/+20°) and roll (22°) angles, vertical acceleration, and roll rate are limited to values established during AFCS certification. The flight director also provides commands to the autopilot.

ACTIVATING THE FLIGHT DIRECTOR

An initial press of a key listed in Table 7-1 (when the flight director is not active) activates the flight director in the listed modes. The flight director may be turned off and the Command Bars removed from the display by pressing the **FD** Key again. The **FD** Key is disabled when the autopilot is engaged.

Control Pressed	Modes Selected			
	Lateral		Vertical	
FD Key	Roll Hold (default)	ROL	Pitch Hold (default)	PIT
AP Key	Roll Hold (default)	ROL	Pitch Hold (default)	PIT
CWS Button	Roll Hold (default)	ROL	Pitch Hold (default)	PIT
GA Button	Takeoff (on ground) Go Around (in air)	TO GA	Takeoff (on ground) Go Around (in air)	TO GA
ALT Key	Roll Hold (default)	ROL	Altitude Hold	ALT
VS Key	Roll Hold (default)	ROL	Vertical Speed	VS
VNV Key	Roll Hold (default)	ROL	Vertical Path Tracking*	VPTH
NAV Key	Navigation**	GPS VOR LOC BC	Pitch Hold (default)	PIT
APR Key	Approach**	GPS VOR LOC	Pitch Hold (default)	PIT
HDG Key	Heading Select	HDG	Pitch Hold (default)	PIT

Valid VNV flight plan must be entered before* **VNV *Key press activates flight director.*

The selected navigation receiver must have a valid VOR or LOC signal or active GPS course before* ***NAV *or* ***APR*** *Key press activates flight director.*

Table 7-1 Flight Director Activation

AFCS STATUS BOX

Flight director mode annunciations are displayed on the PFD when the flight director is active. Autopilot status is displayed in the center of the AFCS Status Box. Lateral flight director modes are displayed on the left and vertical on the right. Armed modes are annunciated in white and active in green.

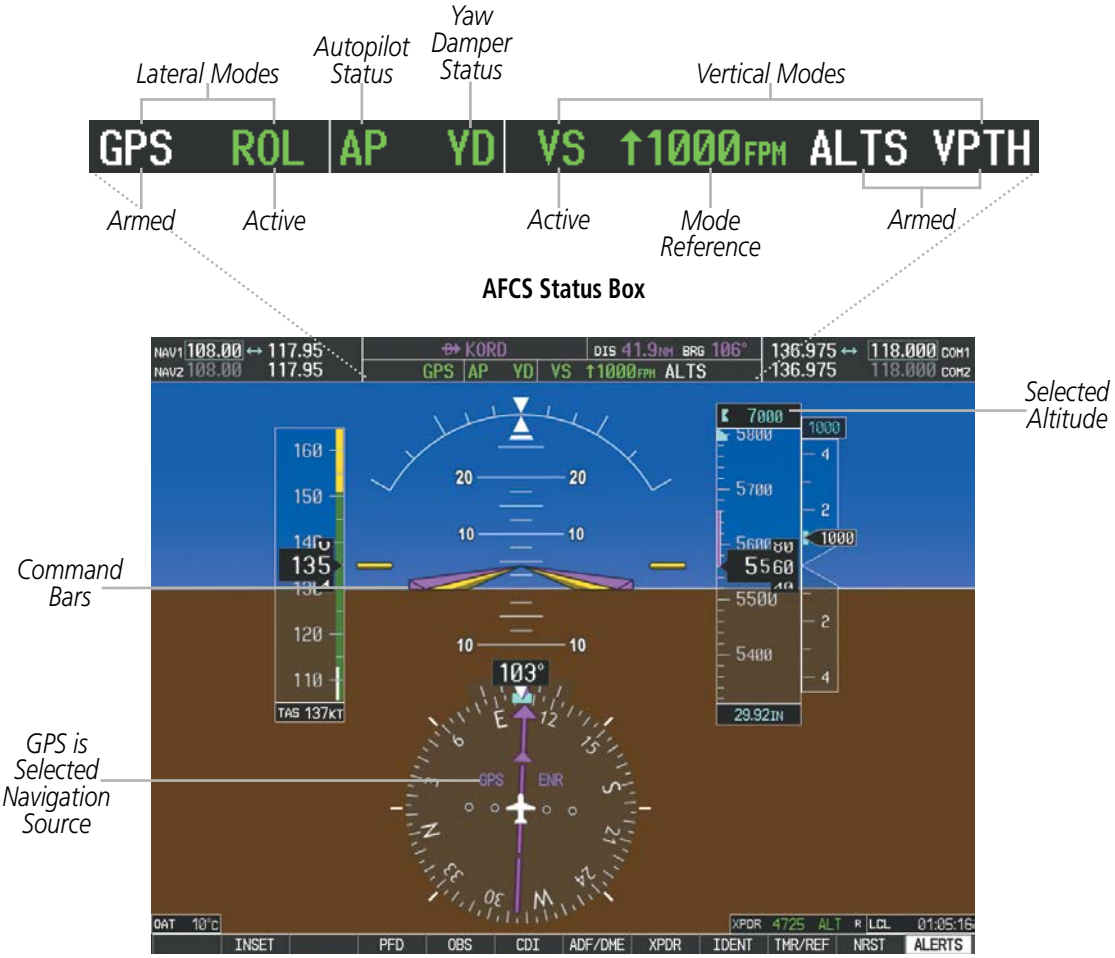


Figure 7-2 PFD AFCS Display

COMMAND BARS

Upon activation of the flight director, Command Bars are displayed on the PFD as a single magenta cue. The Command Bars move together vertically to indicate pitch commands and bank left or right to indicate roll commands. The Command Bars do not override the aircraft symbol.

If the attitude information sent to the flight director becomes invalid or unavailable, the Command Bars are removed from the display. The flight director Command Bars also disappear if either pitch exceeds +30°/-20° or bank exceeds 65°.

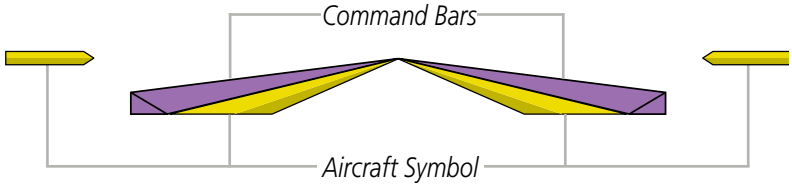


Figure 7-3 Command Bars

FLIGHT DIRECTOR MODES

Flight director modes are normally selected independently for the pitch and roll axes. Unless otherwise specified, all mode keys are alternate action (i.e., press on, press off). In the absence of specific mode selection, the flight director reverts to the default pitch and/or roll mode(s).

Armed modes are annunciated in white and active in green in the AFCS Status Box. Under normal operation, when the control for the active flight director mode is pressed, the flight director reverts to the default mode(s) for the axis(es). Automatic transition from armed to active mode is indicated by the white armed mode annunciation moving to the green active mode field and flashing for 10 seconds.

If the information required to compute a flight director mode becomes invalid or unavailable, the flight director automatically reverts to the default mode for that axis. A flashing yellow mode annunciation and annunciator light indicate loss of sensor (ADC) or navigation data (VOR, LOC, GPS, VNV, SBAS) required to compute commands. When such a loss occurs, the system automatically begins to roll the wings level (enters Roll Hold Mode) or maintain the pitch angle (enters Pitch Hold Mode), depending on the affected axis. The flashing annunciation stops when the affected mode key is pressed or another mode for the axis is selected. If after 10 seconds no action is taken, the flashing annunciation stops.



Figure 7-4 Loss of VOR Signal

The flight director is automatically disabled if the attitude information required to compute the default flight director modes becomes invalid or unavailable.

7.4 AFCS MODES

The AFCS is cabable of operating in a variety of independent Lateral Modes, Vertical Modes and Combonation of both the Lateral and Vertical Modes.

VERTICAL MODES (PIT, ALT, VS, FLC)

Table 7-2 lists the vertical modes that do not operate in conjuntion with a Lateral Mode with their corresponding controls and annunciations. The mode reference is displayed next to the active mode annunciation for Altitude Hold, Vertical Speed, and Flight Level Change modes. The **NOSE UP/NOSE DN** Keys can be used to change the vertical mode reference while operating under Pitch Hold, Vertical Speed, or Flight Level Change Mode. Increments of change and acceptable ranges of values for each of these references using the **NOSE UP/NOSE DN** Keys are also listed in the table.

Vertical Mode	Description	Control	Annunciation		Reference Range	Reference Change Increment
Pitch Hold	Holds aircraft pitch attitude; may be used to climb/descend to the Selected Altitude	(default)	PIT		-15° to +20°	0.5°
Selected Altitude Capture	Captures the Selected Altitude	*	ALTS			
Altitude Hold	Holds current Altitude Reference	**ALT** Key	ALT	nnnnn FT		
Vertical Speed	Holds aircraft vertical speed; may be used to climb/descend to the Selected Altitude	**VS** Key	VS	nnnn FPM	-3000 to +1500 fpm	100 fpm
Flight Level Change	Holds aircraft airspeed while aircraft is climbing/descending to the Selected Altitude	**FLC** Key	FLC	nnn KT	90 to 180 kt	1 kt

* *ALTS is armed automatically when Selected Altitude is to be captured instead of the VNV Target Altitude.*

Table 7-2 Flight Director Vertical Modes

PITCH HOLD MODE (PIT)

When the flight director is activated (the **FD** Key is pressed), Pitch Hold Mode is selected by default. Pitch Hold Mode is indicated as the active pitch mode by the green annunciation 'PIT'. This mode may be used for climb or descent to the Selected Altitude (shown above the Altimeter), since Selected Altitude Capture Mode is automatically armed when Pitch Hold Mode is activated.

In Pitch Hold Mode, the flight director maintains a constant pitch attitude, the pitch reference. The pitch reference is set to the aircraft pitch attitude at the moment of mode selection. If the aircraft pitch attitude exceeds the flight director pitch command limitations, the flight director commands a pitch angle equal to the nose-up/down limit.

Changing the Pitch Reference

When operating in Pitch Hold Mode, the pitch reference can be adjusted by:

- Using the **NOSE UP/NOSE DN** Keys
- Pressing the **CWS** Button, hand-flying the aircraft to establish a new pitch reference, then releasing the **CWS** Button

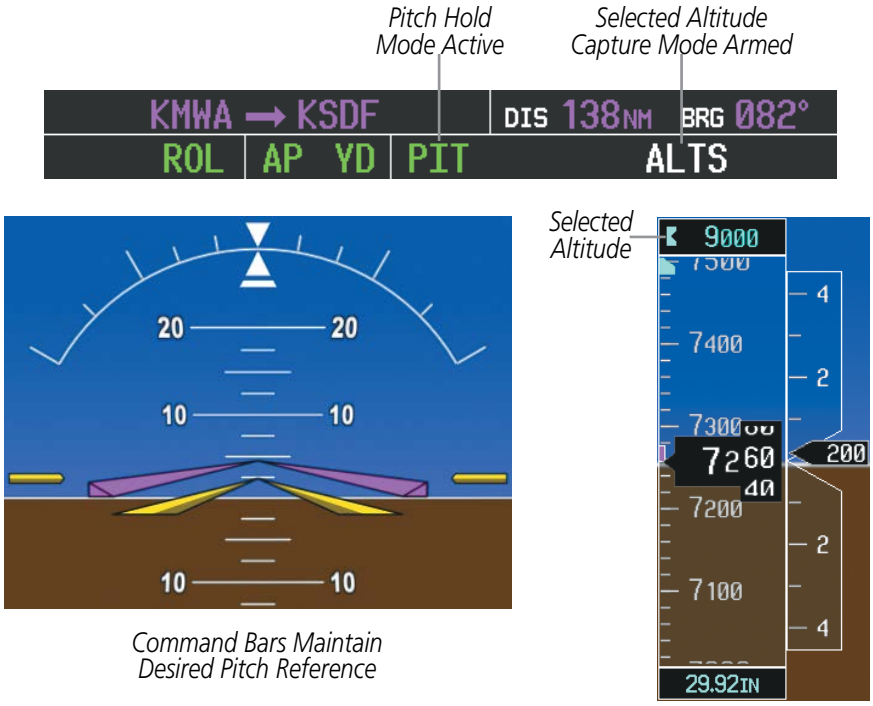


Figure 7-5 Pitch Hold Mode

SELECTED ALTITUDE CAPTURE MODE (ALTS)

Selected Altitude Capture Mode is automatically armed with activation of the following modes:

- Pitch Hold
- Vertical Speed
- Flight Level Change
- Go Around
- Vertical Path Tracking (if the Selected Altitude is to be captured instead of the VNV Target Altitude)

The white 'ALTS' annunciation indicates Selected Altitude Capture Mode is armed (see Figure 7-5 for example). The **ALT** Knob is used to set the Selected Altitude (shown above the Altimeter) until Selected Altitude Capture Mode becomes active.

As the aircraft nears the Selected Altitude, the flight director automatically transitions to Selected Altitude Capture Mode with Altitude Hold Mode armed (Figure 7-6). This automatic transition is indicated by the green 'ALTS' annunciation flashing for up to 10 seconds and the appearance of the white 'ALT" annunciation. The Selected Altitude is shown as the Altitude Reference beside the 'ALTS' annunciation.

At 50 feet from the Selected Altitude, the flight director automatically transitions from Selected Altitude Capture to Altitude Hold Mode and holds the Selected Altitude (shown as the Altitude Reference). As Altitude Hold Mode becomes active, the white 'ALT' annunciation moves to the active pitch mode field and flashes green for 10 seconds to indicate the automatic transition.

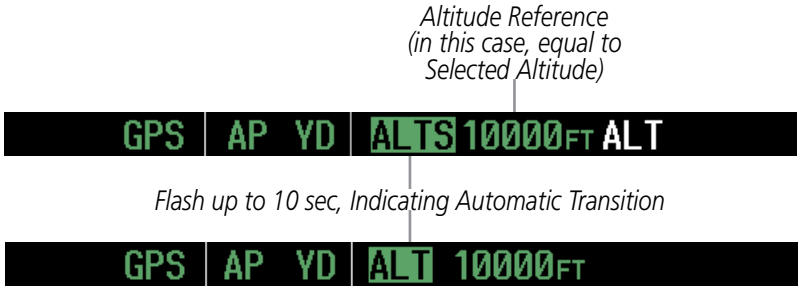


Figure 7-6 Automatic Mode Transitions During Altitude Capture

Changing the Selected Altitude

NOTE: *Pressing the **CWS** Button while in Selected Altitude Capture Mode does not cancel the mode.*

Use of the **ALT** Knob to change the Selected Altitude while Selected Altitude Capture Mode is active causes the flight director to revert to Pitch Hold Mode with Selected Altitude Capture Mode armed for the new Selected Altitude.

ALTITUDE HOLD MODE (ALT)

Altitude Hold Mode can be activated by pressing the **ALT** Key; the flight director maintains the current aircraft altitude (to the nearest 10 feet) as the Altitude Reference. The flight director's Altitude Reference, shown in the AFCS Status Box, is independent of the Selected Altitude, displayed above the Altimeter. Altitude Hold Mode active is indicated by a green 'ALT' annunciation in the AFCS Status Box.

Altitude Hold Mode is automatically armed when the flight director is in Selected Altitude Capture Mode (see Figure 7-6). Selected Altitude Capture Mode automatically transitions to Altitude Hold Mode when the altitude error is less than 50 feet. In this case, the Selected Altitude becomes the flight director's Altitude Reference.

Changing the Altitude Reference

NOTE: *Turning the **ALT** Knob while in Altitude Hold Mode changes the Selected Altitude, but not the flight director's Altitude Reference, and does not cancel the mode.*

With the **CWS** Button depressed, the aircraft can be hand-flown to a new Altitude Reference. When the **CWS** Button is released at the desired altitude, the new altitude is established as the Altitude Reference.

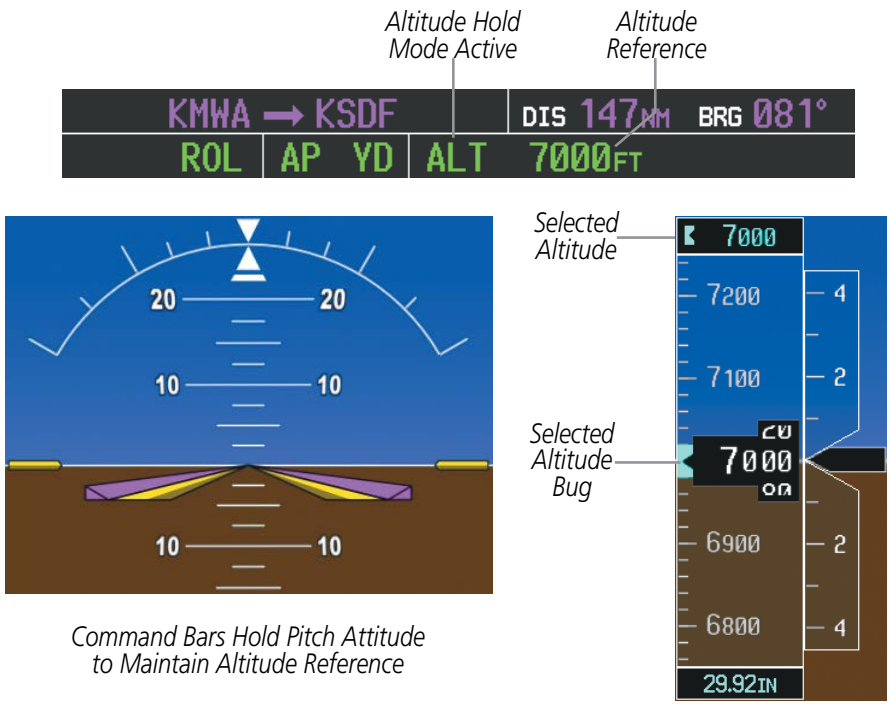


Figure 7-7 Altitude Hold Mode

VERTICAL SPEED MODE (VS)

In Vertical Speed Mode, the flight director acquires and maintains a Vertical Speed Reference. Current aircraft vertical speed (to the nearest 100 fpm) becomes the Vertical Speed Reference at the moment of Vertical Speed Mode activation. This mode may be used for climb or descent to the Selected Altitude (shown above the Altimeter) since Selected Altitude Capture Mode is automatically armed when Vertical Speed Mode is selected.

When Vertical Speed Mode is activated by pressing the **VS** Key, 'VS' is annunciated in green in the AFCS Status Box along with the Vertical Speed Reference. The Vertical Speed Reference is also displayed above the Vertical Speed Indicator. A Vertical Speed Reference Bug corresponding to the Vertical Speed Reference is shown on the indicator.

Changing the Vertical Speed Reference

The Vertical Speed Reference (shown both in the AFCS Status Box and above the Vertical Speed Indicator) may be changed by:

- Using the **NOSE UP/NOSE DN** Keys
- Pressing the **CWS** Button, hand-flying the aircraft to attain a new Vertical Speed Reference, then releasing the **CWS** Button

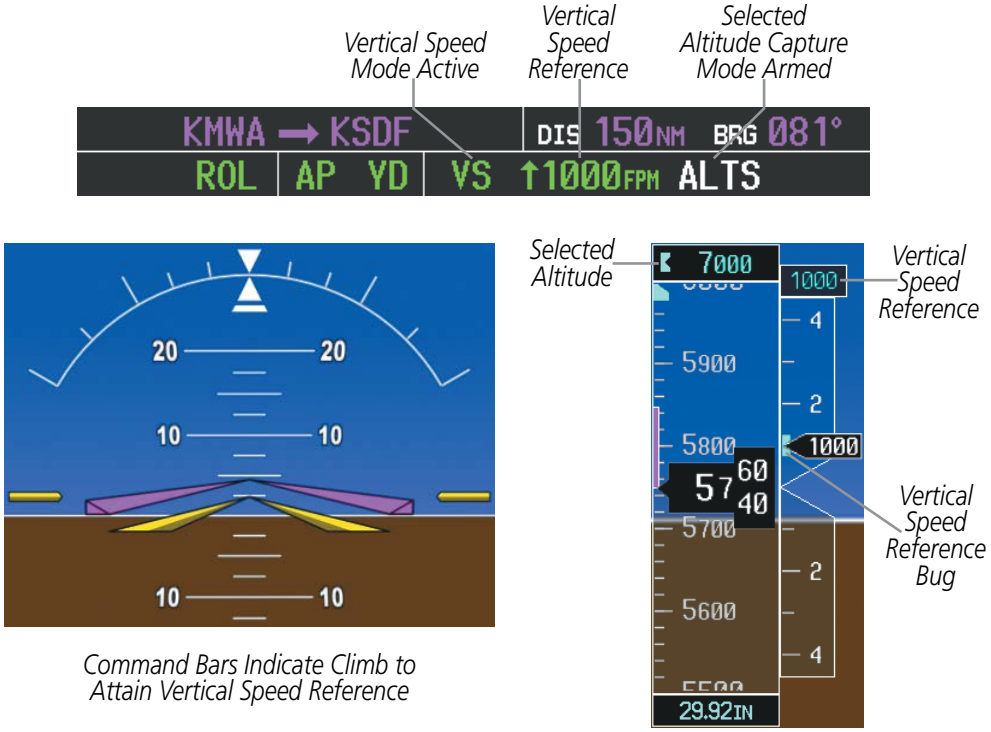


Figure 7-8 Vertical Speed Hold Mode

FLIGHT LEVEL CHANGE MODE (FLC)

NOTE: *The Selected Altitude should be set before selecting Flight Level Change Mode.*

Flight Level Change Mode is selected by pressing the **FLC** Key. This mode acquires and maintains the Airspeed Reference while climbing or descending to the Selected Altitude (shown above the Altimeter). When Flight Level Change Mode is active, the flight director continuously monitors Selected Altitude, airspeed, and altitude.

The Airspeed Reference is set to the current airspeed upon mode activation. Flight Level Change Mode is indicated by a green 'FLC' annunciation beside the Airspeed Reference in the AFCS Status Box. The Airspeed Reference is also displayed directly above the Airspeed Indicator, along with a bug corresponding to the Airspeed Reference along the tape.

Engine power must be adjusted to allow the autopilot to fly the aircraft at a pitch attitude corresponding to the desired flight profile (climb or descent) while maintaining the Airspeed Reference. The flight director maintains the current altitude until either engine power or the Airspeed Reference are adjusted and does not allow the aircraft to climb or descend away from the Selected Altitude.

Changing the Airspeed Reference

The Airspeed Reference (shown in both the AFCS Status Box and above the Airspeed Indicator) may be adjusted by:

- Using the **NOSE UP/NOSE DN** Keys
- Pressing the **CWS** Button, hand-flying the aircraft to a new airspeed, then releasing the **CWS** Button to establish the new Airspeed Reference

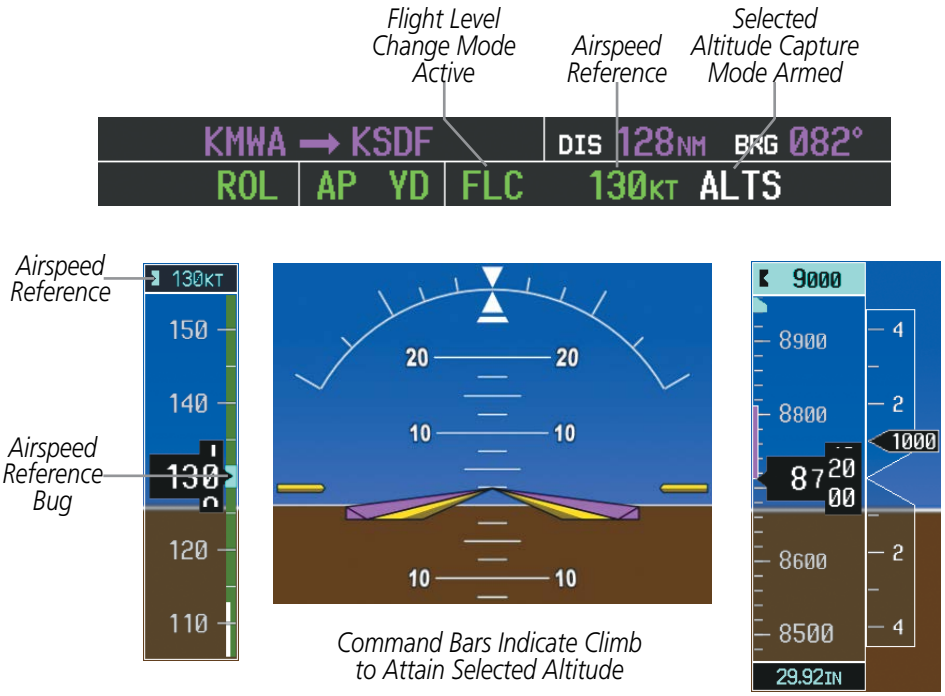


Figure 7-9 Flight Level Change Mode (IAS)

LATERAL MODES

Table 7-3 lists the lateral modes that do not operate in conjunction with a Vertical Mode with their corresponding controls and annunciations.

Lateral Mode	Description	Control	Annunciation	Maximum Roll Command Limit
Roll Hold	Holds the current aircraft roll attitude or rolls the wings level, depending on the commanded bank angle	(default)	ROL	25º
Heading Select	Captures and tracks the Selected Heading	**HDG** Key	HDG	25º
Navigation, GPS	Captures and tracks the selected navigation source (GPS, VOR, LOC)	**NAV** Key	GPS	25º
Navigation, VOR/LOC Enroute Capture/ Track			VOR	25º Capture 10º Track

Table 7-3 Flight Director Lateral Modes

The **CWS** Button does not change lateral references for Heading Select, Navigation, Backcourse, or Approach modes. The autopilot guides the aircraft back to the Selected Heading/Course upon release of the **CWS** Button.

ROLL HOLD MODE (ROL)

NOTE: *If Roll Hold Mode is activated as a result of a mode reversion, the flight director rolls the wings level.*

When the flight director is activated, Roll Hold Mode is selected by default. This mode is annunciated as 'ROL' in the AFCS Status Box. The current aircraft bank angle is held, subject to the bank angle conditions listed in Table 7-4.



Figure 7-10 Roll Hold Mode Annunciation

Bank Angle	Flight Director Response
< 6°	Rolls wings level
6 to 25°	Maintains current aircraft roll attitude
> 25°	Limits bank to 25°

Table 7-4 Roll Hold Mode Responses

CHANGING THE ROLL REFERENCE

The roll reference can be changed by pressing the **CWS** Button, establishing the desired bank angle, then releasing the **CWS** Button.

HEADING SELECT MODE (HDG)

Heading Select Mode is activated by pressing the **HDG** Key. Heading Select Mode acquires and maintains the Selected Heading. The Selected Heading is shown by a light blue bug on the HSI and in the box to the upper left of the HSI.

CHANGING THE SELECTED HEADING

NOTE: *Pressing the **HDG** Knob synchronizes the Selected Heading to the current heading.*

The Selected Heading is adjusted using the **HDG** Knob. Pressing the **CWS** Button and hand-flying the aircraft does not change the Selected Heading. The autopilot guides the aircraft back to the Selected Heading upon release of the **CWS** Button.

Turns are commanded in the same direction as Selected Heading Bug movement, even if the bug is turned more than 180° from the present heading (e.g., a 270° turn to the right). However, Selected Heading changes of more than 340° at a time result in turn reversals.

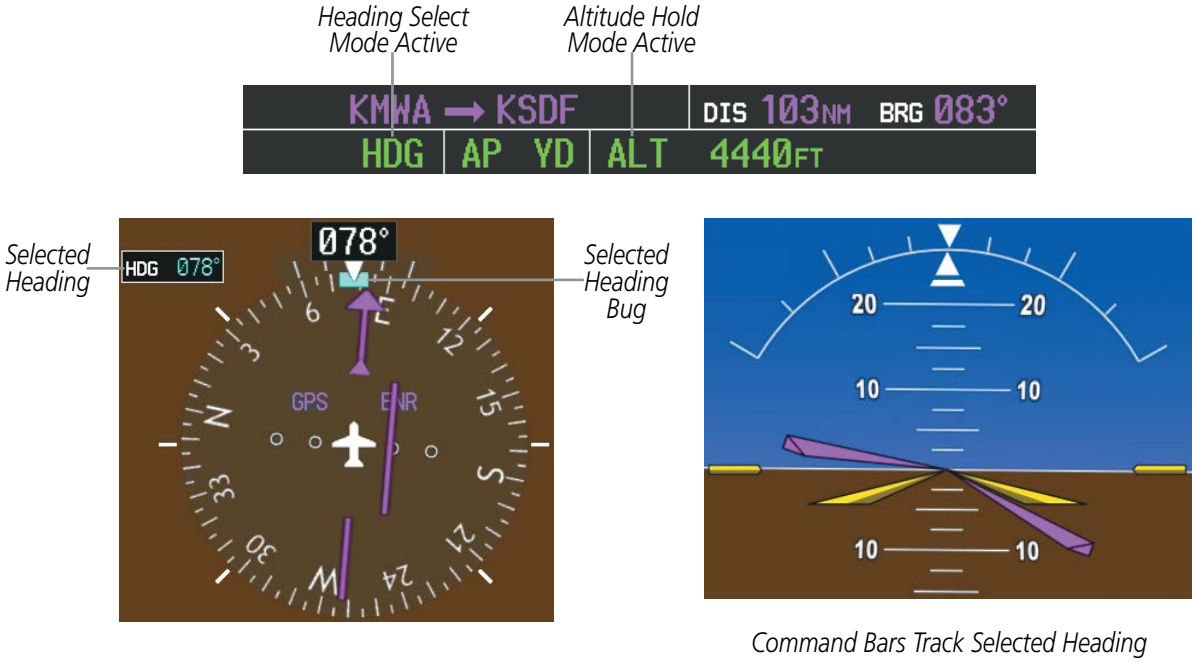


Figure 7-11 Heading Select Mode

NAVIGATION MODES (GPS, VOR, LOC, BC)

NOTE: *The selected navigation receiver must have a valid VOR or LOC signal or active GPS course for the flight director to enter Navigation Mode.*

NOTE: *When intercepting a flight plan leg, the flight director gives commands to capture the active leg at approximately a 45° angle to the track between the waypoints defining the active leg. The flight director does not give commands fly to the starting waypoint of the active leg.*

Pressing the **NAV** Key selects Navigation Mode. Navigation Mode acquires and tracks the selected navigation source (GPS, VOR, LOC). The flight director follows GPS roll steering commands when GPS is the selected navigation source. When the navigation source is VOR or LOC, the flight director creates roll steering commands from the Selected Course and deviation. Navigation Mode can also be used to fly non-precision GPS and LOC approaches where glideslope capture is not required.

Backcourse Navigation Mode is selected when the localizer front course is greater than 105° from the aircraft heading. Backcourse Navigation Mode captures and tracks a localizer signal in the backcourse direction. The annunciation 'BC' in the AFCS Status Box indicates Backcourse Navigation Mode.

If the Course Deviation Indicator (CDI) shows greater than one dot when the **NAV** Key is pressed, the selected mode is armed. If the CDI is less than one dot, Navigation Mode is automatically captured when the **NAV** Key is pressed. The armed annunciation appears in white to the left of the active roll mode.



Figure 7-12 GPS Navigation Mode Armed

When the CDI has automatically switched from GPS to LOC during a LOC/ILS approach, GPS Navigation Mode remains active, providing GPS steering guidance until the localizer signal is captured. LOC Navigation Mode is armed when the automatic navigation source switch takes place. If the **APR** Key is pressed prior to the automatic navigation source switch, LOC Navigation Mode is armed.

If Navigation Mode is active and either of the following occur, the flight director reverts to Roll Hold Mode (wings rolled level):

- Different VOR tuned while in VOR Navigation Mode (VOR Navigation Mode reverts to armed)
- Navigation source manually switched (with the **CDI** Softkey)
- During a LOC/ILS approach the FAF is crossed while in GPS Navigation Mode after the automatic navigation source switch from GPS to LOC

CHANGING THE SELECTED COURSE

The Selected Course is controlled using the **CRS** Knob (while in VOR, LOC, or OBS Mode). Pressing the **CWS** Button and hand-flying the aircraft does not change the Selected Course while in Navigation Mode. The autopilot guides the aircraft back to the Selected Course (or GPS flight plan) when the **CWS** Button is released.

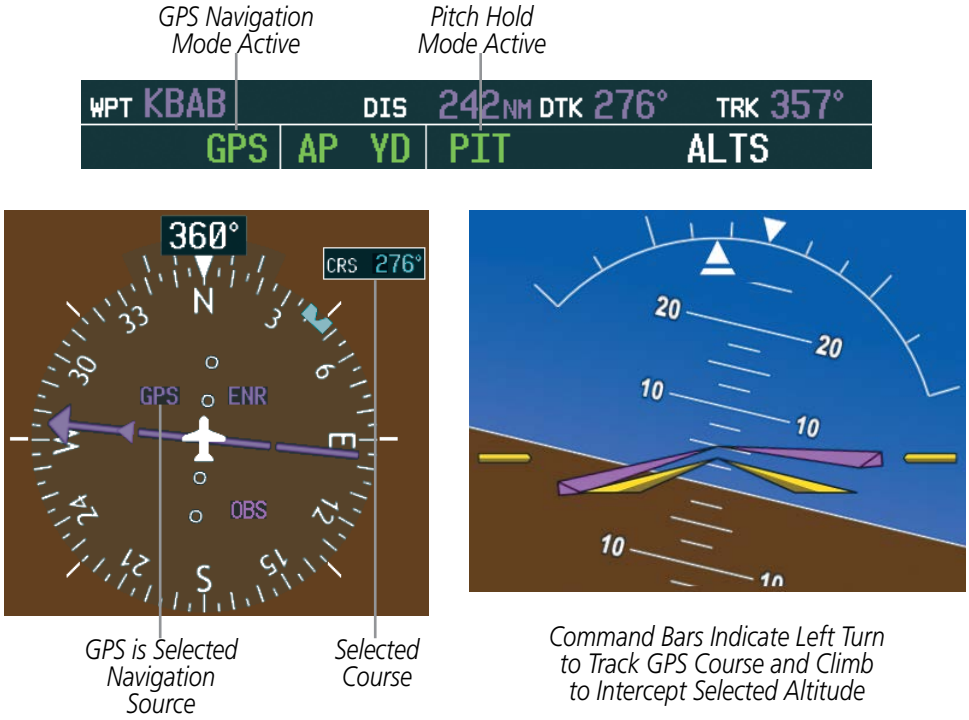


Figure 7-13 Navigation Mode

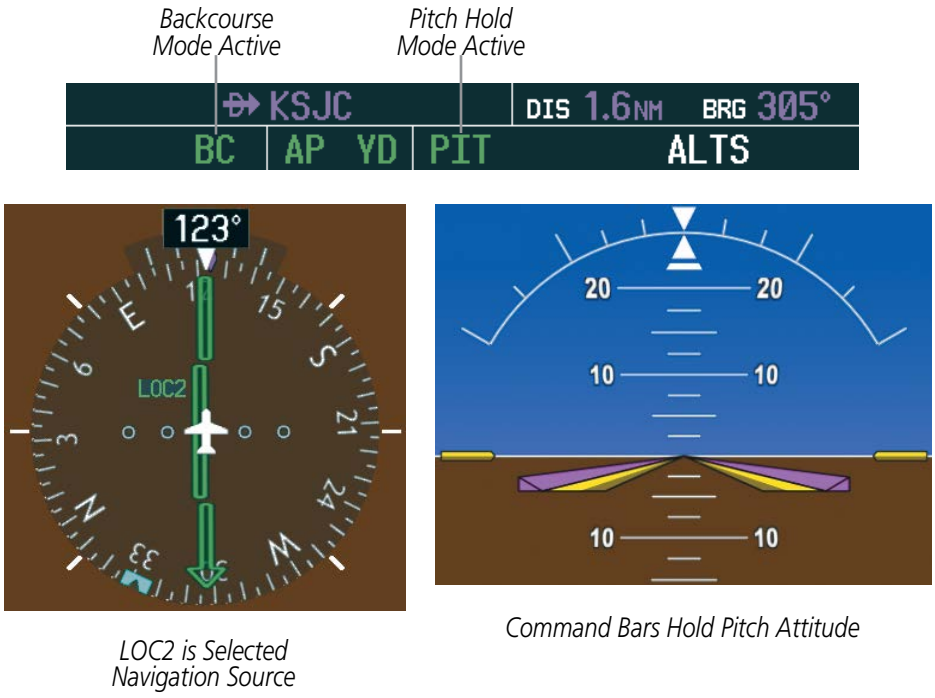


Figure 7-14 Backcourse Mode

COMBINATION MODES (GA, VNV, APR, NAV, BC)

Table 7-4 lists the modes that operating by using both Vertical and Lateral Modes with their corresponding controls and annunciations.

NOTE: *The GFC 7X limits turn rate to 3 degrees per second (standard rate turn).*

Mode	Description	Control	Annunciation	Maximum Roll Command Limit	Reference Range
Vertical Path Tracking	Captures and tracks descent legs of an active vertical profile	**VNV** Key	VPATH		
VNV Target Altitude Capture	Captures the Vertical Navigation (VNV) Target Altitude	*	ALTV		
Glidepath***	Captures and tracks the WAAS glidepath on approach	**APR** Key	GP		
Glideslope	Captures and tracks the ILS glideslope on approach		GS		
Navigation, GPS **	Captures and tracks the selected navigation source (GPS, VOR, LOC)	**NAV** Key	FMS	25°	
Navigation, VOR Enroute Capture/Track **			VOR	25° Capture 10° Track	
Navigation, LOC Capture/Track (No Glideslope)			LOC	25° Capture 10° Track	
Backcourse Capture/Track	Captures and tracks a localizer signal for backcourse approaches	**BC** Key	BC	25° Capture 10° Track	
Approach, GPS	Captures and tracks the selected navigation source (GPS, VOR, LOC)	**APR** Key	FMS	25°	
Approach, VOR Capture/Track			VAPP	25° Capture 10° Track	
Approach, LOC Capture/Track (Glideslope Mode automatically armed)			LOC	25° Capture 10° Track	
Go Around	Disengages the autopilot and commands a constant pitch angle and wings level in the air	**GA** Switch	GA	Wings Level	10°

** ALTV is armed automatically under VPTH when the VNV Target Altitude is to be captured instead of the Selected Altitude.*

*** The Heading, Navigation GPS and Navigation VOR mode maximum roll command limit will be limited to the Low Bank mode value if it is engaged.*

****GP is available in installations with GIA 63W IAUs when SBAS is available.* **Table 7-3 Flight Director Lateral Modes**

Table 7-5 Flight Director Combination Modes

GO AROUND MODE (GA)

Pushing the **GA** Switch engages the flight director in a wings-level, pitch-up attitude, allowing the execution of a missed approach or a go around. This mode is a coupled pitch and roll mode and is annunciated as 'GA' in both the active pitch and roll mode fields. Go Around Mode disengages the autopilot and arms Selected Altitude Capture Mode automatically. Subsequent autopilot engagement is allowed. Attempts to modify the aircraft attitude (i.e., with the **CWS** Button or **NOSE UP/NOSE DN** Keys) result in reversion to Pitch and Roll Hold modes.

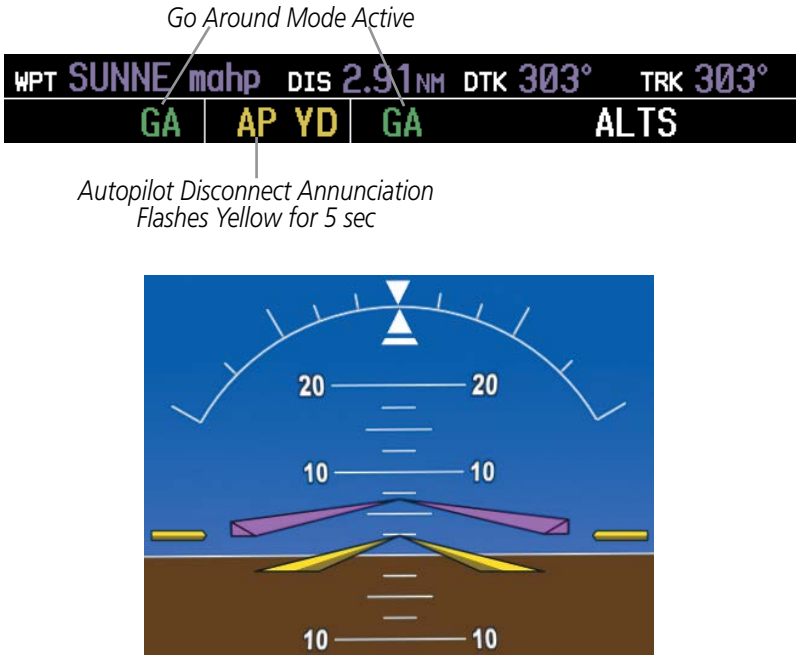


Figure 7-15 Go Around Mode

VERTICAL NAVIGATION MODES (VPTH, ALTV)

NOTE: *VNV is disabled when parallel track or dead reckoning mode is active.*

NOTE: *The Selected Altitude takes precedence over any other vertical constraints.*

Vertical Navigation (VNV) flight control is available for enroute/terminal cruise and descent operations any time that VNV flight planning is available. Refer to the Flight Management Section for more information on VNV flight plans. Conditions for availability include, but are not limited to:

- The selected navigation source is GPS.
- A VNV flight plan (with at least one altitude-constrained waypoint) or vertical direct-to is active.
- VNV is enabled (**VNV ENBL** Softkey pressed on the MFD).
- Crosstrack error is valid and within certain limits.
- Desired/actual track are valid or track angle error is within certain limits.
- The VNV Target Altitude of the active waypoint is no more than 250 ft above the current aircraft altitude.

The flight director may be armed for VNV at any time, but no target altitudes are captured during a climb. The Command Bars provide vertical profile guidance based on specified altitudes (entered manually or loaded from the database) at waypoints in the active flight plan or vertical direct-to. The appropriate VNV flight control modes are sequenced by the flight director to follow the path defined by the vertical profile. Upon reaching the last waypoint in the VNV flight plan, the flight director transitions to Altitude Hold Mode and cancels any armed VNV modes.

Vertical Path Tracking Mode (VPTH)

NOTE: *If another pitch mode key is pressed while Vertical Path Tracking Mode is selected, Vertical Path Tracking Mode reverts to armed.*

NOTE: *Pressing the **CWS** Button while Vertical Path Tracking Mode is active does not cancel the mode. The autopilot guides the aircraft back to the descent path upon release of the **CWS** Button.*

When a vertical profile (VNV flight plan) is active and the **VNV** Key is pressed, Vertical Path Tracking Mode is armed in preparation for descent path capture. 'VPTH' (or '/V' when Glidepath or Glideslope Mode is concurrently armed) is annunciated in white in addition to previously armed modes. If applicable, the appropriate altitude capture mode is armed for capture of the next VNV Target Altitude (ALTV) or the Selected Altitude (ALTS), whichever is greater.



Figure 7-16 Vertical Path Tracking Armed Annunciations

Prior to descent path interception, the Selected Altitude must be set below the current aircraft altitude by at least 75 feet. For the flight director to transition from Altitude Hold to Vertical Path Tracking Mode, acknowledgment is required within 5 minutes of descent path interception by:

- Pressing the **VNV** Key
- Adjusting the Selected Altitude

If acknowledgment is not received within 1 minute of descent path interception, the white 'VPTH' annunciation starts to flash. Flashing continues until acknowledged or the descent path is intercepted. If the descent is not confirmed by the time of interception, Vertical Path Tracking Mode remains armed and the descent is not captured.

In conjunction with the "TOD [top of descent] within 1 minute" annunciation in the Navigation Status Box and the "Vertical track" voice message, VNV indications (VNV Target Altitude, vertical deviation, and vertical speed required) appear on the PFD in magenta (Figure 7-11).

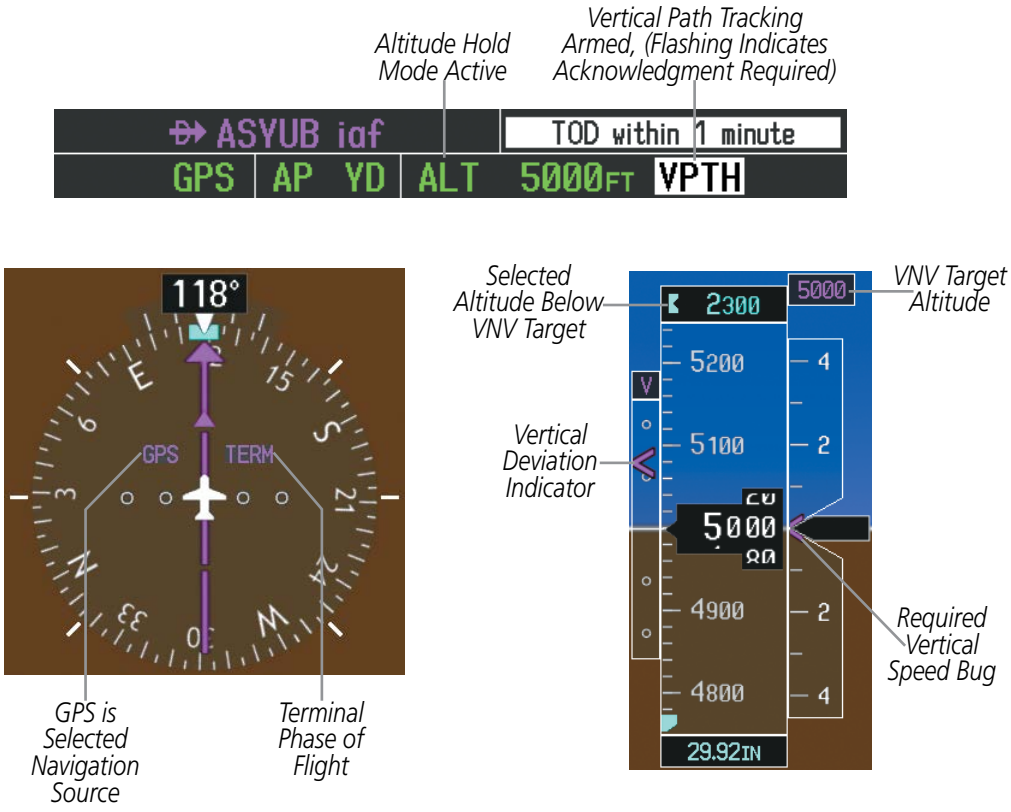


Figure 7-17 Vertical Path Capture

When a descent leg is captured (i.e., vertical deviation becomes valid), Vertical Path Tracking becomes active and tracks the descent profile. An altitude capture mode ('ALTS' or 'ALTV') is armed as appropriate.

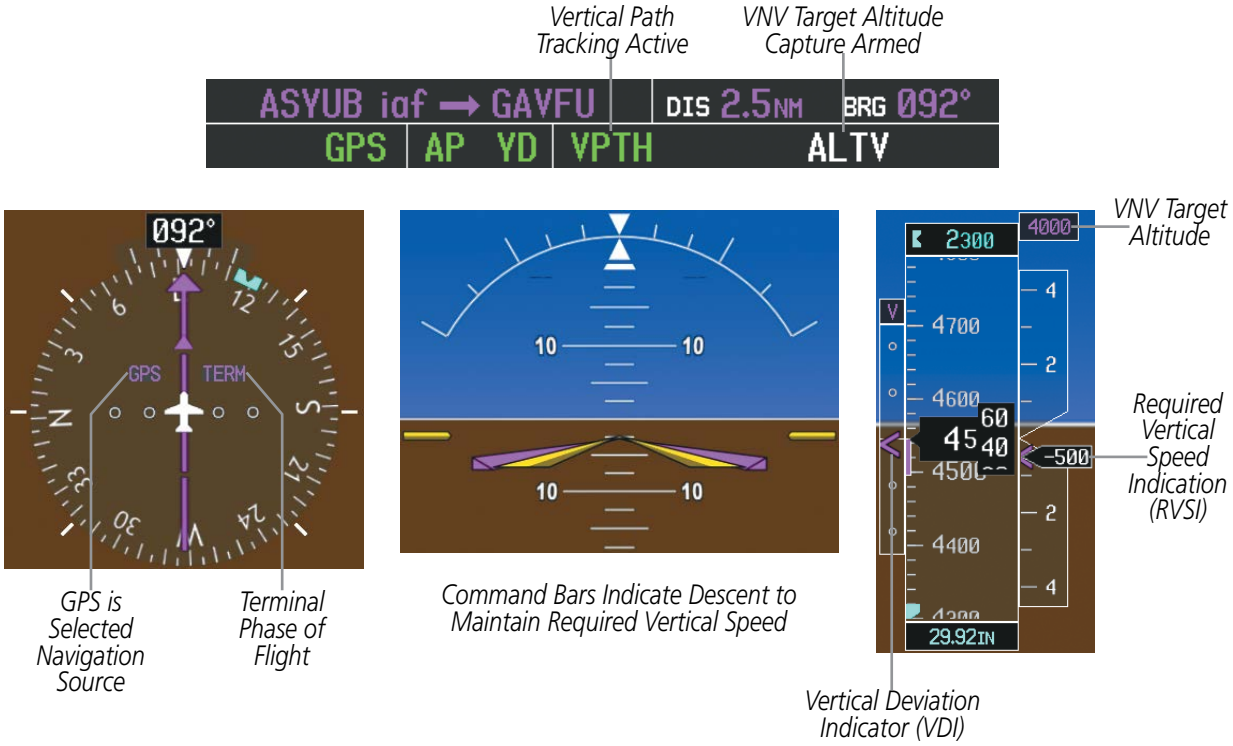


Figure 7-18 Vertical Path Tracking Mode

If the Altimeter's barometric setting is adjusted while Vertical Path Tracking is active, the flight director increases/decreases the descent rate by up to 500 fpm to re-establish the aircraft on the descent path (without commanding a climb). Adjusting the altimeter barometric setting creates discontinuities in VNV vertical deviation, moving the descent path. For large adjustments, it may take several minutes for the aircraft to re-establish on the descent path. If the change is made while nearing a waypoint with a VNV Target Altitude, the aircraft may not re-establish on the descent path in time to meet the vertical constraint.

Automatic Reversion to Pitch Hold Mode

Several situations can occur while Vertical Path Tracking Mode is active which cause the flight director to revert to Pitch Hold Mode:

- Vertical deviation exceeds 200 feet during an overspeed condition.
- Vertical deviation experiences a discontinuity that both exceeds 200 feet in magnitude and results in the vertical deviation exceeding 200 feet in magnitude. Such discontinuities are usually caused by flight plan changes that affect the vertical profile.
- Vertical deviation becomes invalid (the Vertical Deviation Indicator is removed from the PFD).
- A display enters Reversionary Mode (this does not apply to an active vertical direct-to).

Unless VNV is disabled, Vertical Path Tracking Mode and the appropriate altitude capture mode become armed following the reversion to Pitch Hold Mode to allow for possible profile recapture.

Non-Path Descents

Pitch Hold, Vertical Speed, and Flight Level Change modes can also be used to fly non-path descents while VNV flight control is selected. If the **VS** or **FLC** Key is pressed while Vertical Path Tracking Mode is selected, Vertical Path Tracking Mode reverts to armed along with the appropriate altitude capture mode to allow profile re-capture.



Figure 7-19 Flight Level Change VNV Non-Path Descent

To prevent immediate profile re-capture, the following must be satisfied:

- At least 10 seconds have passed since the non-path transition was initiated
- Vertical deviation from the profile has exceeded 250 feet, but is now less than 200 feet

Pressing the **VNV** Key twice re-arms Vertical Path Tracking for immediate profile re-capture.

VNV Target Altitude Capture Mode (ALTV)

NOTE: *Armed VNV Target Altitude and Selected Altitude capture modes are mutually exclusive. However, Selected Altitude Capture Mode is armed implicitly (not annunciated) whenever VNV Target Altitude Capture Mode is armed.*

VNV Target Altitude Capture is analogous to Selected Altitude Capture Mode and is armed automatically after the **VNV** Key is pressed and the next VNV Target Altitude is to be intercepted before the Selected Altitude. The annunciation 'ALTV' indicates that the VNV Target Altitude is to be captured. VNV Target Altitudes are shown in the active flight plan or vertical direct-to, and can be entered manually or loaded from a database (see the Flight Management Section for details). At the same time as "TOD within 1 minute" is annunciated in the Navigation Status Box, the active VNV Target Altitude is displayed above the Vertical Speed Indicator (see Figure 7-11).

As the aircraft nears the VNV Target Altitude, the flight director automatically transitions to VNV Target Altitude Capture Mode with Altitude Hold Mode armed. This automatic transition is indicated by the green 'ALTV' annunciation flashing for up to 10 seconds and the appearance of the white 'ALT' annunciation. The VNV Target Altitude is shown as the Altitude Reference beside the 'ALTV' annunciation and remains displayed above the Vertical Speed Indicator. The Required Vertical Speed Indication (RVSI) is removed once VNV Target Altitude Capture Mode becomes active.

At 50 feet from the VNV Target Altitude, the flight director automatically transitions from VNV Target Altitude Capture to Altitude Hold Mode and tracks the level leg. As Altitude Hold Mode becomes active, the white 'ALT' annunciation moves to the active vertical mode field and flashes green for 10 seconds to indicate the automatic transition. The flight director automatically arms Vertical Path Tracking, allowing upcoming descent legs to be captured and subsequently tracked.

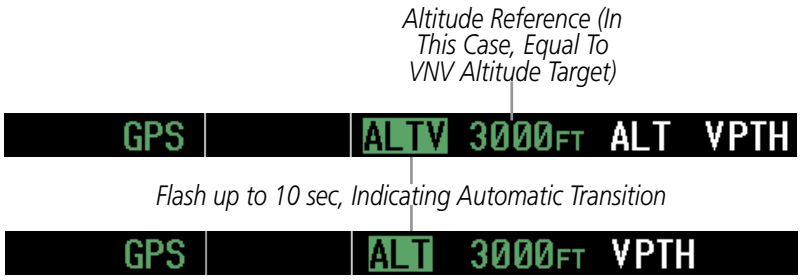


Figure 7-20 Automatic Mode Transitions During Altitude Capture

Changing the VNV Target Altitude

NOTE: *Pressing the **CWS** Button while in VNV Target Altitude Capture Mode does not cancel the mode.*

Changing the current VNV Target Altitude while VNV Target Altitude Capture Mode is active causes the flight director to revert to Pitch Hold Mode. Vertical Path Tracking and the appropriate altitude capture mode are armed in preparation to capture the new VNV Target Altitude or the Selected Altitude, depending on which altitude is to be intercepted first.

VNV target altitudes can be changed while editing the active flight plan (see the Flight Management Section for details).

APPROACH MODES (VAPP, GPS/GP, LOC/GS, BC)

NOTE: *The selected navigation receiver must have a valid VOR or LOC signal or active GPS course for the flight director to enter Approach Mode.*

Approach Mode is activated when the **APR** Key is pressed. Approach Mode acquires and tracks the selected navigation source (GPS, VOR, or LOC), depending on loaded approach. This mode uses the selected navigation receiver deviation and desired course inputs to fly the approach. Pressing the **APR** Key when the CDI is greater than one dot arms the selected approach mode (annunciated in white to the left of the active lateral mode). If the CDI is less than one dot, the LOC is automatically captured when the **APR** Key is pressed.

VOR Approach Mode (VAPP) provides greater sensitivity for signal tracking than VOR Navigation Mode.

Selecting VOR Approach Mode:

1) Ensure a valid VOR frequency is tuned
2) Ensure that VOR is the selected navigation source (use the **CDI** Softkey to cycle through navigation sources if necessary).
3) Press the **APR** Key.

When GPS Approach Mode is armed, Glidepath (**GP**) Mode is also armed.

Selecting GPS Approach Mode without Vertical Guidance:

1) Ensure a GPS approach is loaded into the active flight plan. The active waypoint must be part of the flight plan (cannot be a direct-to a waypoint not in the flight plan).
2) Ensure that GPS is the selected navigation source (use the **CDI** Softkey to cycle through navigation sources if necessary).
3) Press the **APR** or **NAV** Key.

The Flight Director will then supply Lateral Guidance.



Figure 7-21 GPS Approach Mode Armed

GLIDEPATH MODE (GP) (SBAS ONLY)

NOTE: *Refer to the Aircraft Flight Manual (AFM) to determine whether SBAS functionality is approved.*

NOTE: *Pressing the **CWS** Button while Glidepath Mode is active does not cancel the mode. The autopilot guides the aircraft back to the glidepath upon release of the **CWS** Button.*

Glidepath Mode is available only in installations with GIA 63W IAUs when SBAS is available. Glidepath Mode is used to track the SBAS-based glidepath. When Glidepath Mode is armed, 'GP' is annunciated in white in the AFCS Status Box.

Selecting GPS Approach with Vertical Guidance:

1) Ensure a GPS approach with vertical guidance (LPV, LNAV/VNAV, LNAV+V) is loaded into the active flight plan. The active waypoint must be part of the flight plan (cannot be a direct-to a waypoint not in the flight plan).
2) Ensure that GPS is the selected navigation source (use the **CDI** Softkey to cycle through navigation sources).
3) Press the **APR** Key.

NOTE: *Some RNAV (GPS) approaches provide a vertical descent angle as an aid in flying a stabilized approach. These approaches are NOT considered Approaches with Vertical Guidance (APV). Approaches that are annunciated on the HSI as LNAV or LNAV+V are considered Nonprecision Approaches (NPA) and are flown to an MDA even though vertical glidepath (GP) information may be provided.*

WARNING: *When flying an LNAV approach (with vertical descent angle) with the autopilot coupled, the aircraft will not level off at the MDA even if the MDA is set in the altitude preselect.*

Upon reaching the glidepath, the flight director transitions to Glidepath Mode and begins to capture and track the glidepath.



Figure 7-22 Glidepath Mode Armed

Once the following conditions have been met, the glidepath can be captured:

- The active waypoint is at or after the final approach fix (FAF)
- Vertical deviation is valid
- The CDI is at less than full scale deviation
- Automatic sequencing of waypoints has not been suspended (no 'SUSP' annunciation on the HSI)

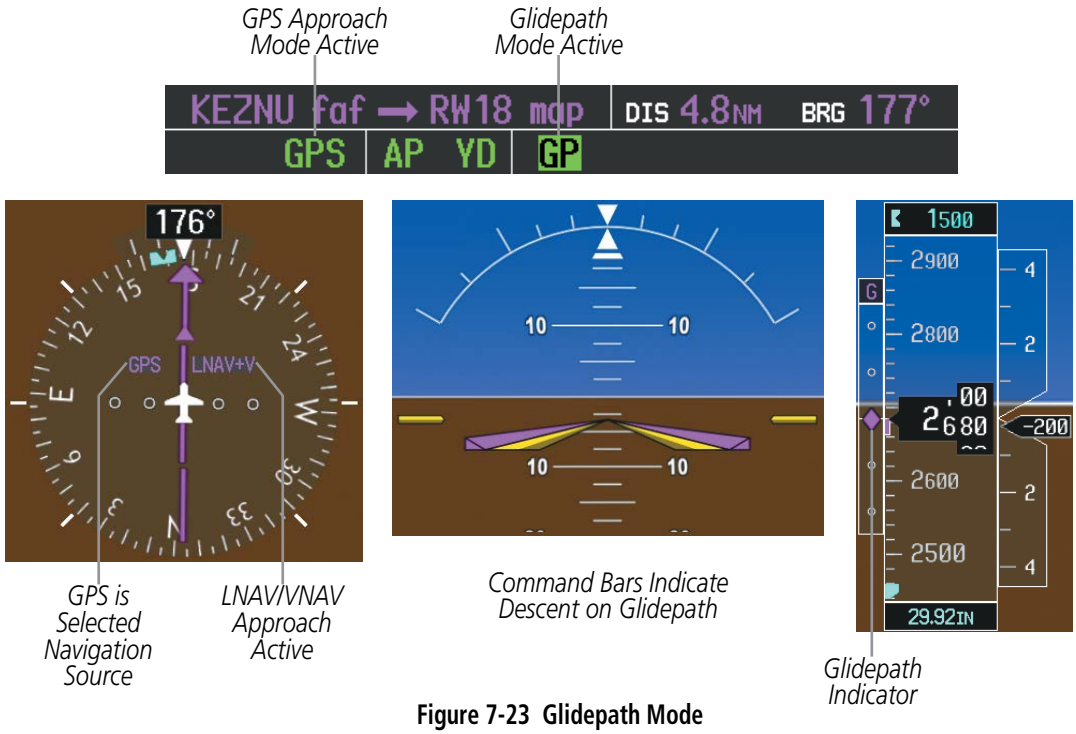


Figure 7-23 Glidepath Mode

Selecting LOC Only Navigation Mode:

1) Ensure a valid localizer frequency is tuned.
2) Ensure that LOC is the selected navigation source (use the **CDI** Softkey to cycle through navigation sources if necessary).
3) Press the **NAV** Key.

If the following occurs, the flight director reverts to Roll Hold Mode (wings rolled level):

- Approach Mode is active and a Vectors-To-Final is activated
- Approach Mode is active and Navigation source is manually switched
- During a LOC/ILS approach, GPS Navigation Mode is active and the FAF is crossed after the automatic navigation source switch from GPS to LOC

NOTE: *When making a backcourse approach, set the Selected Course to the localizer front course.*

Selecting LOC Backcourse Mode (BC)

1) Ensure a valid localizer frequency is tuned.
2) Ensure that LOC is the selected navigation source (use the **CDI** Softkey to cycle through navigation sources if necessary).
3) Set the Selected Course to the localizer front course
4) Press the **BC** Key.

GLIDESLOPE MODE (GS)

NOTE: *Pressing the **CWS** Button while Glideslope Mode is active does not cancel the mode. The autopilot guides the aircraft back to the glideslope upon release of the **CWS** Button.*

Glideslope Mode is available for LOC/ILS approaches to capture and track the glideslope. When Glideslope Mode is armed (annunciated as 'GS' in white), LOC Approach Mode is armed as the lateral flight director mode.

Selecting Glideslope Mode:

1) Ensure a valid localizer frequency is tuned.
2) Ensure that LOC is the selected navigation source (use the **CDI** Softkey to cycle through navigation sources).
3) Press the **APR** Key.

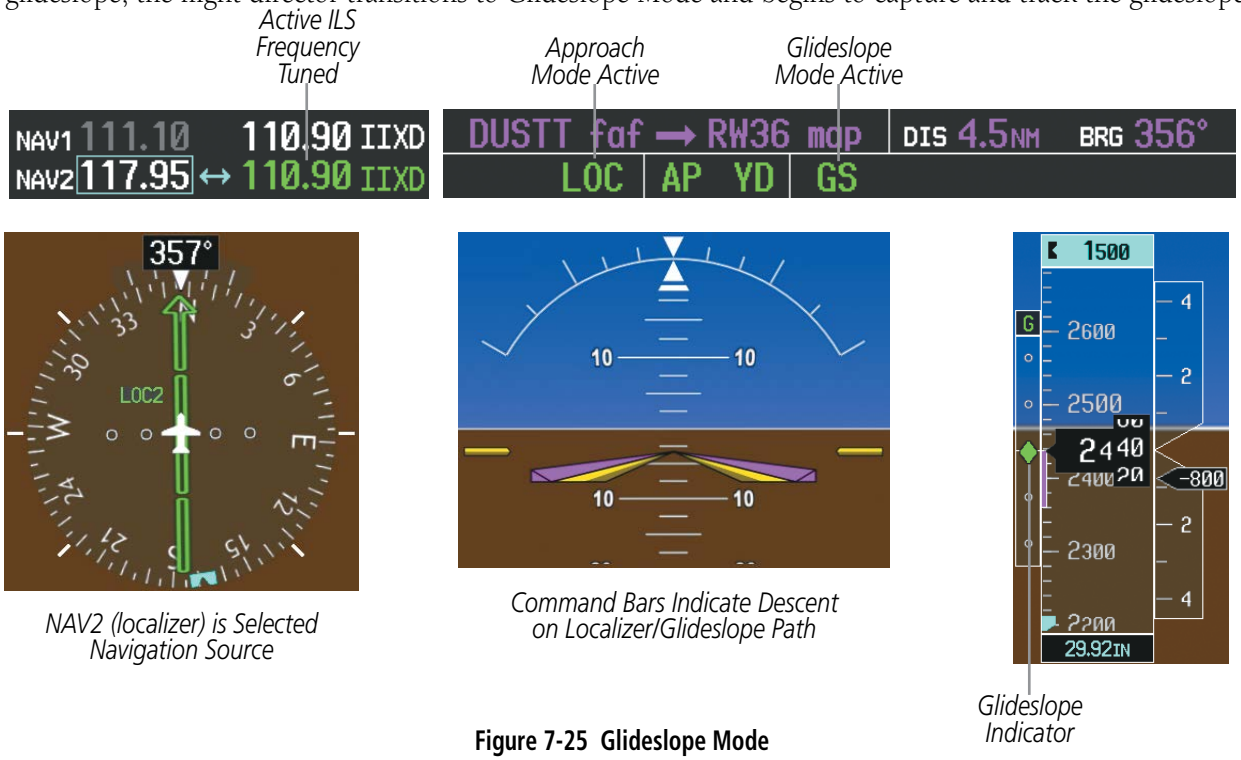
Or:

1) Ensure that GPS is the selected navigation source (use the **CDI** Softkey to cycle through navigation sources).
2) Ensure a LOC/ILS approach is loaded into the active flight plan.
3) Ensure the corresponding LOC frequency is tuned.
4) Press the **APR** Key.



Figure 7-24 Glideslope Mode Armed

Once LOC is the navigation source, the localizer and glideslope can be captured. Upon reaching the glideslope, the flight director transitions to Glideslope Mode and begins to capture and track the glideslope.



NAV2 (localizer) is Selected Navigation Source

Command Bars Indicate Descent on Localizer/Glideslope Path

Figure 7-25 Glideslope Mode

Changing the Selected Course

The Selected Course is controlled using the **CRS** Knob (while in VOR, LOC, or OBS Mode). Pressing the **CWS** Button and hand-flying the aircraft does not change the Selected Course while in Approach Mode. The autopilot guides the aircraft back to the Selected Course (or GPS flight plan) when the **CWS** Button is released.

Intercepting and Flying a DME Arc

The AFCS will intercept and track a DME arc that is part of the active flight plan provided that GPS Navigation Mode is engaged, GPS is the active navigation source on the CDI, and the DME arc segment is the active flight plan leg. It is important to note that automatic navigation of DME arcs is based on GPS. Thus, even if the APR key is pressed and LOC or VOR Approach Mode is armed prior to reaching the Initial Approach Fix (IAF), Approach Mode will not activate until the arc segment is completed.

If the pilot decides to intercept the arc at a location other than the published IAF (i.e. ATC provides vectors to intercept the arc) and subsequently selects Heading Mode or Roll Mode, the AFCS will not automatically intercept or track the arc unless the pilot activates the arc leg of the flight plan and arms GPS Navigation Mode. The AFCS will not intercept and fly a DME arc before reaching an IAF that defines the beginning of the arc segment. Likewise, if at any point while established on the DME arc the pilot deselects GPS Navigation Mode, the AFCS will no longer track the arc.

7.5 AUTOPILOT AND YAW DAMPER OPERATION

NOTE: *Refer to the AFM for specific instructions regarding emergency procedures.*

The autopilot and yaw damper operate flight control surface servos to provide automatic flight control. The autopilot controls the aircraft pitch and roll attitudes following commands received from the flight director. Pitch autotrim provides trim commands to the pitch trim servo to relieve any sustained effort required by the pitch servo. The yaw damper reduces Dutch roll tendencies and coordinates turns.

FLIGHT CONTROL

Pitch and roll commands are provided to the servos, based on the active flight director modes. Servo motor control limits the maximum servo speed and torque. The servo mounts are equipped with slip-clutches set to certain values. This allows the servos to be overridden in case of an emergency.

PITCH AXIS AND PITCH TRIM

The autopilot pitch axis uses pitch rate to stabilize the aircraft pitch attitude during upsets and flight director maneuvers. Flight director pitch commands are rate- and attitude-limited, combined with pitch damper control, and sent to the pitch servo motor. The pitch servo measures the output effort (torque) and provides this signal to the pitch trim servo. The pitch trim servo commands the motor to reduce the average pitch servo effort.

When the autopilot is not engaged, the pitch trim servo may be used to provide manual electric trim. This allows the aircraft to be trimmed using a control stick switch rather than the trim wheel. Manual trim commands are generated only when both halves of the **MEPT** Switch are operated simultaneously. Trim speeds are scheduled with airspeed to provide more consistent response.

ROLL AXIS

The autopilot roll axis uses roll rate to stabilize aircraft roll attitude during upsets and flight director maneuvers. The flight director roll commands are rate- and attitude-limited, combined with roll damper control, and sent to the roll servo motor.

YAW AXIS

The yaw damper uses yaw rate and roll attitude to dampen the aircraft's natural Dutch roll response. It also uses lateral acceleration to coordinate turns. Yaw damper operation is independent of autopilot engagement.

ENGAGING THE AUTOPILOT AND YAW DAMPER

NOTE: *Autopilot engagement/disengagement is not equivalent to servo engagement/disengagement. Use the **CWS** Button to disengage the pitch and roll servos while the autopilot remains active.*

When the **AP** Key is pressed, the autopilot, yaw damper, and flight director are activated (if not already engaged). The flight director engages in Pitch and Roll Hold modes when initially activated. When the **YD** Key is pressed, the system engages the yaw damper independently of the autopilot (if not already engaged). Autopilot and yaw damper status are displayed in the center of the AFCS Status Box. Engagement is indicated by green 'AP' and 'YD' annunciations, respectively.



Figure 7-26 Autopilot and Yaw Damper Engaged

CONTROL WHEEL STEERING

During autopilot operation, the aircraft may be hand-flown without disengaging the autopilot. Pressing and holding the **CWS** Button disengages the pitch and roll servos from the flight control surfaces and allows the aircraft to be hand-flown. At the same time, the flight director is synchronized to the aircraft attitude during the maneuver. CWS activity has no effect on yaw damper engagement. The 'AP' annunciation is temporarily replaced by 'CWS' in white for the duration of CWS maneuvers.

In most scenarios, releasing the **CWS** Button reengages the autopilot with a new reference. Refer to the flight director modes section for CWS behavior in each mode.

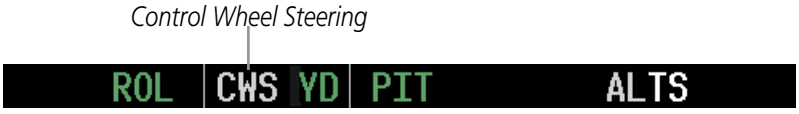


Figure 7-27 CWS Annunciation

DISENGAGING THE AUTOPILOT AND YAW DAMPER

The autopilot is manually disengaged by pushing the **AP DISC** Switch**, GA** Button, **AP TRIM** ARM Switch, or the **AP** Key on the MFD. Manual disengagement is indicated by a five-second flashing yellow 'AP' annunciation and a two-second autopilot disconnect aural alert. After manual disengagement, the autopilot disconnect aural alert may be cancelled by pushing the **AP TRIM** ARM or **AP DISC** Switch (**AP DISC** Switch also cancels the flashing 'AP' annunciation).

The **YD** Key or **AP DISC** Switch can be used to disengage the yaw damper. The 'YD' annunciation turns yellow and flashes for five seconds upon disengagement.



Figure 7-28 Manual Autopilot Disengagement

Automatic autopilot disengagement is indicated by a flashing red 'AP' annunciation and by the autopilot disconnect aural alert, which continue until acknowledged by pushing the **AP DISC** or **AP TRIM** ARM Switch.

Automatic disengagement occurs due to:

- System failure
- Inability to compute default flight director modes (FD also disengages automatically)
- Invalid sensor data
- Stall Warning



Figure 7-29 Automatic Autopilot Disengagement

Automatic yaw damper disengagement occurs when autopilot disengagement is caused by a failure in a parameter also affecting the yaw damper. This means that the yaw damper can remain operational in some cases where the autopilot automatically disengages. The yaw damper also disengages upon a localized failure in the yaw damper system.



Figure 7-30 Automatic Autopilot Disengagement

7.6 EXAMPLE FLIGHT PLAN

NOTE: *The following example flight plan and diagrams (not to be used for navigation) in this section are for instructional purposes only and should be considered not current. Numbered portions of accompanying diagrams correspond to numbered procedure steps.*

This scenario-based set of procedures (based on the example flight plan found in the Flight Management Section) shows various GFC 700 AFCS modes used during a flight. In this scenario, the aircraft departs Charles B. Wheeler Downtown Airport (KMKC), enroute to Colorado Springs Airport (KCOS). After departure, the aircraft climbs to 12,000 ft and airway V4 is intercepted, following ATC vectors.

Airway V4 is flown to Salina VOR (SLN) using VOR navigation, then airway V244 is flown using GPS navigation. The ILS approach for runway 35L and LPV (WAAS) approach for runway 35R are shown and a missed approach is executed.

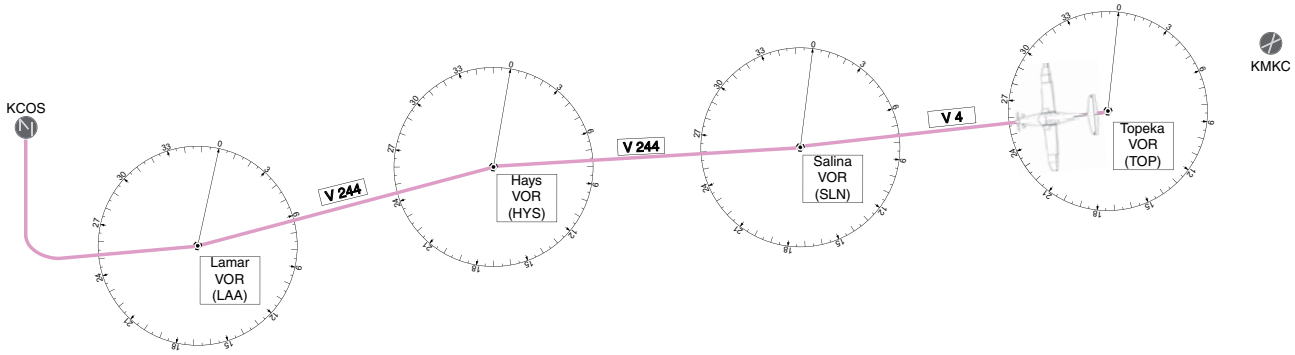


Figure 7-31 Flight Plan Overview

DEPARTURE

Climbing to the Selected Altitude and flying an assigned heading:

1) Before takeoff, set the Selected Altitude to 12,000 feet using the **ALT** Knob.

2) In this example, Vertical Speed Mode is used to capture the Selected Altitude (Pitch Hold, Vertical Speed, or Flight Level Change Mode may be used).

a) Press the **VS** Key to activate Vertical Speed Mode.



The Vertical Speed Reference may be adjusted after Vertical Speed Mode is selected using the **NOSE UP/NOSE DN** Keys or pushing the **CWS** Button while hand-flying the aircraft to establish a new Vertical Speed Reference.

b) Press the **AP** Key to engage the autopilot in a climb using Vertical Speed Mode.



3) Use the **HDG** Knob to set the Selected Heading, complying with ATC vectors to intercept Airway V4.

Press the **HDG** Key to activate Heading Select Mode while the autopilot is engaged in the climb. The autopilot follows the Selected Heading Bug on the HSI and turns the aircraft to the desired heading.



4) As the aircraft nears the Selected Altitude, the flight director transitions to Selected Altitude Capture Mode, indicated by the green 'ALTS' annunciation flashing for up to 10 seconds.



At 50 feet from the Selected Altitude, the green 'ALT' annunciation flashes for up to 10 seconds; the autopilot transitions to Altitude Hold Mode and levels the aircraft.



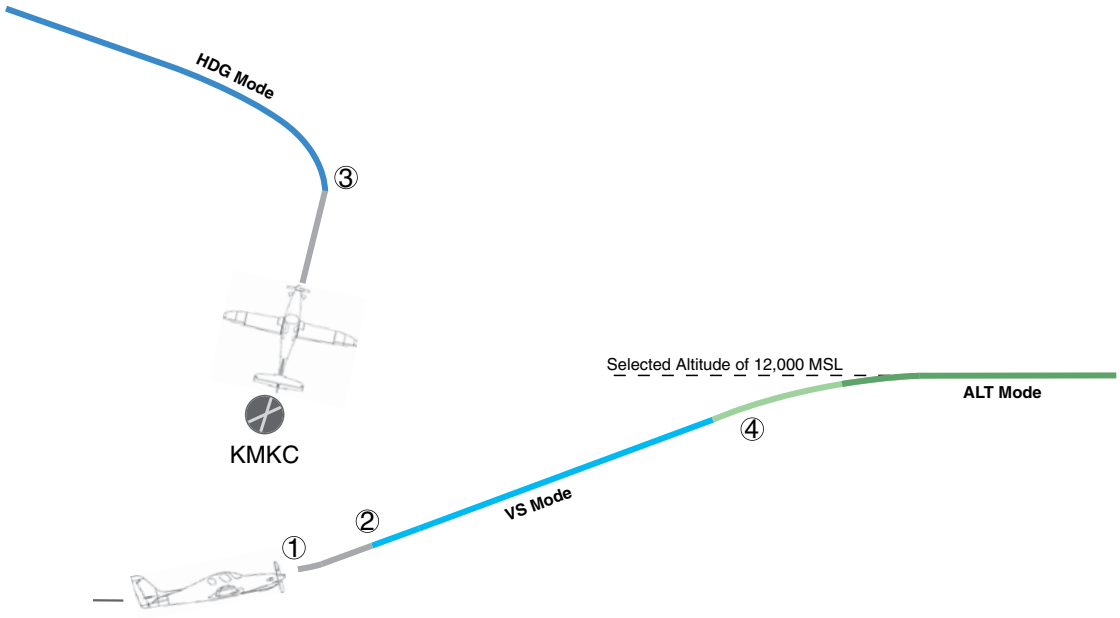


Figure 7-32 Departure

INTERCEPTING A VOR RADIAL

During climb-out, the autopilot continues to fly the aircraft in Heading Select Mode. Airway V4 to Salina VOR (SLN) should now be intercepted. Since the enroute flight plan waypoints correspond to VORs, flight director Navigation Mode using either VOR or GPS as the navigation source may be used. In this scenario, VOR Navigation Mode is used for navigation to the first VOR waypoint in the flight plan.

Intercepting a VOR radial:

1) Arm VOR Navigation Mode:

a) Tune the VOR frequency.

b) Press the **CDI** Softkey to set the navigation source to VOR.

c) Use the **CRS** Knob to set the Selected Course to 255°. Note that at this point, the flight director is still in Heading Select Mode and the autopilot continues to fly 290°.

d) Press the **NAV** Key. This arms VOR Navigation Mode and the white 'VOR' annunciation appears to the left of the active lateral mode.



2) As the aircraft nears the Selected Course, the flight director transitions from Heading Select to VOR Navigation Mode and the 'VOR' annunciation flashes green. The autopilot begins turning to intercept the Selected Course.



3) The autopilot continues the turn until the aircraft is established on the Selected Course.

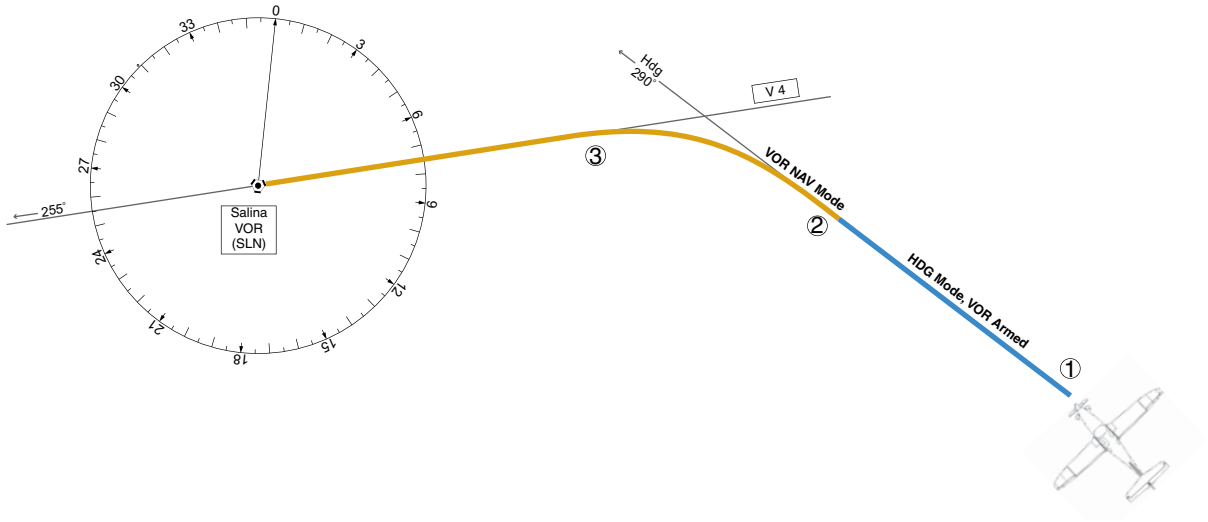


Figure 7-33 Intercepting a VOR Radial

FLYING A FLIGHT PLAN/GPS COURSE

NOTE: *Changing the navigation source cancels Navigation Mode and causes the flight director to revert back to Roll Hold Mode (wings rolled level).*

As the aircraft closes on Salina VOR, GPS is used to navigate the next leg, airway V244. The aircraft is currently tracking inbound on Airway V4.

Flying a GPS flight plan:

1) Transition from VOR to GPS Navigation Mode:

a) Press the **CDI** Softkey until GPS is the selected navigation source.

b) Press the **NAV** Key to activate GPS Navigation Mode. The autopilot guides the aircraft along the active flight plan leg.



2) Following the flight plan, the autopilot continues to steer the aircraft under GPS guidance. Note that in GPS Navigation Mode, course changes defined by the flight plan are automatically made without pilot action required.

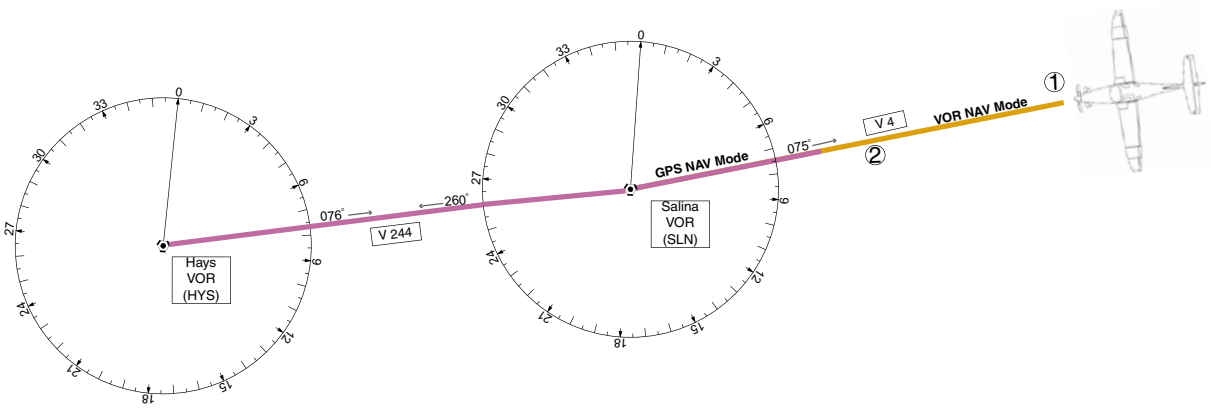


Figure 7-34 Transition to GPS Flight Plan

DESCENT

While flying the arrival procedure, the aircraft is cleared for descent in preparation for the approach to KCOS. Three methods are presented for the descent:

- Flight Level Change descent – Flight Level Change Mode can be used to descend to the Selected Altitude at a constant airspeed. This descent method does not account for flight plan waypoint altitude constraints.
- Vertical Path Tracking descent – Vertical Path Tracking Mode is used to follow the vertical descent path defined in the GPS flight plan. Altitude constraints correspond to waypoints in the flight plan. Before VNV flight control can provide vertical profile guidance, a VNV flight plan must be entered and enabled.
- Non-path descent in a VNV scenario – A VNV flight plan is entered and enabled, however Pitch Hold, Vertical Speed, or Flight Level Change Mode can be used to descend to the VNV Target Altitude prior to reaching the planned TOD. Flight Level Change Mode is used in the example.

Flight Level Change descent:

1) Select Flight Level Change Mode:

a) Using the **ALT** Knob, set the Selected Altitude to 10,000 feet.

b) Press the **FLC** Key to activate Flight Level Change Mode. The annunciation 'FLC' appears next to the Airspeed Reference, which defaults to the current aircraft airspeed. Selected Altitude Capture Mode is armed automatically.



2) Use the **NOSE UP/NOSE DN** Keys or push the **CWS** Button while hand-flying the aircraft to adjust the commanded airspeed while maintaining the same power, or reduce power to allow descent in Flight Level Change Mode while the autopilot maintains the current airspeed.

3) As the aircraft nears the Selected Altitude, the flight director transitions to Selected Altitude Capture Mode, indicated by the green 'ALTS' annunciation flashing for up to 10 seconds.



The green 'ALT' annunciation flashes for up to 10 seconds upon reaching 50 feet from the Selected Altitude; the autopilot transitions to Altitude Hold Mode and levels the aircraft.



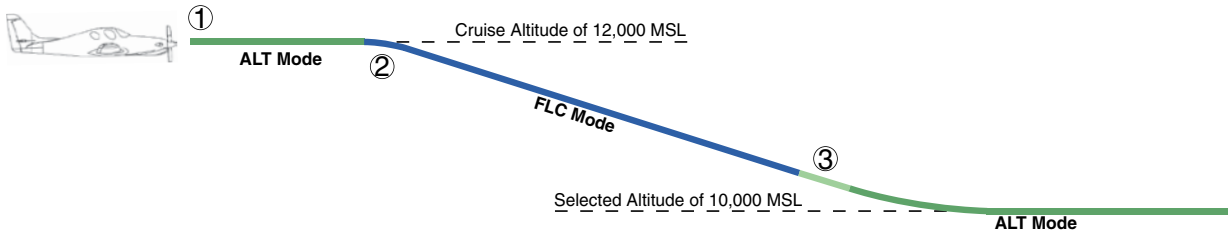


Figure 7-35 FLC Descent

Vertical Path Tracking descent to VNV Target Altitude:

1) Select VNV flight control:

a) Press the **VNV** Key to arm Vertical Path Tracking Mode. The white annunciation 'VPTH' appears.



b) Using the **ALT** Knob, set the Selected Altitude below the flight plan's VNV Target Altitude of 10,000 feet.

If the Selected Altitude is not at least 75 ft below the VNV Target Altitude, the flight director captures the Selected Altitude rather than the VNV Target Altitude once Vertical Path Tracking Mode becomes active (ALTS is armed rather than ALTV).

c) If Vertical Path Tracking Mode is armed more than 5 minutes prior to descent path capture, acknowledgment is required for the flight director to transition from Altitude Hold to Vertical Path Tracking Mode. To proceed with descent path capture if the white 'VPTH' annunciation begins flashing, do one of the following

- Press the **VNV** Key
- Turn the **ALT** Knob to adjust the Selected Altitude

If the descent is not confirmed by the time of interception, Vertical Path Tracking Mode remains armed and the descent is not captured.

2) When the top of descent (TOD) is reached, the flight director transitions to Vertical Path Tracking Mode and begins the descent to the VNV Target Altitude. Intention to capture the VNV Target Altitude is indicated by the white 'ALTV' annunciation.



3) As the aircraft nears the VNV Target Altitude, the flight director transitions to VNV Target Altitude Capture Mode, indicated by the green 'ALTV' annunciation flashing for up to 10 seconds.



The green 'ALT' annunciation flashes for up to 10 seconds upon reaching 50 feet from the VNV Target Altitude; the autopilot transitions to Altitude Hold Mode and levels the aircraft at the vertical waypoint.



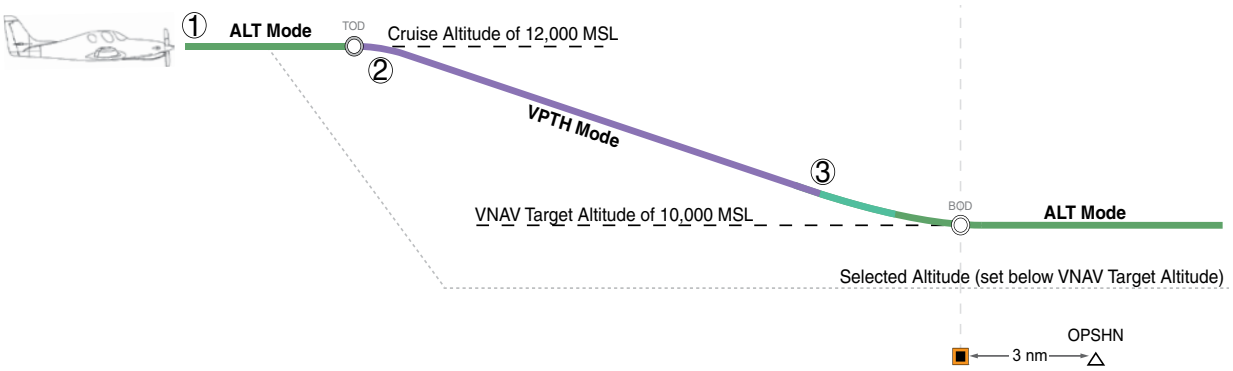


Figure 7-36 VPTH Descent

Non-path descent using Flight Level Change Mode:

1) Using Flight Level Change Mode, command a non-path descent to an intermediate altitude above the next VNV flight plan altitude:

a) Using the **ALT** Knob, set the Selected Altitude below the current aircraft altitude to an altitude (in this case 9,400 feet) at which to level off between VNV flight plan altitudes.

b) Press the **FLC** Key before the planned TOD during an altitude hold while VPTH is armed. The Airspeed Reference defaults to the current aircraft airspeed. Vertical Path Tracking and Selected Altitude Capture Mode are armed automatically.



2) Reduce power to allow descent in Flight Level Change Mode. The autopilot maintains the Airspeed Reference.

3) As the aircraft nears the Selected Altitude, the flight director transitions to Selected Altitude Capture Mode, indicated by the green 'ALTS' annunciation flashing for up to 10 seconds.



The green 'ALT' annunciation flashes for up to 10 seconds upon reaching 50 feet from the Selected Altitude; the autopilot transitions to Altitude Hold Mode and levels the aircraft. After leveling off, reset Selected Altitude at or below 9,000 ft.



4) When the next TOD is reached, Vertical Path Tracking becomes active (may require acknowledgment to allow descent path capture).



5) As the aircraft nears the VNV Target Altitude, the flight director transitions to VNV Target Altitude Capture Mode, indicated by the green 'ALTV' annunciation flashing for up to 10 seconds.



The green 'ALT' annunciation flashes for up to 10 seconds upon reaching 50 feet from the VNV Target Altitude; the autopilot transitions to Altitude Hold Mode and levels the aircraft at the vertical waypoint.



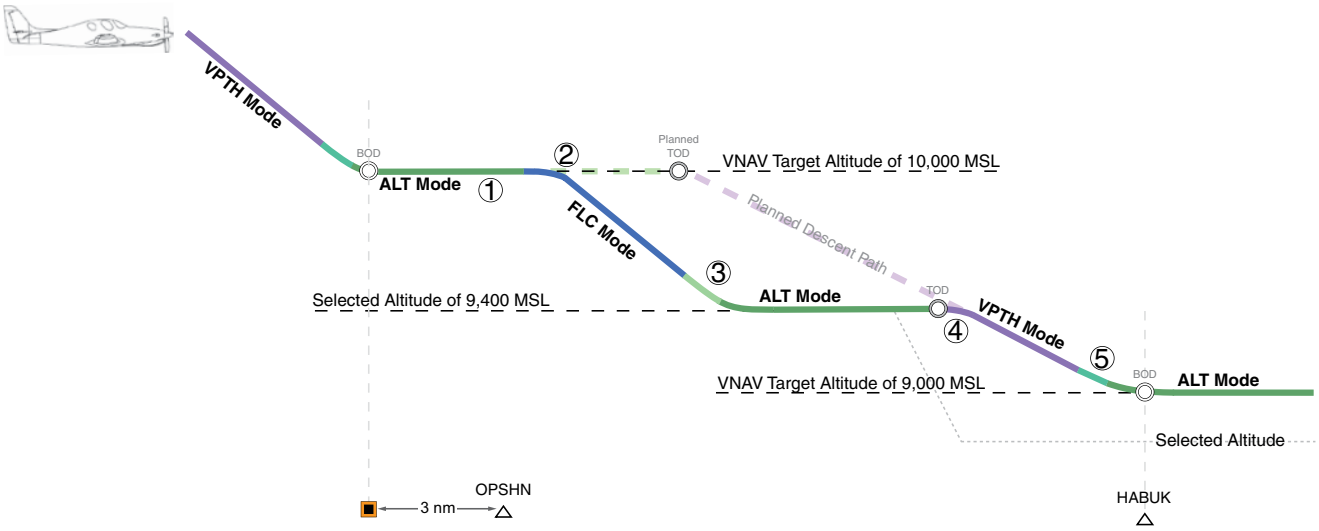


Figure 7-37 Non-path Descent

APPROACH

Flying an ILS approach:

1) Transition from GPS Navigation Mode to Heading Select Mode.

a) Select the Runway 35L ILS approach for KCOS and select 'VECTORS' for the transition. Load and activate the approach into the flight plan.

b) Use the **HDG** Knob to set the Selected Heading after getting vectors from ATC.

c) Press the **HDG** Key. The autopilot turns the aircraft to the desired heading.

d) Use Heading Select Mode to comply with ATC vectors as requested.



2) Arm LOC Approach and Glideslope modes.

a) Ensure the appropriate localizer frequency is tuned.

b) Press the **APR** Key when cleared for approach to arm Approach and Glideslope modes. 'LOC' and 'GS' appear in white as armed mode annunciations.



c) The navigation source automatically switches to LOC. After this switch occurs, the localizer signal can be captured and the flight director determines when to begin the turn to intercept the final approach course. The flight director now provides guidance to the missed approach point.

3) There are two options available at this point, as the autopilot flies the ILS approach:

- Push the **AP DISC** Switch at the decision height and land the aircraft.
- Use the **GA** Button to execute a missed approach.

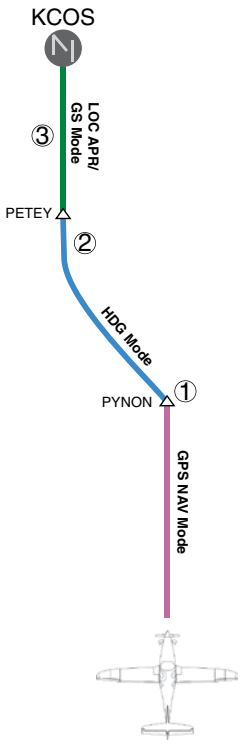


Figure 7-38 ILS Approach to KCOS

NOTE: *Refer to the AFM to determine whether SBAS functionality is approved. Support for SBAS precision approaches is available only in installations with GIA 63Ws when SBAS is available.*

Flying a RNAV GPS approach with vertical guidance:

1) Arm flight director modes for a RNAV GPS approach with vertical guidance:

a) Make sure the navigation source is set to GPS (use **CDI** Softkey to change navigation source).

b) Select the Runway 35R LPV approach for KCOS. Load and activate the approach into the flight plan.

2) Press the **APR** Key once clearance for approach has been received. GPS Approach Mode is activated and Glidepath Mode is armed.



3) Once the glidepath is captured, Glidepath Mode becomes active. The flight director now provides guidance to the missed approach point.



4) There are two options available at this point, as the autopilot flies the approach:

- Push the **AP DISC** Switch at the Decision height and land the aircraft.
- Use the **GA** Button to execute a missed approach.

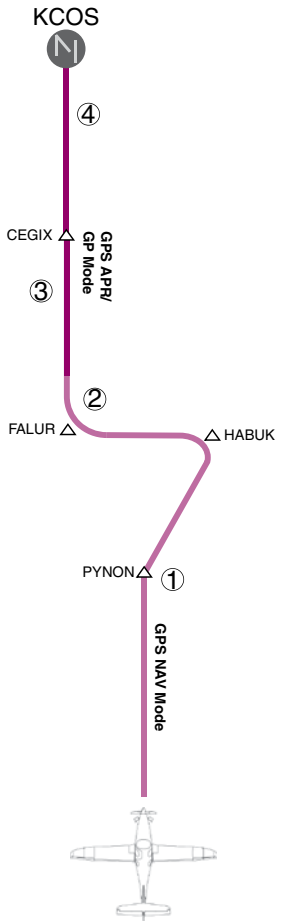


Figure 7-39 LPV Approach to KCOS

GO AROUND/MISSED APPROACH

NOTE: *As a result of calculations performed by the system while flying the holding pattern, the display may re-size automatically and the aircraft may not precisely track the holding pattern as depicted on the PFD and MFD.*

Flying a missed approach:

1) Push the **GA** Button at the Decision Height and apply go around power to execute a missed approach. The flight director Command Bars establish a nose-up climb to follow. If flying an ILS or LOC approach the CDI also switches to GPS as the navigation source.

Note that when the **GA** Button is pushed, the missed approach is activated and the autopilot disconnects, indicated by the 'AP' annunciation flashing yellow for 5 seconds.



2) Start the climb to the prescribed altitude in the published Missed Approach Procedure (in this case, 10,000 ft).

a) Press the **AP** Key to re-engage the autopilot.

b) Press the **NAV** Key to have the autopilot fly to the hold.



3) Use the **ALT** Knob to set a Selected Altitude to hold.

To hold the current airspeed during the climb, press the **FLC** Key.



As the aircraft nears the Selected Altitude, the flight director transitions to Selected Altitude Capture Mode, indicated by the green 'ALTS' annunciation flashing for up to 10 seconds.



The green 'ALT' annunciation flashes for up to 10 seconds upon reaching 50 feet from the Selected Altitude; the autopilot transitions to Altitude Hold Mode and levels the aircraft.



4) The autopilot flies the holding pattern after the missed approach is activated. Annunciations are displayed in the Navigation Status Box, above the AFCS Status Box.



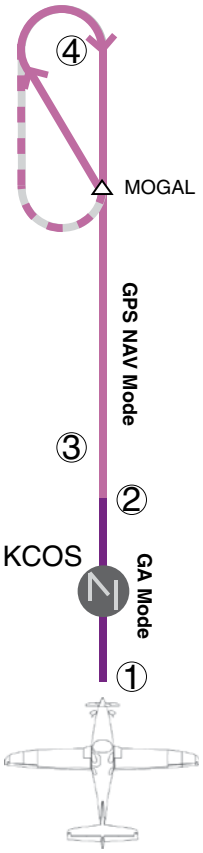


Figure 7-40 Go Around/Missed Approach

7.7 AFCS ANNUNCIATIONS AND ALERTS

AFCS STATUS ALERTS

The annunciations in Table 7-5 (listed in order of increasing priority) can appear on the PFD above the Airspeed and Attitude indicators. Only one annunciation may occur at a time, and messages are prioritized by criticality.

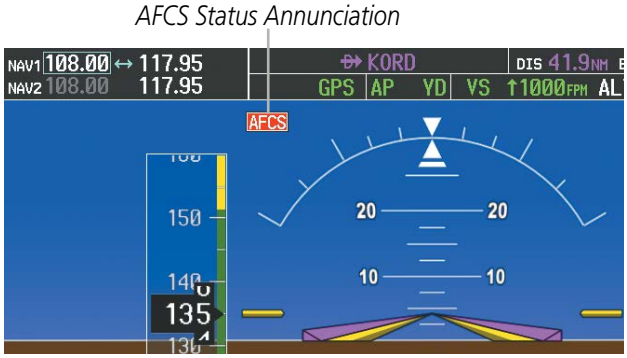


Figure 7-41 AFCS Status Annunciation

Alert Condition	Annunciation	Description
Aileron Mistrim Right	AIL→	Roll servo providing sustained force in indicated direction
Aileron Mistrim Left	←AIL	
Elevator Mistrim Down	↓ELE	Pitch servo providing sustained force in the indicated direction
Elevator Mistrim Up	↑ELE	
Pitch Trim Failure (or Stuck **AP TRIM** Switch)	PTRM	If AP engaged, take control of the aircraft and disengage AP If AP disengaged, move **AP TRIM** switches separately to unstick
Yaw Damper Failure	YAW	YD control failure
Roll Failure	ROLL	Roll axis control failure; AP inoperative
Pitch Failure	PTCH	Pitch axis control failure; AP inoperative
System Failure	AFCS	AP and MET are unavailable; FD may still be available
Preflight Test	PFT	Performing preflight system test; aural alert sounds at completion Do not press the **AP DISC** Switch during servo power-up and preflight system tests. Doing so may cause the preflight system test to fail or never to start. Cycle power to the servos if this occurs.
	PFT	Preflight system test failed; aural alert sounds at failure

Table 7-6 AFCS Status Alerts

OVERSPEED PROTECTION

NOTE: *Overspeed protection is not active in Altitude Hold, Glideslope or Glidepath Modes.*

While Pitch Hold, Vertical Speed, Flight Level Change, Vertical Path Tracking, or an altitude capture mode is active, airspeed is monitored by the flight director and pitch commands are limited for overspeed protection. Overspeed protection is provided in situations where the flight director cannot acquire and maintain the mode reference for the selected vertical mode without exceeding the certified maximum autopilot airspeed.

When an autopilot overspeed condition occurs, the Airspeed Reference appears in a box above the Airspeed Indicator, flashing a yellow 'MAXSPD' annunciation. Engine power should be reduced and/or the pitch reference adjusted to slow the aircraft. The annunciation disappears when the overspeed condition is resolved.



Figure 7-42 Overspeed Annunciation

Blank Page

SECTION 8 ADDITIONAL FEATURES

NOTE: *With the availability of SafeTaxi®, ChartView, or FliteCharts®, it may be necessary to carry another source of charts on-board the aircraft.*

Additional features of the G900X include the following:

- Synthetic Vision Technology (SVT)
- SafeTaxi® diagrams
- ChartView and FliteCharts® electronic charts
- Airport Directory
- Satellite telephone and SMS messaging services
- SiriusXM Satellite Radio entertainment
- Bluetooth® Management using a Flight Stream 210 (Optional)
- Scheduler
- Flight Data Logging

The optional Synthetic Vision Technology (SVT) provides a three-dimensional forward view of terrain features on the PFD. SVT imagery shows the pilot's view of relevant features in relation to the aircraft attitude, as well as the flight path pertaining to the active flight plan.

SafeTaxi diagrams provide detailed taxiway, runway, and ramp information at more than 700 airports in the United States. By decreasing range on an airport that has a SafeTaxi diagram available, a close up view of the airport layout can be seen.

The optional ChartView and FliteCharts provide on-board electronic terminal procedures charts. Electronic charts offer the convenience of rapid access to essential information. Either ChartView or FliteCharts may be configured in the system, but not both.

The AOPA and optional AC-U-KWIK Airport Directories offer detailed information for a selected airport, such as available services, hours of operation, and lodging options. Either the AOPA or AC-U-KWIK database may be installed, but not both simultaneously.

Satellite telephone and SMS messaging service is available with an optional subscription service.

The optional SiriusXM Satellite Radio entertainment audio feature of the GDL 69A Data Link Receiver offers more than 170 channels of music, news, and sports. SiriusXM Satellite Radio offers more entertainment choices and longer range coverage than commercial broadcast stations.

The optional Flight Stream 210 device provides a Bluetooth® connection between the G900 and a mobile device running the Garmin Pilot™ application. GPS, AHRS, ADS-B, and FIS-B weather data can then be shared with the mobile device. Also, flight plans can be transferred from the mobile device to the G900X.

The Scheduler feature can be used to enter and display short term or long term reminder messages such as maintenance phase checks or other events in the Messages Window on the PFD.

The Flight Data Logging feature automatically stores critical flight and engine data on an SD data card. Approximately 1,000 flight hours can be recorded for each 1GB of available space on the card.

8.1 SYNTHETIC VISION TECHNOLOGY (SVT)

NOTE: *SVT requires a terrain database that has a resolution of nine arc-seconds.*

WARNING: *Use appropriate primary systems for navigation, and for terrain, obstacle, and traffic avoidance. SVT is intended as an aid to situational awareness only and may not provide either the accuracy or reliability upon which to solely base decisions and/or plan maneuvers to avoid terrain, obstacles, or traffic.*

The optional Synthetic Vision Technology (SVT) is a visual enhancement to the G900X Integrated Flight Deck. SVT depicts a forward-looking attitude display of the topography immediately in front of the aircraft. The field of view is 30 degrees to the left and 35 degrees to the right. SVT information is shown on the Primary Flight Display (PFD), or on the Multifunction Display (MFD) in Reversionary Mode (Figure 8-101). The depicted imagery is derived from the aircraft attitude, heading, GPS three-dimensional position, and a nine arc-second database of terrain, obstacles, and other relevant features. The terrain data resolution of nine arc-seconds, meaning that the terrain elevation contours are stored in squares measuring nine arc-seconds on each side, is required for the operation of SVT. Loss of any of the required data, including temporary loss of the GPS signal, will cause SVT to be disabled until the required data is restored.

The SVT terrain display shows land contours (colors are consistent with those of the topographical map display), large water features, towers, and other obstacles over 200' AGL that are included in the obstacle database. Cultural features on the ground such as roads, highways, railroad tracks, cities, and state boundaries are not displayed even if those features are found on the MFD map. The terrain display also includes a north–south east–west grid with lines oriented with true north and spaced at one arc-minute intervals to assist in orientation relative to the terrain.

The optional Terrain Awareness and Warning System (TAWS) or standard Terrain-SVT is integrated within SVT to provide visual and auditory alerts to indicate the presence of terrain and obstacle threats relevant to the projected flight path. Terrain alerts are displayed in red and yellow shading on the PFD.

The terrain display is intended for situational awareness only. It may not provide the accuracy or fidelity on which to base decisions and plan maneuvers to avoid terrain or obstacles. Navigation must not be predicated solely upon the use of the Terrain–SVT or TAWS terrain or obstacle data displayed by the SVT.

The following SVT enhancements appear on the PFD:

- Pathways
- Flight Path Marker
- Horizon Heading Marks
- Traffic Display
- Airport Signs
- Runway Display
- Terrain Alerting
- Obstacle Alerting

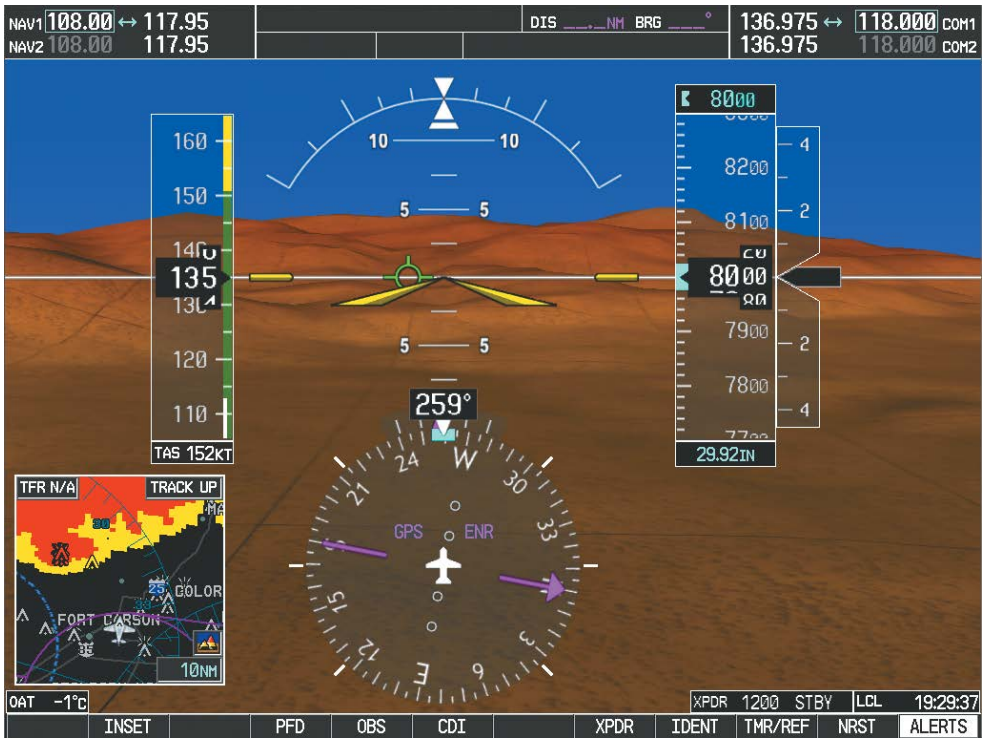


Figure 8-1 Synthetic Vision Imagery

SVT OPERATION

SVT is activated from the PFD using the softkeys located along the bottom edge of the display. Pressing the softkeys turns the related function on or off. When SVT is enabled, the pitch ladder increments are reduced to 10 degrees up and 7.5 degrees down.

SVT functions are displayed on three levels of softkeys. The **PFD** Softkey leads into the PFD function Softkeys, including synthetic vision. Pressing the **SYN VIS** Softkey displays the SVT feature softkeys. The softkeys are labeled **PATHWAY**, **SYN TERR**, **HRZN HDG**, and **APTSIGNS**. The **BACK** Softkey returns to the previous level of softkeys. Synthetic Terrain must be active before any other SVT feature may be activated.

HRZN HDG, **APTSIGNS**, and **PATHWAY** Softkeys are only available when the **SYN TERR** Softkey is activated (gray with black characters). After activating the **SYN TERR** Softkey, the **HRZN HDG**, **APTSIGNS**, and **PATHWAY** softkeys may be activated in any combination to display desired features. When system power is cycled, the last selected state (on or off) of the **SYN TERR, HRZN HDG**, **APTSIGNS**, and **PATHWAY** softkeys is remembered by the system.

- **PATHWAY** Softkey enables display of rectangular boxes that represent course guidance.
- **SYN TERR** Softkey enables synthetic terrain depiction.
- **HRZN HDG** Softkey enables horizon heading marks and digits.
- **APTSIGNS** Softkey enables airport signposts.

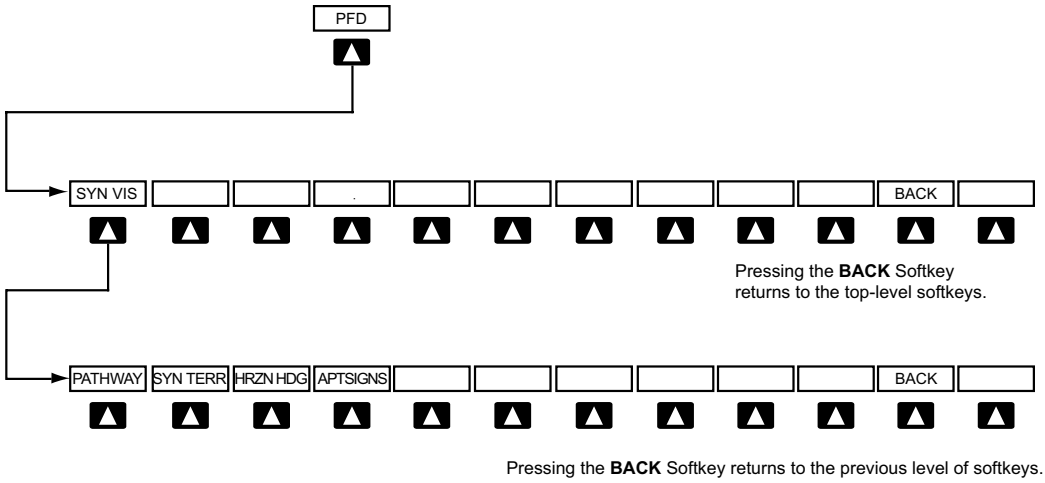


Figure 8-2 SVT Softkeys

Activating and deactivating SVT:

1) Press the **PFD** Softkey.
2) Press the **SYN VIS** Softkey.
3) Press the **SYN TERR** Softkey. The SVT display will cycle on or off with the **SYN TERR** Softkey.

Activating and deactivating Pathways:

1) Press the **PFD** Softkey.
2) Press the **SYN VIS** Softkey.
3) Press the **PATHWAY** Softkey. The Pathway feature will cycle on or off with the **PATHWAY** Softkey.

Activating and deactivating Horizon Headings:

1) Press the **PFD** Softkey.
2) Press the **SYN VIS** Softkey.
3) Press the **HRZN HDG** Softkey. The horizon heading display will cycle on or off with the **HRZN HDG** Softkey.

Activating and deactivating Airport Signs:

1) Press the **PFD** Softkey.
2) Press the **SYN VIS** Softkey.
3) Press the **APTSIGNS** Softkey. Display of airport signs will cycle on or off with the **APTSIGNS** Softkey.

SVT FEATURES

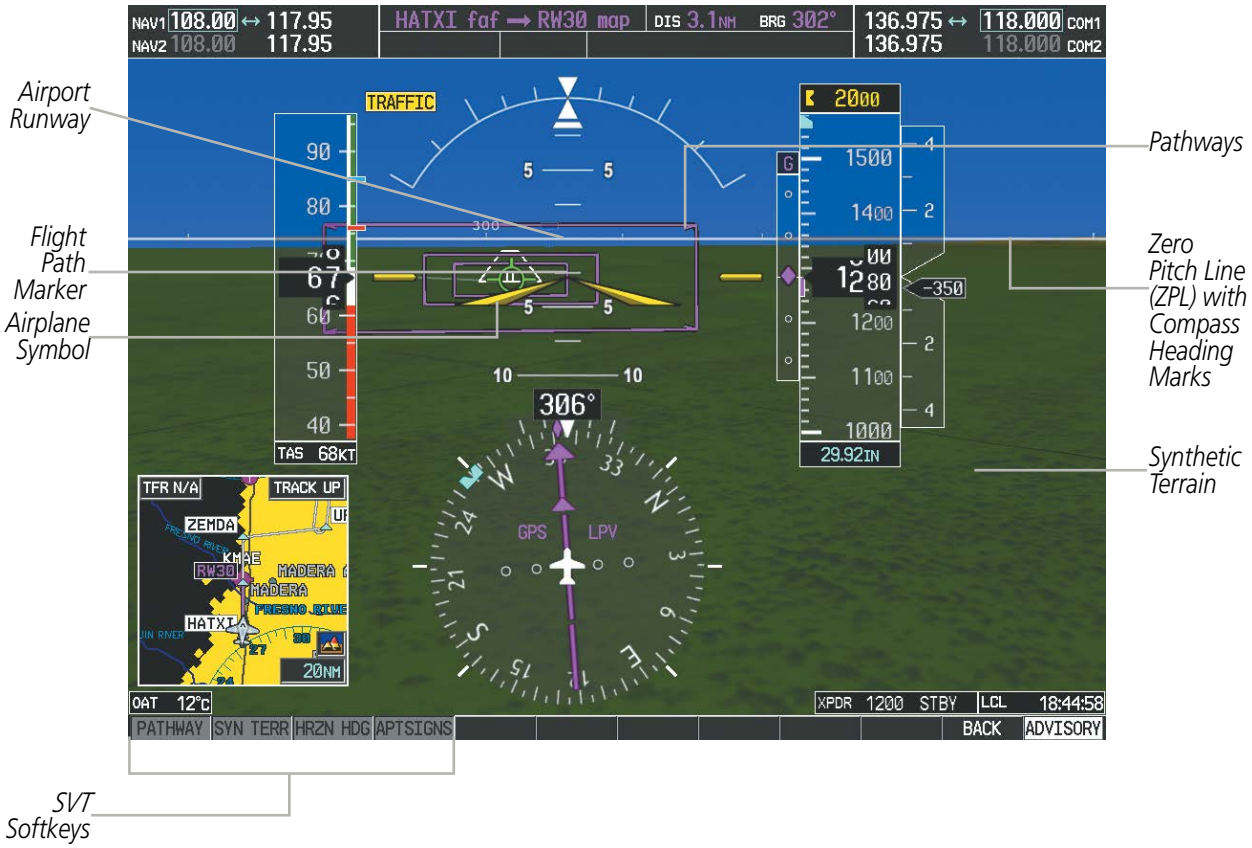


Figure 8-3 SVT on the Primary Flight Display

NOTE: *Pathways and terrain features are not a substitute for standard course and altitude deviation information provided by the altimeter, CDI, and VDI.*

PATHWAYS

Pathways provide a three-dimensional perspective view of the selected route of flight shown as colored rectangular boxes representing the horizontal and vertical flight path of the active flight plan. The box size represents 700 feet wide by 200 feet tall during enroute, oceanic, and terminal flight phases. During an approach, the box width is 700 feet or one half full scale deviation on the HSI, whichever is less. The height is 200 feet or one half full scale deviation on the VDI, whichever is less. The altitude at which the pathway boxes are displayed is determined by the selected altitude during climb, cruise, and when the active leg is the final approach course prior to intercepting the glidepath/glideslope. During a descent (except while on the approach glidepath/glideslope), the pathway boxes are displayed at the selected altitude, or the VNAV altitude programmed for the active leg in the flight plan, or the published altitude constraint, whichever is higher (Figure 8-4). Just prior to intercepting the glidepath/glideslope, the pathway boxes are displayed on the glidepath/glideslope, or the selected altitude, whichever is lower.

The color of the rectangular boxes may be magenta, green, or white depending on the route of flight and navigation source selected. The active GPS or GPS overlay flight plan leg is represented by magenta boxes that correspond to the Magenta CDI. A localizer course is represented by green boxes that correspond to a green CDI. An inactive leg of an active flight plan is represented by white boxes corresponding to a white line drawn on the Inset map or MFD map indicating an inactive leg.

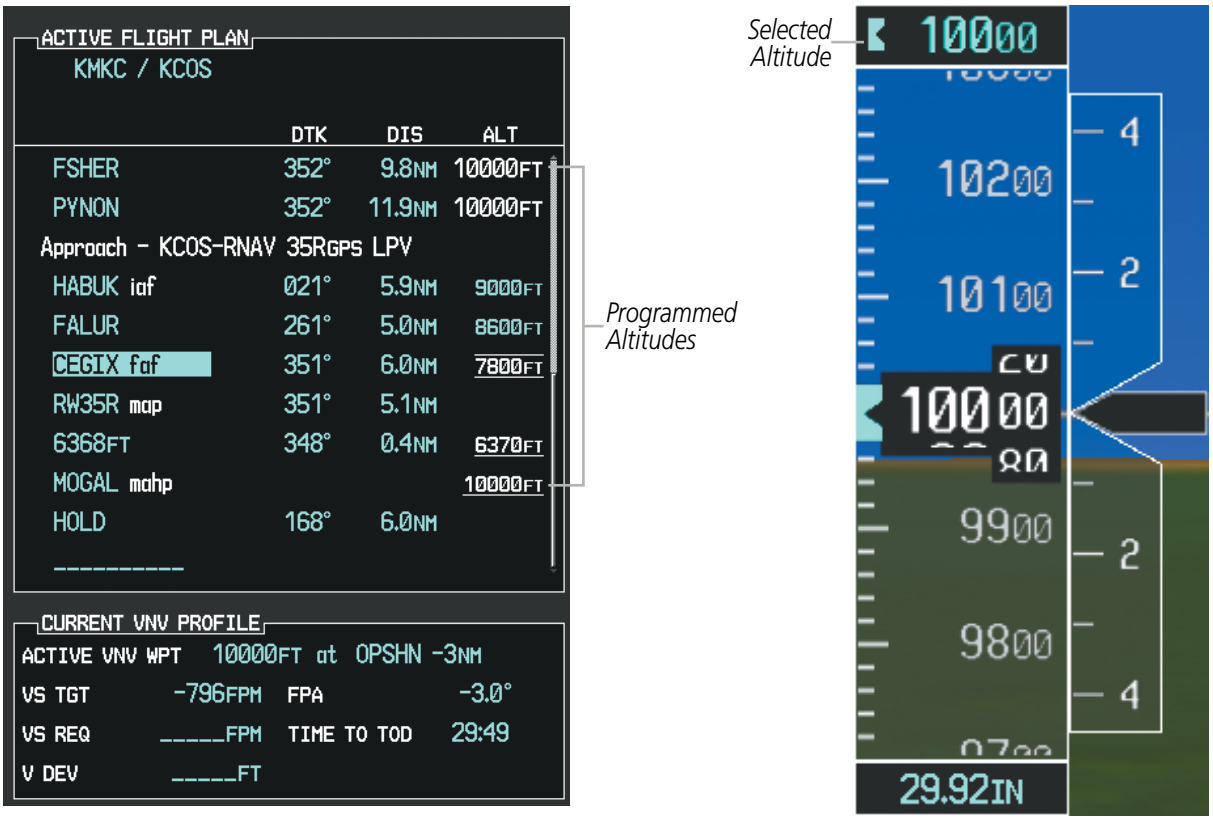


Figure 8-4 Programmed and Selected Altitude

Pathways provide supplemental glidepath/glideslope information on an active ILS, LPV, LNAV/VNAV, and some LNAV approaches. Pathways are intended as an aid to situational awareness and should not be used independent of the CDI, VDI, glide path indicator, and glide slope indicator. They are removed from the display when the selected navigation information is not available. Pathways are not displayed beyond the active leg when leg sequencing is suspended and are not displayed on any portion of the flight plan leg that would lead to intercepting a leg in the wrong direction.

Departure and Enroute

Prior to intercepting an active flight plan leg, pathways are displayed as a series of boxes with pointers at each corner that point in the direction of the active waypoint. Pathways are not displayed for the first leg of the flight plan if that segment is a Heading-to-Altitude leg. The first segment displaying pathways is the first active GPS leg or active leg with a GPS overlay. If this leg of the flight plan route is outside the SVT field of view, pathways will not be visible until the aircraft has turned toward this leg. While approaching the center of the active leg and prescribed altitude, the number of pathway boxes decreases to a minimum of four.

Climb profiles cannot be displayed due to the variables associated with aircraft performance. Flight plan legs requiring a climb are indicated by pathways displayed at a level above the aircraft at the altitude selected or programmed.

Descent and Approach

Pathways are shown descending only for a programmed descent (Figures 8-5, 8-6). When the flight plan includes programmed descent segments, pathways are displayed along the descent path provided that the selected altitude is lower than the programmed altitude.

When an approach providing vertical guidance is activated, Pathways are shown level at the selected altitude up to the point along the final approach course where the altitude intercepts the extended vertical descent path, glidepath, or glideslope. From the vertical path descent, glidepath, or glideslope intercept point, the pathways are shown inbound to the Missed Approach Point (MAP) along the published lateral and vertical descent path, or at the selected altitude, whichever is lower.

During an ILS approach, the initial approach segment is displayed in magenta at the segment altitudes if GPS is selected as the navigation source on the CDI. When switching to localizer inbound with LOC selected as the navigation source on the CDI, pathways are displayed in green along the localizer and glide slope.

VOR, LOC BC, and ADF approach segments that are approved to be flown using GPS are displayed in magenta boxes. Segments that are flown using other than GPS or ILS, such as heading legs or VOR final approach courses are not displayed.

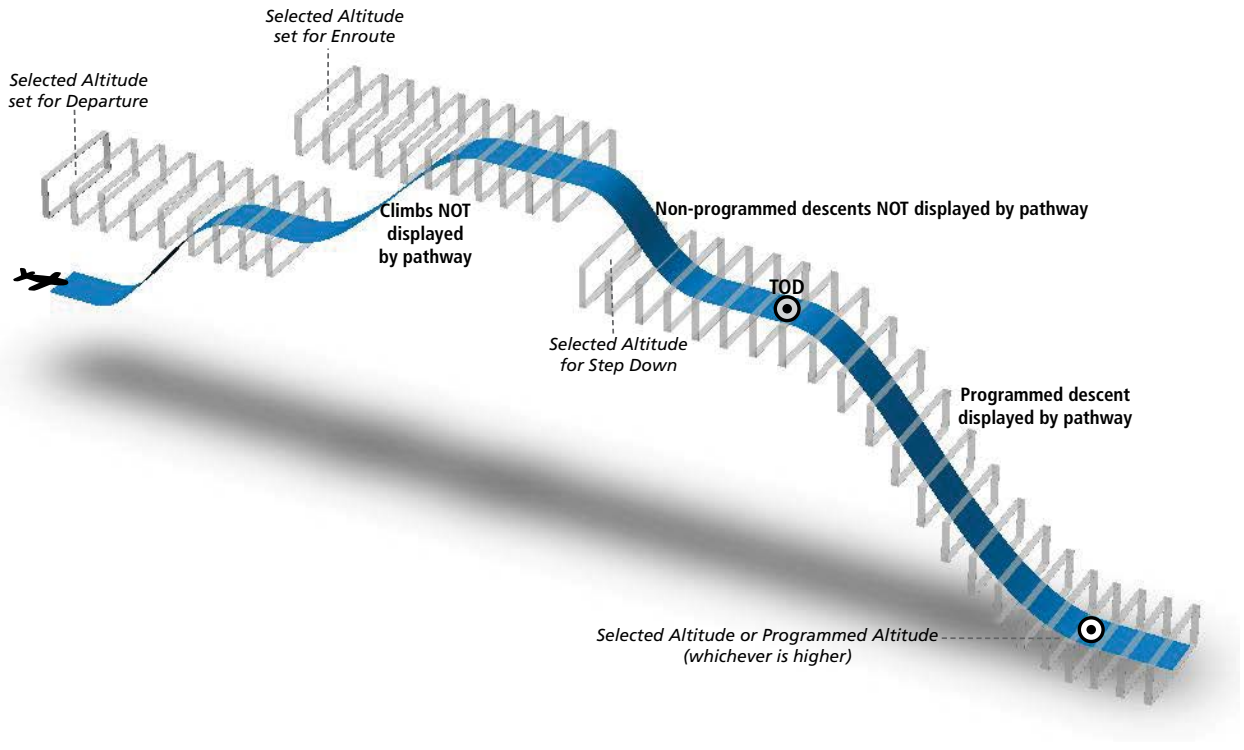


Figure 8-5 SVT Pathways, Enroute and Descent

Missed Approach

Upon activating the missed approach, pathways lead to the Missed Approach Holding Point (MAHP) and are displayed as a level path at the published altitude for the MAHP, or the selected altitude, whichever is the highest. If the initial missed approach leg is a Course-to-Altitude (CA) leg, the pathways boxes will be displayed level at the altitude published for the MAHP. If the initial missed approach leg is defined by a course using other than GPS, pathways are not displayed for that segment. In this case, the pathways displayed for the next leg may be outside the field of view and will be visible when the aircraft has turned in the direction of that leg.

Pathways are displayed along each segment including the path required to track course reversals that are part of a procedure, such as holding patterns. Pathways boxes will not indicate a turn to a MAHP unless a defined geographical waypoint exists between the MAP and MAHP.

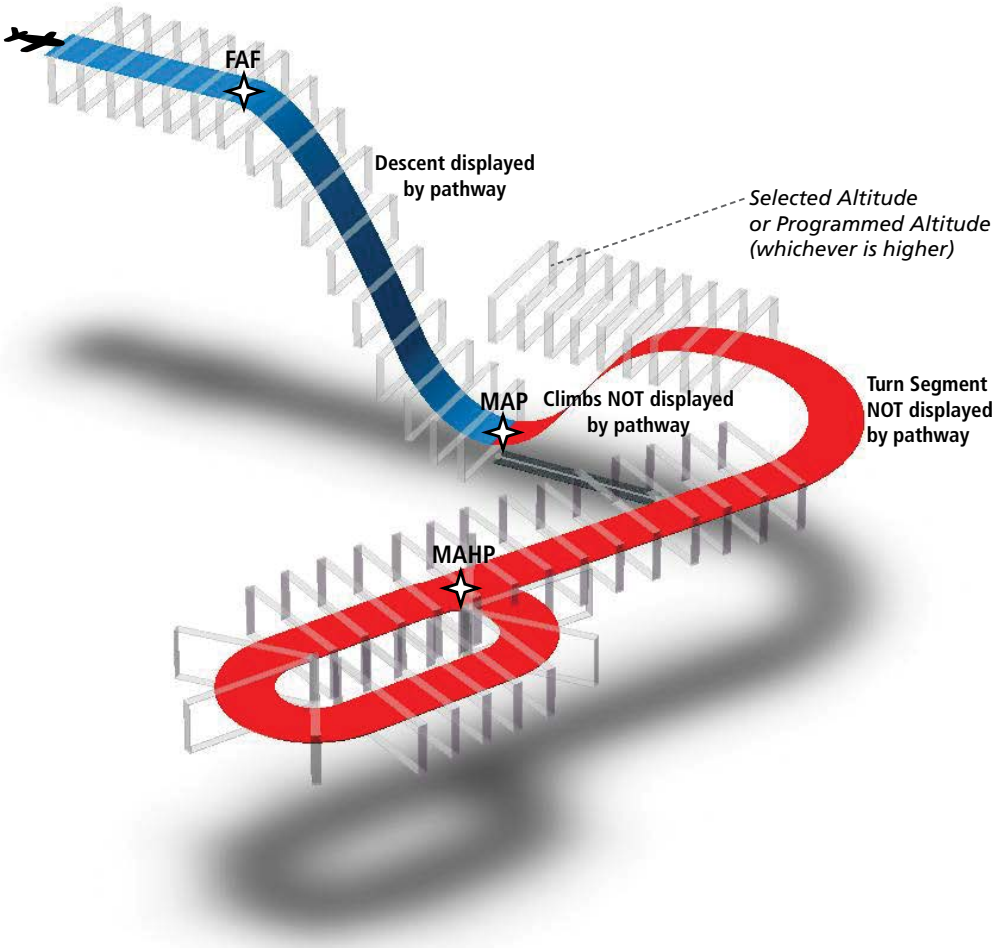


Figure 8-6 SVT Pathways, Approach, Missed Approach, and Holding

FLIGHT PATH MARKER

The Flight Path Marker (FPM), also known as a Velocity Vector, is displayed on the PFD at groundspeeds above 30 knots. The FPM depicts the approximate projected path of the aircraft accounting for wind speed and direction relative to the three-dimensional terrain display.

The FPM is always available when the Synthetic Terrain feature is in operation. The FPM represents the direction of the flight path as it relates to the terrain and obstacles on the display, while the airplane symbol represents the aircraft heading.

The FPM works in conjunction with the Pathways feature to assist the pilot in maintaining desired altitudes and direction when navigating a flight plan. When on course and altitude the FPM is aligned inside the pathway boxes as shown (Figure 8-7).

The FPM may also be used to identify a possible conflict with the aircraft flight path and distant terrain or obstacles. Displayed terrain or obstacles in the aircraft's flight path extending above the FPM could indicate a potential conflict, even before an alert is issued by TAWS. However, decisions regarding terrain and/or obstacle avoidance should not be made using only the FPM.



Figure 8-7 Flight Path Marker and Pathways

ZERO PITCH LINE

The Zero Pitch Line is drawn completely across the display and represents the horizon when the terrain horizon is difficult to distinguish from other terrain being displayed. It may not align with the terrain horizon, particularly when the terrain is mountainous or when the aircraft is flown at high altitudes.

HORIZON HEADING

The Horizon Heading is synchronized with the HSI and shows approximately 60 degrees of compass heading in 30-degree increments on the Zero Pitch Line. Horizon Heading tick marks and digits appearing on the zero pitch line are not visible behind either the airspeed or altitude display. Horizon Heading is used for general heading awareness, and is activated and deactivated by pressing the **HRZN HDG** Softkey.

TRAFFIC

WARNING: *Intruder aircraft at or below 500 ft. AGL may not appear on the SVT display or may appear as a partial symbol.*

Traffic symbols are displayed in their approximate locations as determined by the related traffic systems. Traffic symbols are displayed in three dimensions, appearing larger as they are getting closer, and smaller when they are further away. Traffic symbols and coloring are consistent with that used for traffic displayed in the Inset map or MFD traffic page. If the traffic altitude is unknown, the traffic will not be displayed on the SVT display. For more details refer to the traffic system discussion in the Hazard Avoidance section.

AIRPORT SIGNS

Airport Signs provide a visual representation of airport location and identification on the synthetic terrain display. When activated, the signs appear on the display when the aircraft is approximately 15 nm from an airport and disappear at approximately 4.5 nm. Airport signs are shown without the identifier until the aircraft is approximately eight nautical miles from the airport. Airport signs are not shown behind the airspeed or altitude display. Airport signs are activated and deactivated by pressing the **APTSIGNS** Softkey.

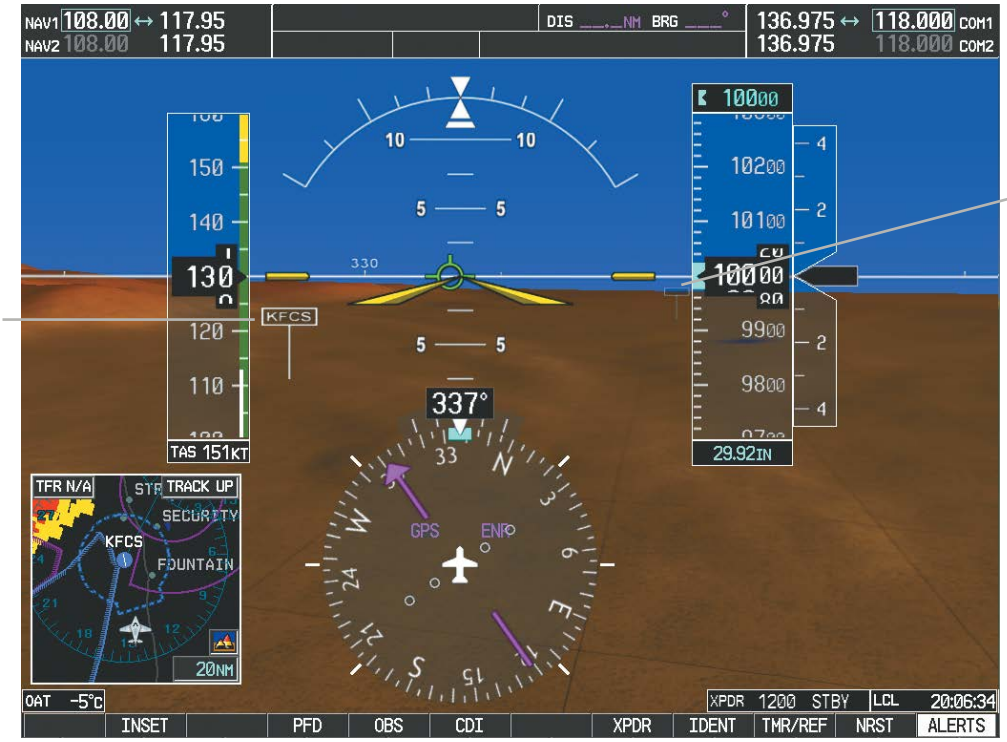


Figure 8-8 Airport Signs

RUNWAYS

WARNING: *Do not use SVT runway depiction as the sole means for determining the proximity of the aircraft to the runway or for maintaining the proper approach path angle during landing.*

NOTE: *Not all airports have runways with endpoint data in the database, therefore, these runways are not displayed.*

Runway data provides improved awareness of runway location with respect to the surrounding terrain. All runway thresholds are depicted at their respective elevations as defined in the database. In some situations, where threshold elevations differ significantly, crossing runways may appear to be layered. As runways are displayed, those within 45 degrees of the aircraft heading are outlined in white. Other runways will be outlined in gray. When an approach for a specific runway is active, that runway will appear brighter and be outlined with a white box, regardless of the runway orientation as related to aircraft heading. As the aircraft gets closer to the runway, more detail such as runway numbers and centerlines will be displayed.



Figure 8-9 Runways

TERRAIN-SVT AND TAWS ALERTING

Terrain alerting on the synthetic terrain display is triggered by Forward-looking Terrain Avoidance (FLTA) alerts, and corresponds to the red and yellow X symbols on the Inset Map and MFD map displays. For more detailed information regarding Terrain-SVT and TAWS, refer to the Hazard Avoidance Section.

In some instances, a terrain or obstacle alert may be issued with no conflict shading displayed on the synthetic terrain. In these cases, the conflict is outside the SVT field of view to the left or right of the aircraft.

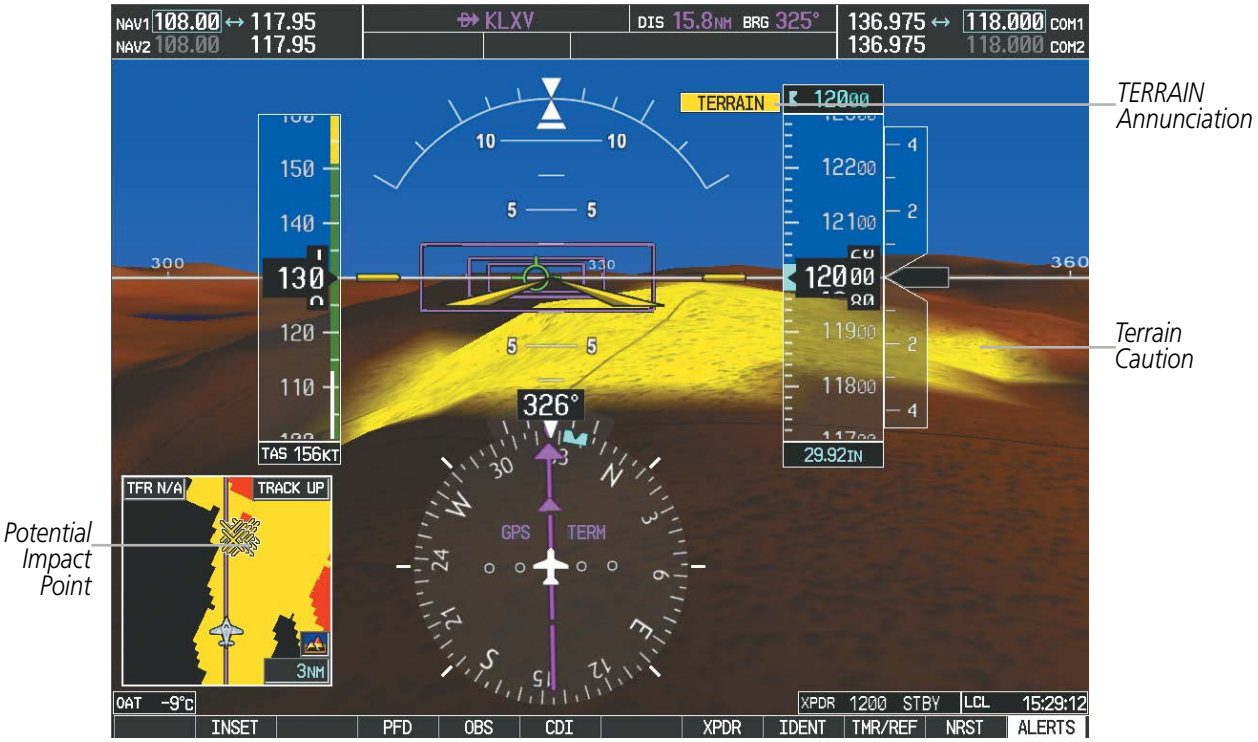


Figure 8-10 Terrain Alert

Obstacles are represented on the synthetic terrain display by standard two-dimensional tower symbols found on the Inset map and MFD maps and charts. Obstacle symbols appear in the perspective view with relative height above terrain and distance from the aircraft. Unlike the Inset map and MFD moving map display, obstacles on the synthetic terrain display do not change colors to warn of potential conflict with the aircraft's flight path until the obstacle is associated with an actual FLTA alert. Obstacles greater than 1000 feet below the aircraft altitude are not shown. Obstacles are shown behind the airspeed and altitude displays.



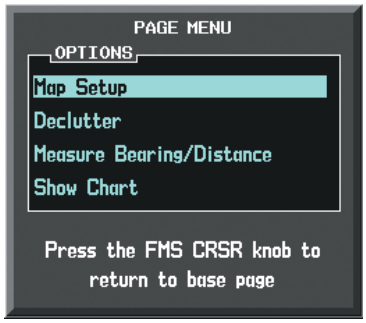
Figure 8-11 Obstacle Alert

FIELD OF VIEW

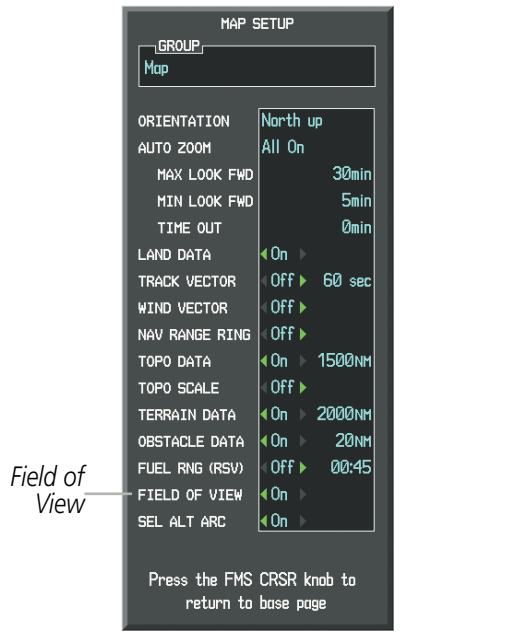
The PFD field of view can be represented on the MFD Navigation Map Page. Two dashed lines forming a V-shape in front of the aircraft symbol on the map, represent the forward viewing area shown on the PFD.

Displaying field of view:

1) While viewing the Navigation Map Page, press the **MENU** Key to display the PAGE MENU.
2) Turn the large **FMS** Knob to highlight Map Setup and press the **ENT** Key.



Navigation Map Page OPTIONS Menu

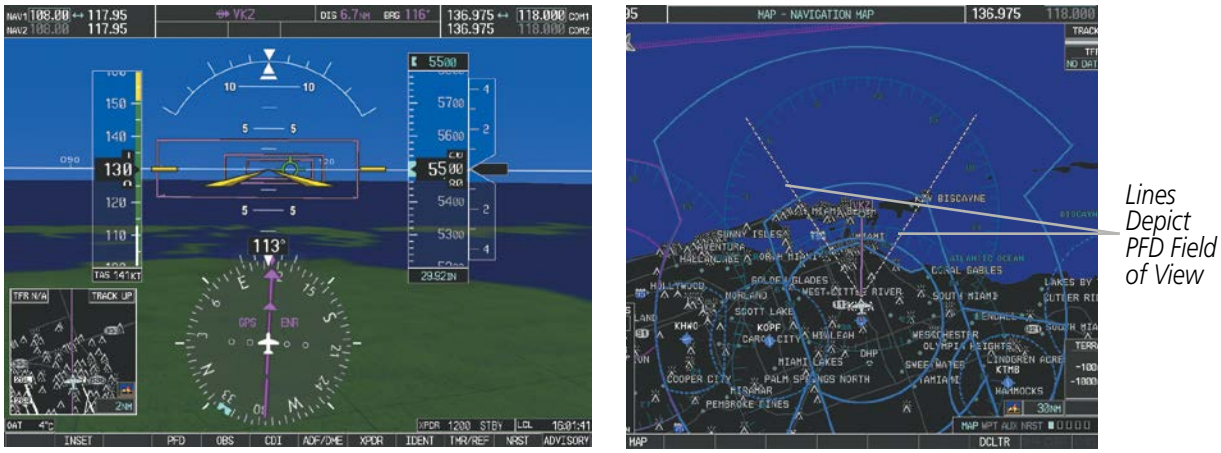


Map Setup Menu, Map Group, Field of View Option

Figure 8-12 Option Menus

3) Turn the **FMS** Knob to select the Map Group and press the **ENT** Key.
4) Turn the large **FMS** Knob to scroll through the Aviation Group options to FIELD OF VIEW.
5) Turn the small **FMS** Knob to select On or Off.
6) Press the **FMS** Knob to return to the Navigation Map Page.

The following figure compares the PFD forward looking depiction with the MFD plan view and FIELD OF VIEW turned on.



SVT View on the PFD

Field of View on the MFD

Figure 8-13 PFD and MFD Field of View Comparison

8.2 SAFETAXI

SafeTaxi is an enhanced feature that gives greater map detail when viewing airports at close range. The maximum map ranges for enhanced detail are pilot configurable. When viewing at ranges close enough to show the airport detail, the map reveals taxiways with identifying letters/numbers, airport Hot Spots, and airport landmarks including ramps, buildings, control towers, and other prominent features. Resolution is greater at lower map ranges. When the MFD display is within the SafeTaxi ranges, the airplane symbol on the airport provides enhanced position awareness.

Designated Hot Spots are recognized at airports with many intersecting taxiways and runways, and/or complex ramp areas. Airport Hot Spots are outlined to caution pilots of areas on an airport surface where positional awareness confusion or runway incursions happen most often. Hot Spots are defined with a magenta circle or outline around the region of possible confusion.

Any map page that displays the navigation view can also show the SafeTaxi airport layout within the maximum configured range. The following is a list of pages where the SafeTaxi feature can be seen:

- Navigation Map Page
- Inset Map (PFD)
- Weather Datalink Page
- Airport Information Page
- Intersection Information Page
- NDB Information Page
- VOR Information Page
- User Waypoint Information Page
- Trip Planning Page
- Nearest Pages
- Active and Stored Flight Plan Pages

During ground operations the aircraft's position is displayed in reference to taxiways, runways, and airport features. In the example shown, the aircraft is on taxiway Bravo inside the High Alert Intersection boundary on KSFO airport. Airport Hot Spots are outlined in magenta. When panning over the airport, features such as runway holding lines and taxiways are shown at the cursor.



Figure 8-14 SafeTaxi Depiction on the Navigation Map Page

The **DCLTR** Softkey (declutter) label advances to DCLTR-1, DCLTR -2, and DCLTR-3 each time the softkey is pressed for easy recognition of decluttering level. Pressing the **DCLTR** Softkey removes the taxiway markings and airport feature labels. Pressing the **DCLTR-1** Softkey removes VOR station ID, the VOR symbol, and intersection names if within the airport plan view. Pressing the **DCLTR-2** Softkey removes the airport runway layout, unless the airport in view is part of an active route structure. Pressing the **DCLTR-3** Softkey cycles back to the original map detail. Refer to Map Declutter Levels in the Flight Management Section.

Configuring SafeTaxi range:

1) While viewing the Navigation Map Page, press the **MENU** Key to display the PAGE MENU.
2) Turn the large **FMS** Knob to highlight the Map Setup Menu Option and press the **ENT** Key.

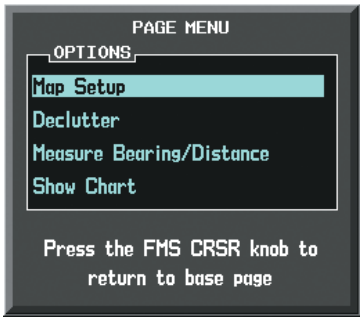


Figure 8-15 Navigation Map PAGE MENU, Map Setup Option

3) Turn the **FMS** Knob to select the Aviation Group and press the **ENT** Key.
4) Turn the large **FMS** Knob to scroll through the Aviation Group options to SAFETAXI.
5) Turn the small **FMS** Knob to display the range of distances.
6) Turn either **FMS** Knob to select the desired distance for maximum SafeTaxi display range.
7) Press the **ENT** Key to complete the selection.
8) Press the **FMS** Knob to return to the Navigation Map Page.

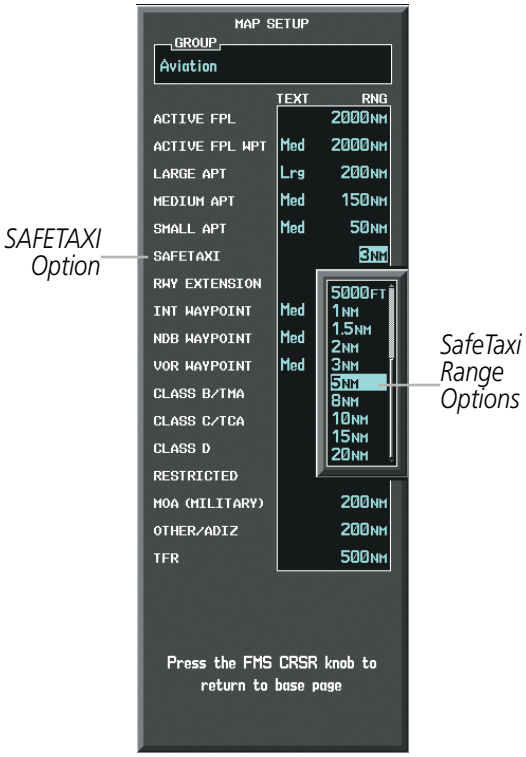


Figure 8-16 MAP SETUP Menu, Aviation Group, SAFETAXI Range Options

SAFETAXI CYCLE NUMBER AND REVISION

SafeTaxi database is revised every 56 days. SafeTaxi is always available for use after the expiration date. When turning on the system, the Power-up Page indicates whether the databases are current, out of date, or not available.



Figure 8-17 Power-up Page, SafeTaxi Database

Power-up Page Display	Definition
SafeTaxi Expires 10-MAR-2012	Normal operation. SafeTaxi database is valid and within current cycle.
SafeTaxi Expires 10-MAR-2012	SafeTaxi database has expired.
SafeTaxi: N/A	Database card contains no SafeTaxi data.

Table 8-1 SafeTaxi Annunciation Definitions

The SafeTaxi Region, Version, Cycle, Effective date and Expires date of the database cycle can also be found on the AUX - System Status page, as seen in Figure 8-18.

Press the **MFD1 DB** Softkey to place the cursor in the DATABASE window. Scroll through the listed information by turning the **FMS** Knob or pressing the **ENT** Key until the SafeTaxi database information is shown.

The SafeTaxi database cycle number shown in the figure, 12S1, is deciphered as follows:

12 – Indicates the year 2012

S – Indicates the data is for SafeTaxi

1 – Indicates the first issue of the SafeTaxi database for the year

The SafeTaxi EFFECTIVE date 13–JAN–12 is the beginning date for the current database cycle. SafeTaxi EXPIRES date 10–MAR–12 is the revision date for the next database cycle.

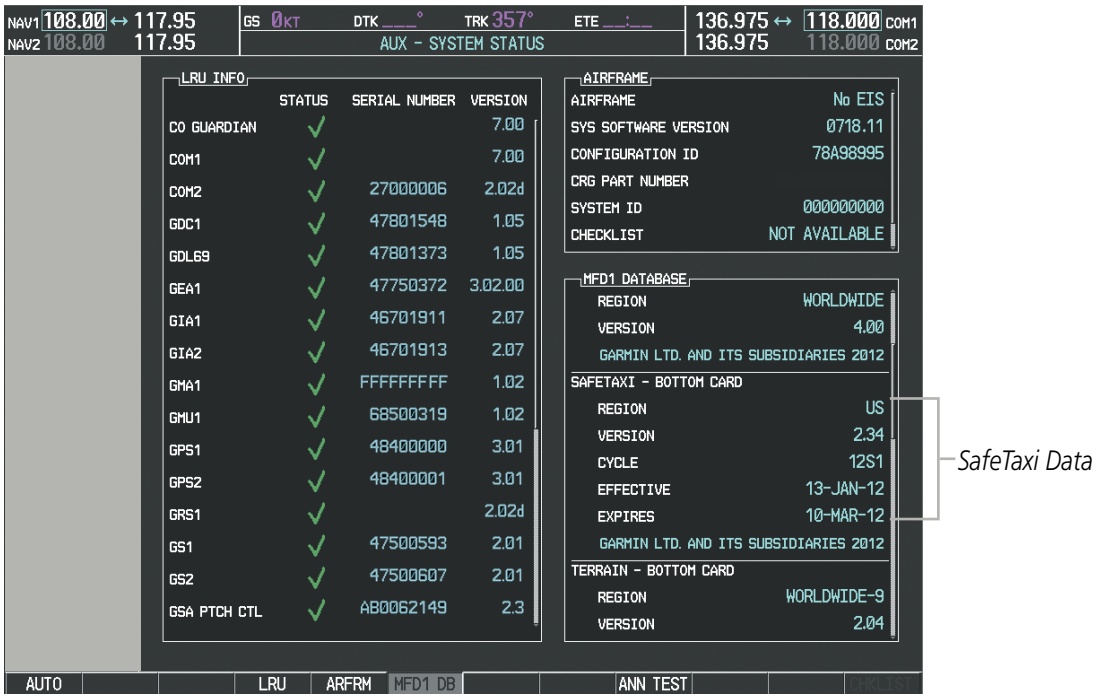


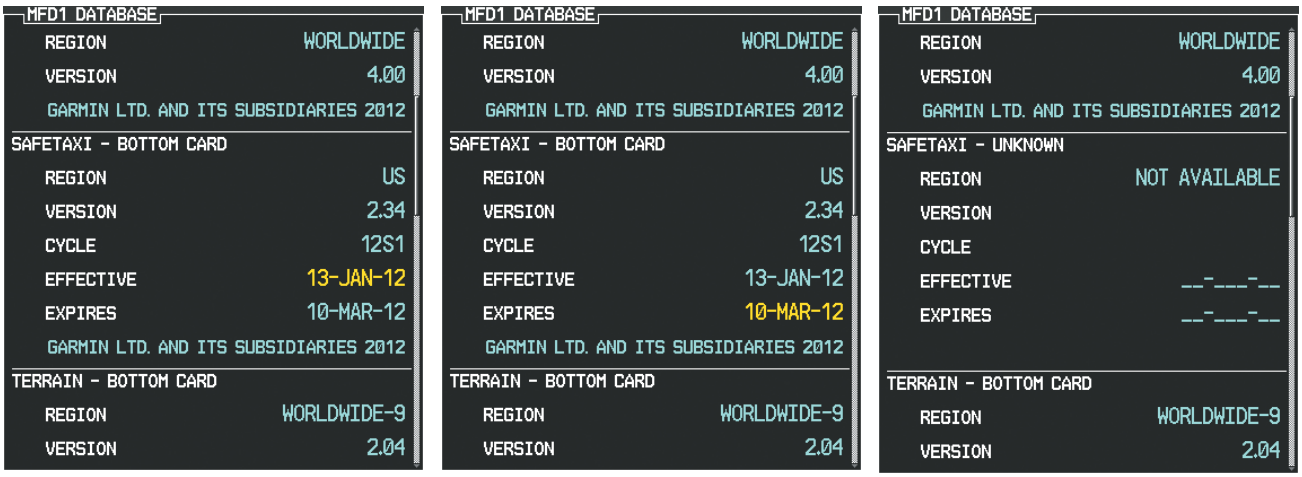
Figure 8-18 AUX – System Status Page, SafeTaxi Current Information

SafeTaxi information appears in blue and yellow text. The EFFECTIVE date appears in blue when data is current and in yellow when the current date is before the effective date. The EXPIRES date appears in blue when data is current and in yellow when expired (Figures 8-18 and 8-19). NOT AVAILABLE appears in blue in the REGION field if SafeTaxi data is not available on the database card (Figure 8-19). An expired SafeTaxi database is not disabled and will continue to function indefinitely.

Press the **MFD1 DB** Softkey a second time. The softkey label will change to **PFD1 DB**. The DATABASE window will now be displaying database information for PFD1. As before, scroll through the listed information by turning the **FMS** Knob or pressing the **ENT** Key until the SafeTaxi database information is shown.

Refer to Updating Garmin Databases in Appendix B for instructions on revising the SafeTaxi database.

Figure 8-19 illustrates possible SafeTaxi database conditions that may appear on the AUX - System Status Page. The EFFECTIVE date is the beginning date for this database cycle. If the present date is before the effective date, the EFFECTIVE date appears in yellow and the EXPIRES date appears in blue. The EXPIRES date is the revision date for the next database cycle. NOT AVAILABLE indicates that SafeTaxi is not available on the database card or no database card is inserted.



Current Date is before Effective Date *SafeTaxi Database has Expired* *SafeTaxi Database Not Installed*

Figure 8-19 AUX – System Status Page, SafeTaxi Database Status

8.3 CHARTVIEW

ChartView resembles the paper version of Jeppesen terminal procedures charts. The charts are displayed in full color with high-resolution. The MFD depiction shows the aircraft position on the moving map in the planview of approach charts and on airport diagrams. Airport Hot Spots are outlined in magenta.

The geo-referenced aircraft position is indicated by an aircraft symbol displayed on the chart when the current position is within the boundaries of the chart. Inset boxes (Figure 8-20) are not considered within the chart boundaries. Therefore, when the aircraft symbol reaches a chart boundary line, or inset box, the aircraft symbol is removed from the display.

Figure 8-20 shows examples of off-scale areas, indicated by the grey shading. Note, the grey shading is for illustrative purposes only and will not appear on the published chart or MFD display. These off-scale areas appear on the chart to convey supplemental information. However, the depicted geographical position of this information, as it relates to the chart planview, is not the actual geographic position. Therefore, when the aircraft symbol appears within one of these areas, the aircraft position indicated is relative to the chart planview, not to the off-scale area.

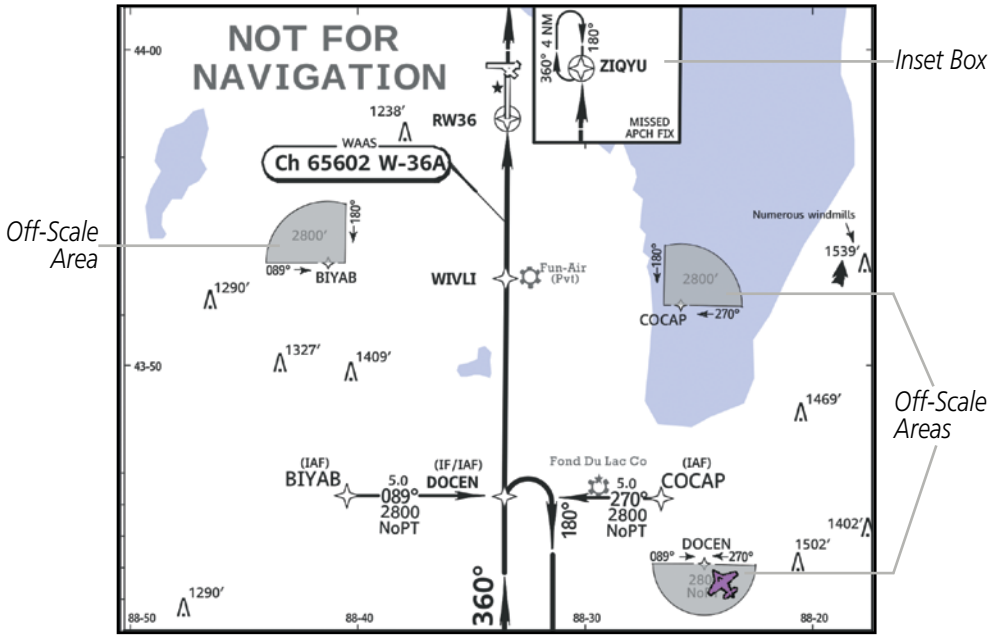


Figure 8-20 Sample Chart Indicating Off-Scale Areas

NOTE: *Do not maneuver the aircraft based solely upon the geo-referenced aircraft symbol.*

The ChartView database subscription is available from Jeppesen, Inc. Available data includes:

- Arrivals (STAR)
- Departure Procedures (DP)
- Approaches
- Airport Diagrams
- NOTAMs

CHARTVIEW SOFTKEYS

ChartView functions are displayed on three levels of softkeys. While on the Navigation Map Page, Nearest Airports Page, or Flight Plan Page, pressing the **SHW CHRT** Softkey displays the available terminal chart and advances to the chart selection level of softkeys: **CHRT OPT**, **CHRT**, **INFO**, **DP**, **STAR**, **APR**, **WX**, **NOTAM**, and **GO BACK**. The chart selection softkeys shown below appear on the Airport Information Page.

Pressing the **GO BACK** Softkey reverts to the top level softkeys and previous page.

Pressing the **CHRT OPT** Softkey advances to the next level of softkeys: **ALL**, **HEADER**, **PLAN**, **PROFILE**, **MINIMUMS**, **FIT WDTH**, **FULL SCN**, and **BACK**.

While viewing the **CHRT OPT** Softkeys, after 45 seconds of softkey inactivity, the system reverts to the chart selection softkeys.

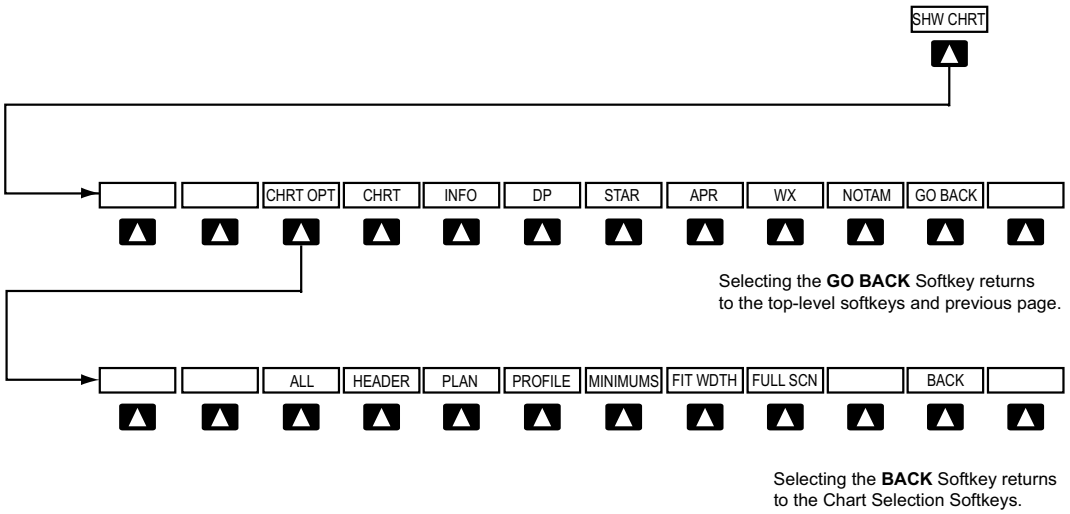


Figure 8-21 ChartView SHW CHRT, Chart Selection, and Chart Option Softkeys

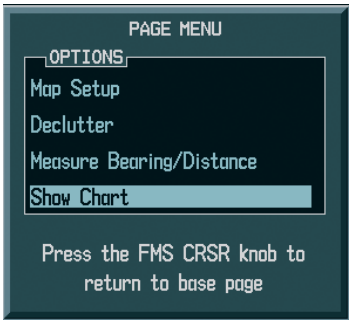
TERMINAL PROCEDURES CHARTS

Selecting Terminal Procedures Charts:

While viewing the Navigation Map Page, Nearest Airport Page, or Flight Plan Page, press the **SHW CHRT** Softkey.

Or:

1) Press the **MENU** Key to display the PAGE MENU.
2) Turn the large **FMS** Knob to scroll through the OPTIONS Menu to Show Chart.
3) Press the **ENT** Key to display the chart.



Navigation Map Page OPTIONS Menu



Waypoint Airport Information Page OPTIONS Menu

Figure 8-22 Option Menus

When no terminal procedure chart is available for the nearest airport or the selected airport, the banner CHART NOT AVAILABLE appears on the screen. The CHART NOT AVAILABLE banner does not refer to the Jeppesen subscription, but rather the availability of a particular airport chart selection or procedure for a selected airport.



Figure 8-23 Chart Not Available Banner

If there is a problem in rendering the data (such as a data error or a failure of an individual chart), the banner UNABLE TO DISPLAY CHART is then displayed.



Figure 8-24 Unable To Display Chart Banner

When a chart is not available by pressing the **SHW CHRT** Softkey or selecting a Page Menu Option, charts may be obtained for other airports from the WPT Pages or Flight Plan Pages.

If a chart is available for the destination airport, or the airport selected in the active flight plan, the chart appears on the screen. When no flight plan is active, or when not flying to a direct-to destination, pressing the **SHW CHRT** Softkey displays the chart for the nearest airport, if available.

The chart shown is one associated with the WPT – Airport Information page. Usually this is the airport runway diagram. Where no runway diagram exists, but Take Off Minimums or Alternate Minimums are available, that page appears. If Airport Information pages are unavailable, the Approach Chart for the airport is shown.

Selecting a chart:

1) While viewing the Navigation Map Page, Flight Plan Page, or Nearest Airports Page, press the **SHW CHRT** Softkey. The airport diagram or approach chart is displayed on the Airport Information Page.
2) Press the **FMS** Knob to activate the cursor.
3) Turn the large **FMS** Knob to select either the Airport Identifier Box or the Approach Box. (Press the **APR** Softkey if the Approach Box is not currently shown).
4) Turn the small and large **FMS** Knob to enter the desired airport identifier.
5) Press the **ENT** Key to complete the airport selection.
6) Turn the large **FMS** Knob to select the Approach Box.
7) Turn the small **FMS** Knob to show the approach chart selection choices.
8) Turn either **FMS** Knob to scroll through the available charts.
9) Press the **ENT** Key to complete the chart selection.

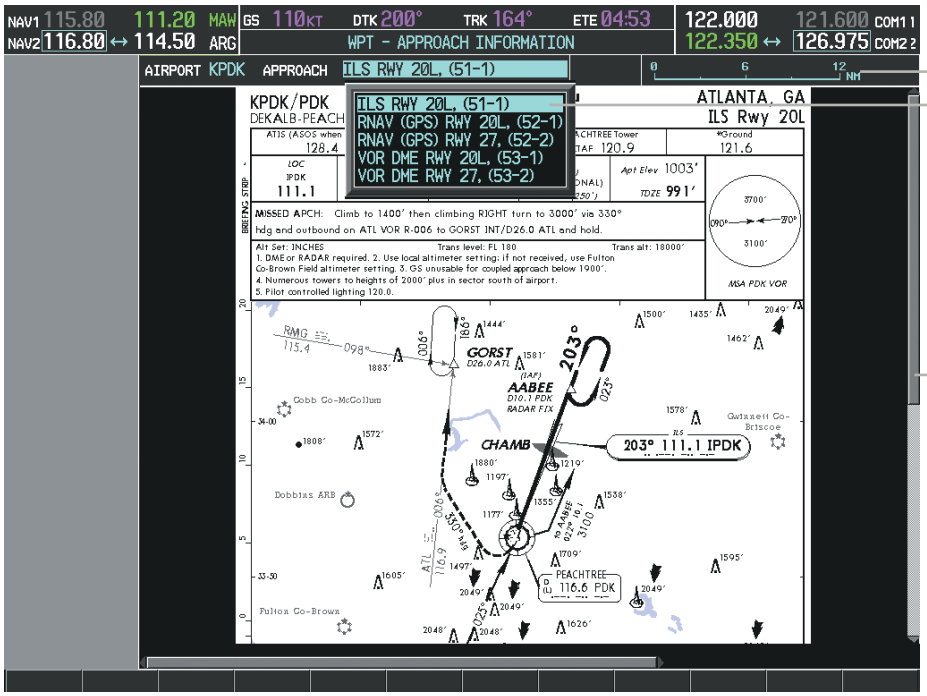


Figure 8-25 Approach Information Page, Chart Selection

While the APPROACH Box is selected using the **FMS** Knob, the G900X softkeys are blank. Once the desired chart is selected, the chart scale can be changed and the chart page can be scrolled using the **Joystick**. Pressing the **Joystick** centers the chart on the screen.

The aircraft symbol is shown on the chart only if the chart is to scale and the aircraft position is within the boundaries of the chart. The aircraft symbol is not displayed when the Aircraft Not Shown Icon appears (Figure 8-29). If the Chart Scale Box displays a banner NOT TO SCALE, the aircraft symbol is not shown. The Aircraft Not Shown Icon may appear at certain times, even if the chart is displayed to scale.

Pressing the **CHRT** Softkey switches between the ChartView diagram and the associated map in the WPT page group. In the example shown, the **CHRT** Softkey switches between the DeKalb Peachtree (KPDK) Airport Diagram and the navigation map on the WPT – Airport Information page.

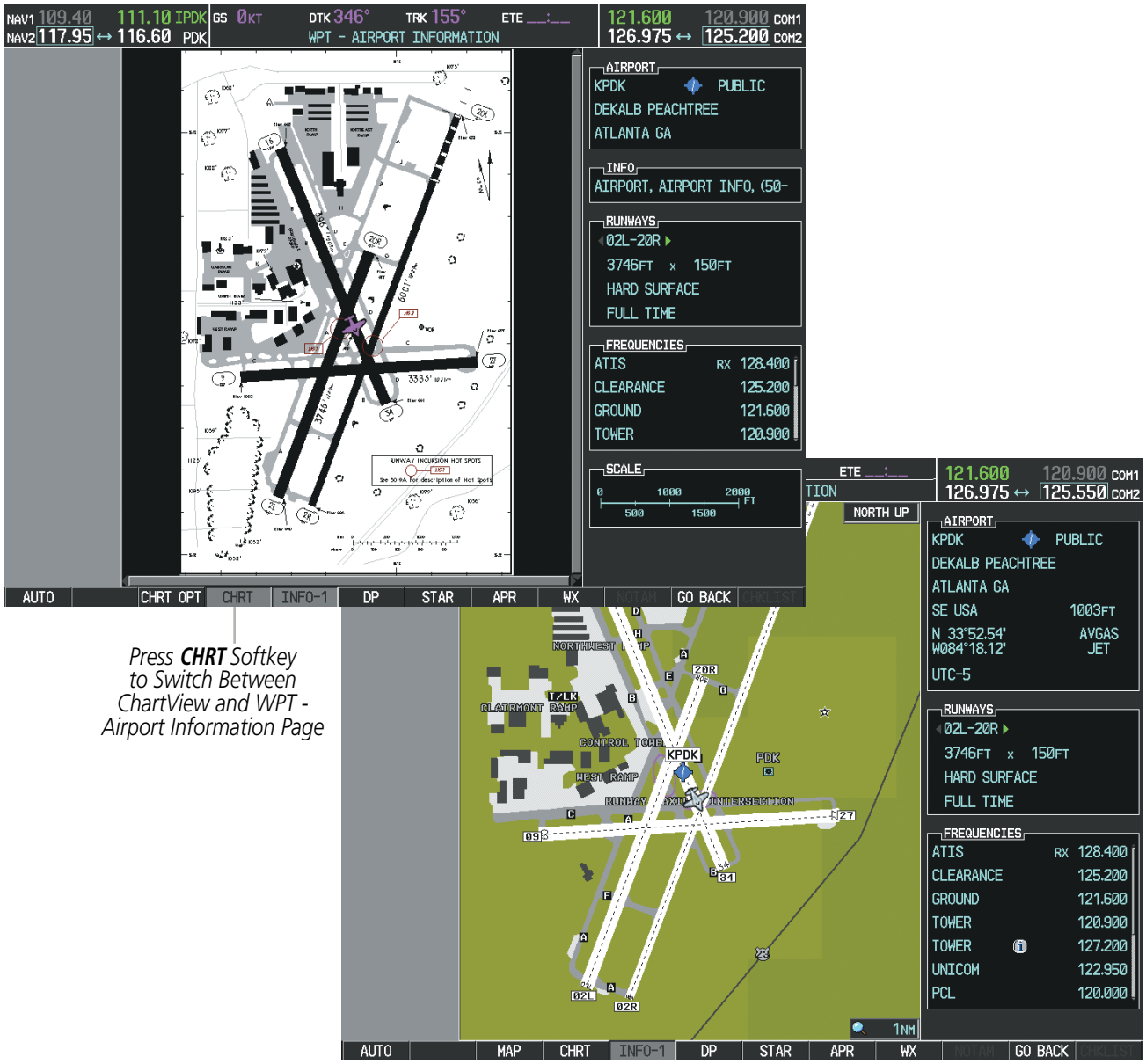


Figure 8-26 CHRT Softkey, Airport Information Page

Pressing the **INFO-1** or **INFO-2** Softkey returns to the airport diagram chart when the view is on a terminal procedure chart. If the displayed chart is the airport diagram chart, pressing the **INFO-1** or **INFO-2** Softkey returns to the Airport Information Page.

The aircraft position is shown in magenta on the ChartView diagrams when the location of the aircraft is within the chart boundaries. In the example shown, the aircraft is turning onto Taxiway Bravo on the Charlotte, NC (KCLT) airport.

Another source for additional airport information is from the INFO Box above the chart for certain airports. This information source is not related to the **INFO-1** or **INFO-2** Softkey. When the INFO Box is selected using the **FMS** Knob, the softkeys are blank. The Charlotte, NC airport has five additional charts offering information: the Airport Diagram, Take-off Minimums, Class B Airspace, Airline Parking Gate Coordinates, and Airline Parking Gate Location. (The numbers in parentheses after the chart name are Jeppesen designators.)

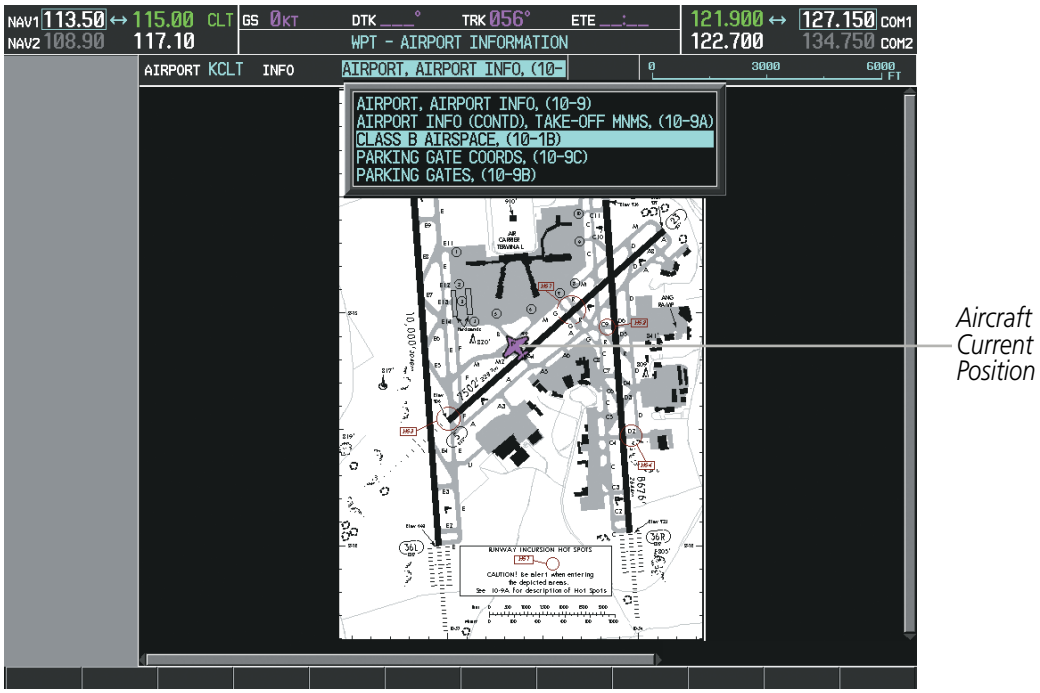


Figure 8-27 Airport Information Page, INFO View, Full Screen Width

In the example shown in Figure 8-27, the Class B Chart is selected. Pressing the **ENT** Key displays the Charlotte Class B Airspace Chart (Figure 8-28).

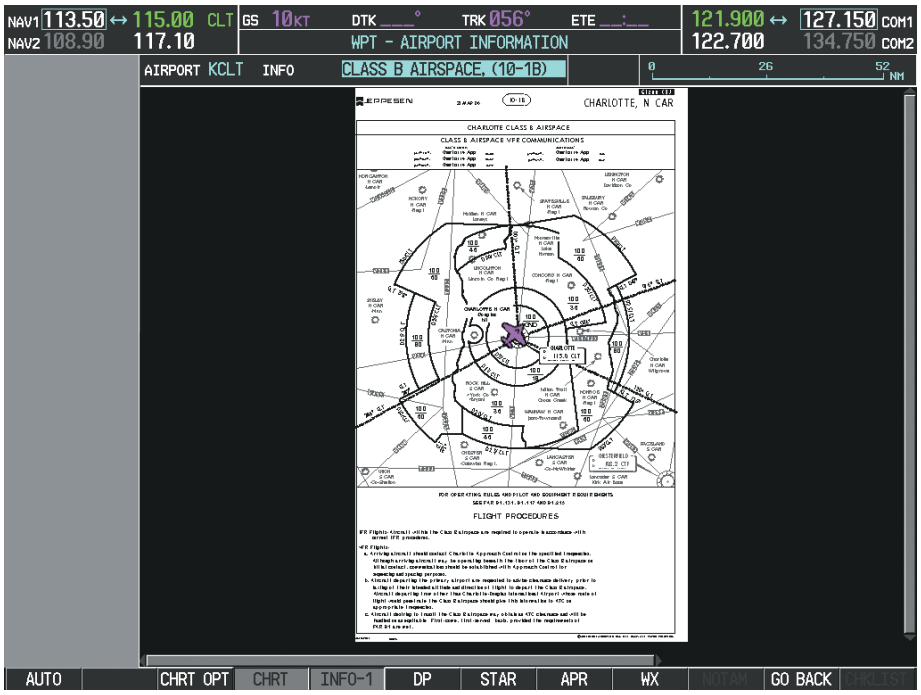


Figure 8-28 Airport Information Page, Class B Chart Selected from INFO View

Pressing the **DP** Softkey displays the Departure Procedure Chart if available.

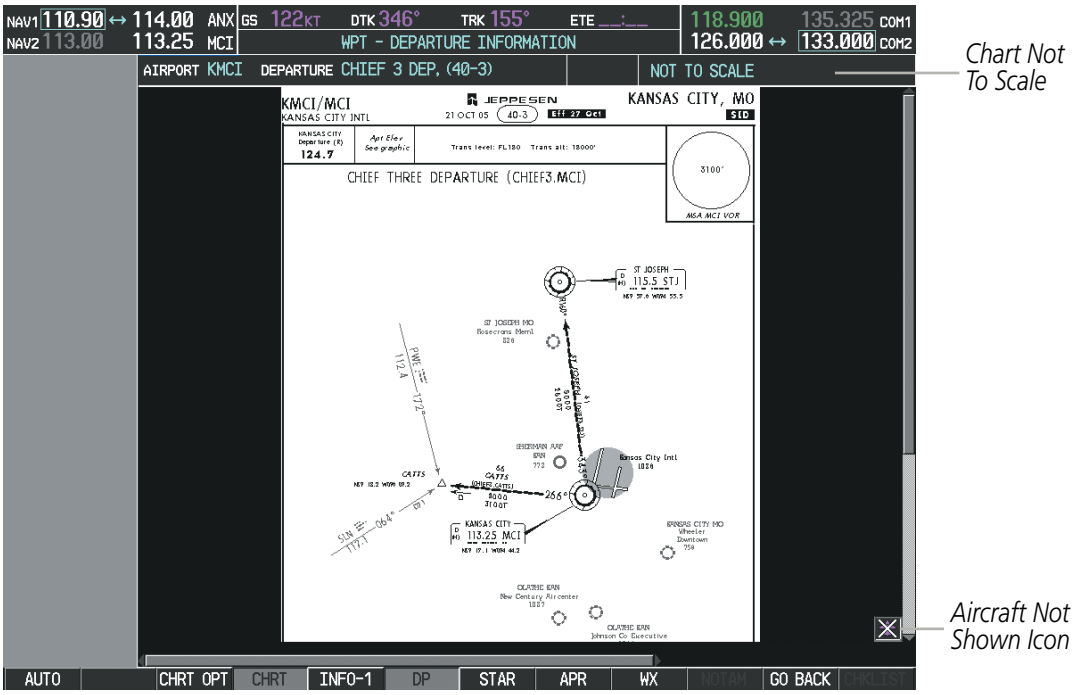


Figure 8-29 Departure Information Page

Pressing the **STAR** Softkey displays the Standard Terminal Arrival Chart if available.

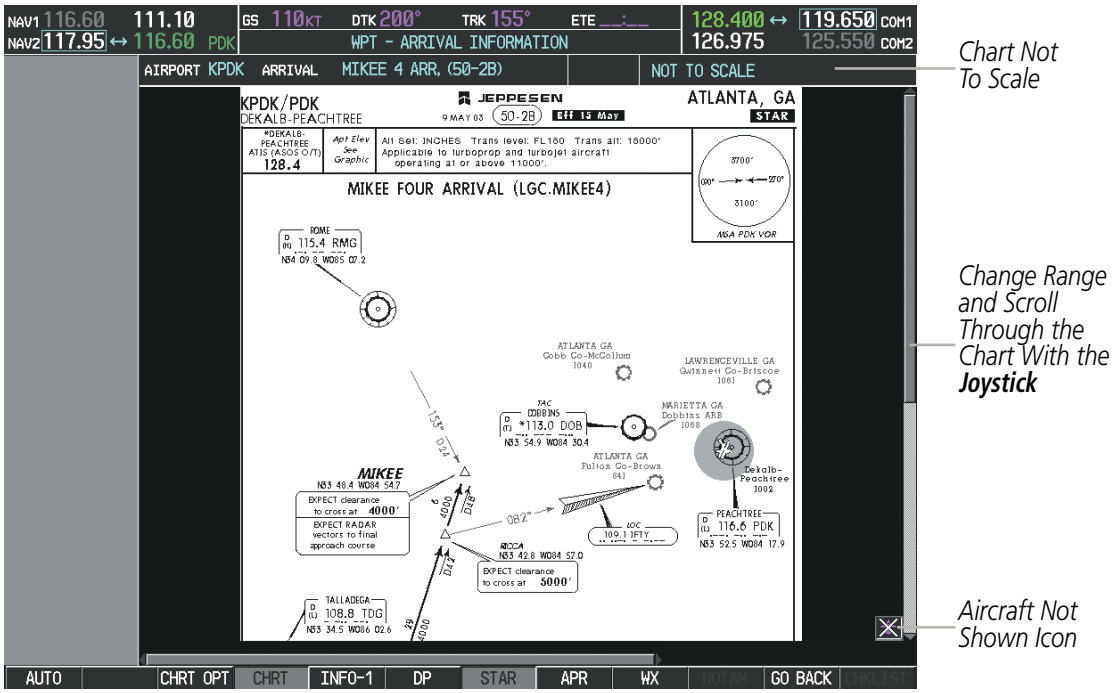


Figure 8-30 Arrival Information Page

Pressing the **APR** Softkey displays the approach chart for the airport if available.

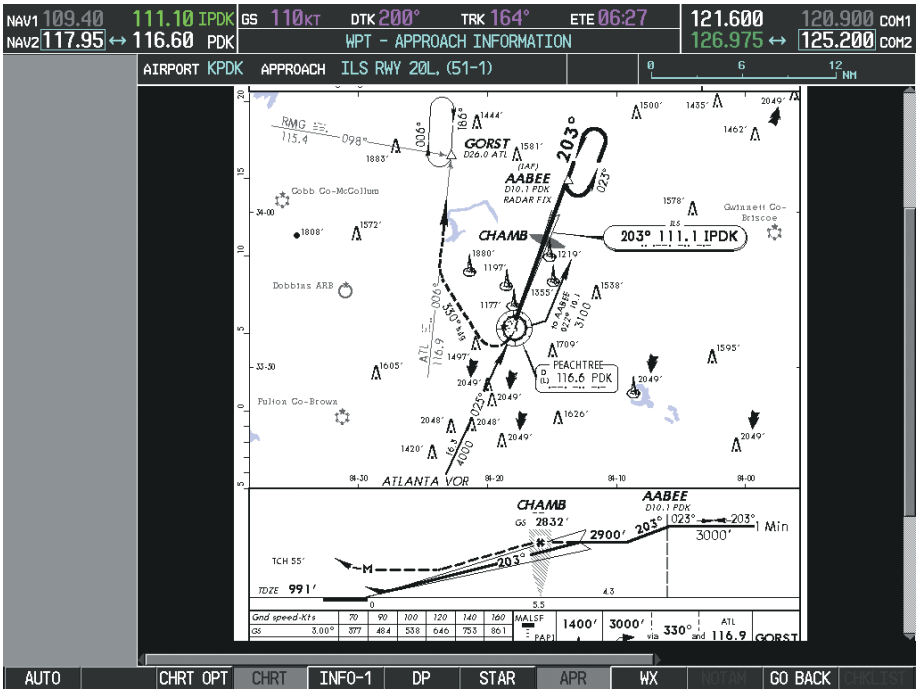


Figure 8-31 Approach Information Page

Pressing the **WX** Softkey shows the airport weather frequency information, and includes weather data such as METAR and TAF from the XM Data Link Receiver, when available. Weather information is available only when an XM Data Link Receiver is installed and the XM WX Satellite Weather subscription is current.

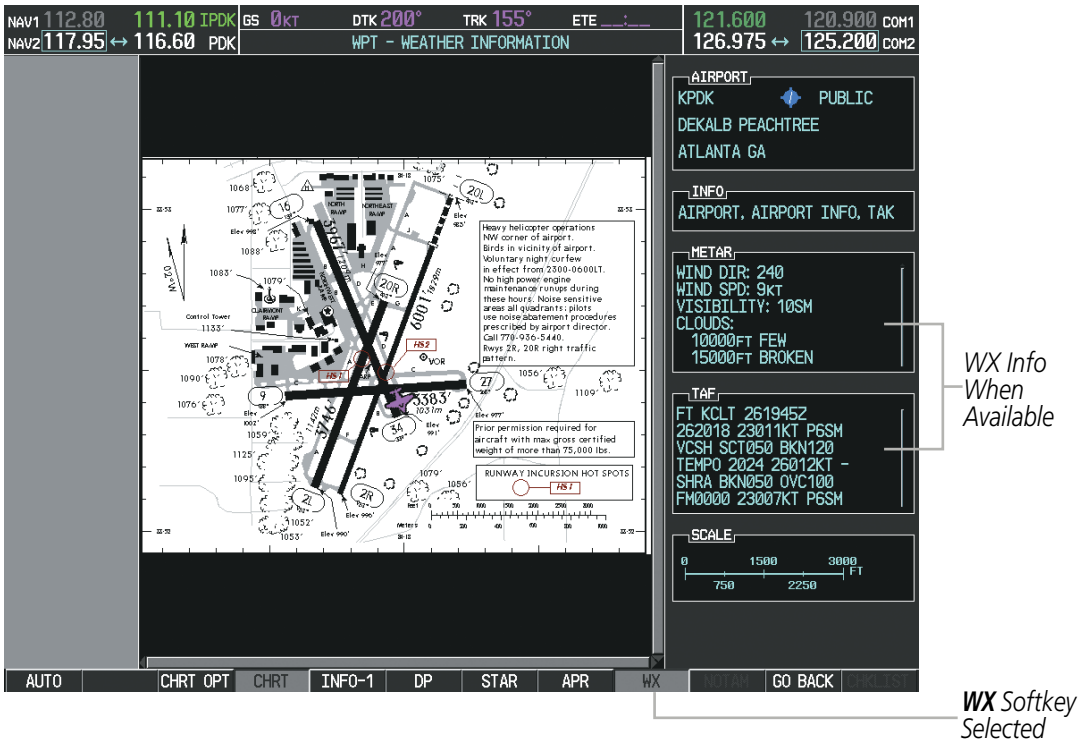


Figure 8-32 Weather Information Page

NOTE: *A subdued softkey label indicates the function is disabled.*

Recent NOTAMS applicable to the current ChartView cycle are included in the ChartView database. Pressing the **NOTAM** Softkey shows the local NOTAM information for selected airports, when available. When NOTAMS are not available, the **NOTAM** Softkey label appears subdued and is disabled as shown in Figure 8-32. The **NOTAM** Softkey may appear on the Airport Information Page and all of the chart page selections.

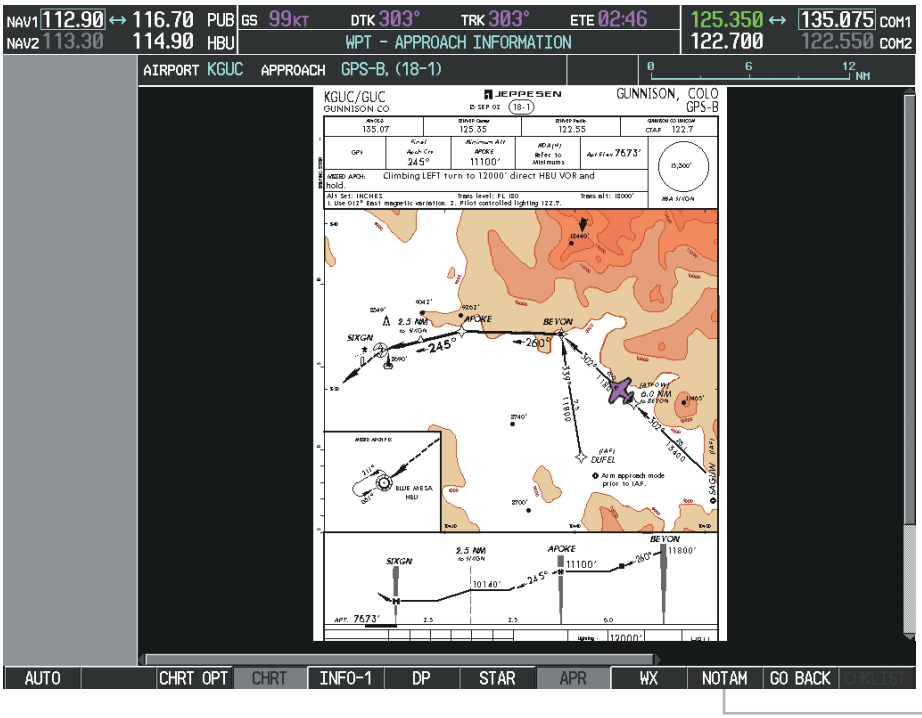


Figure 8-33 NOTAM Softkey Available

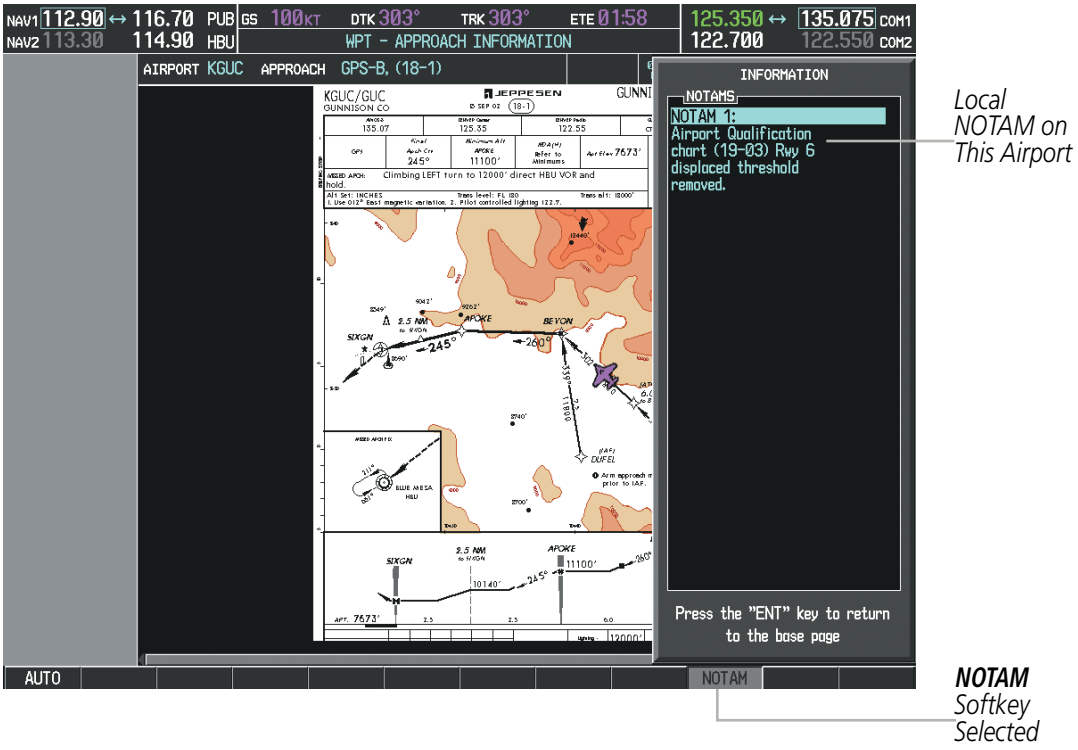


Figure 8-34 Airport Information Page, Local NOTAMs

Pressing the **NOTAM** Softkey again removes the NOTAMS information.

Pressing the **GO BACK** Softkey reverts to the previous page (Navigation Map Page, Nearest Pages, or Flight Plan Page).

CHART OPTIONS

Pressing the **CHRT OPT** Softkey displays the next level of softkeys, the chart options level (Figure 8-21).

Pressing the **ALL** Softkey shows the complete approach chart on the screen.

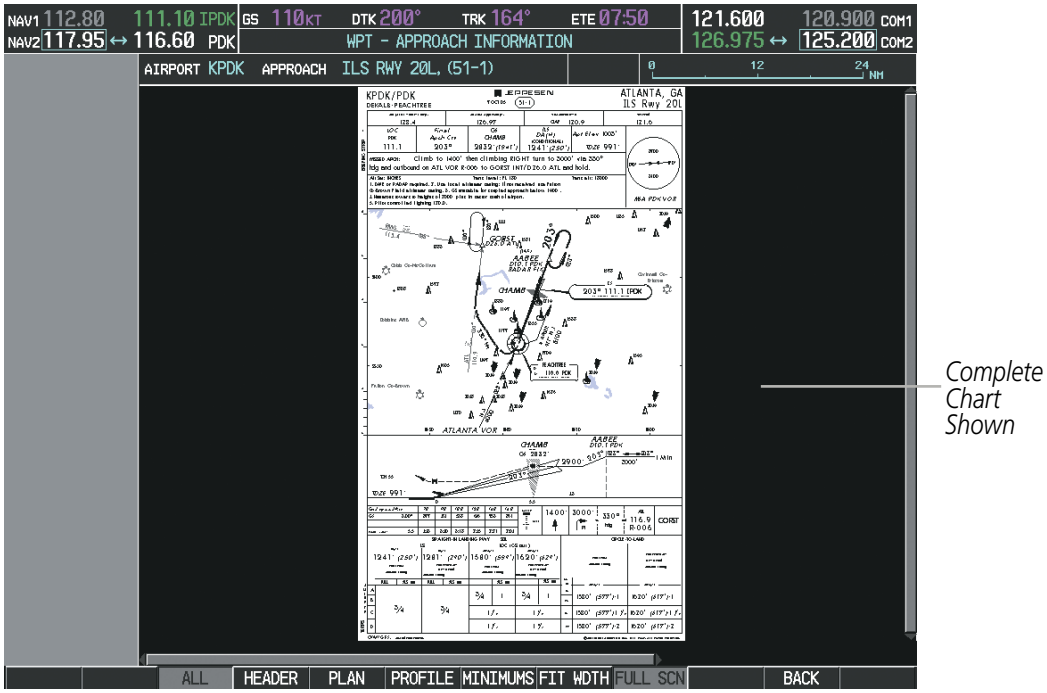


Figure 8-35 Approach Information Page, ALL View

Pressing the **HEADER** Softkey shows the header view (approach chart briefing strip) on the screen.

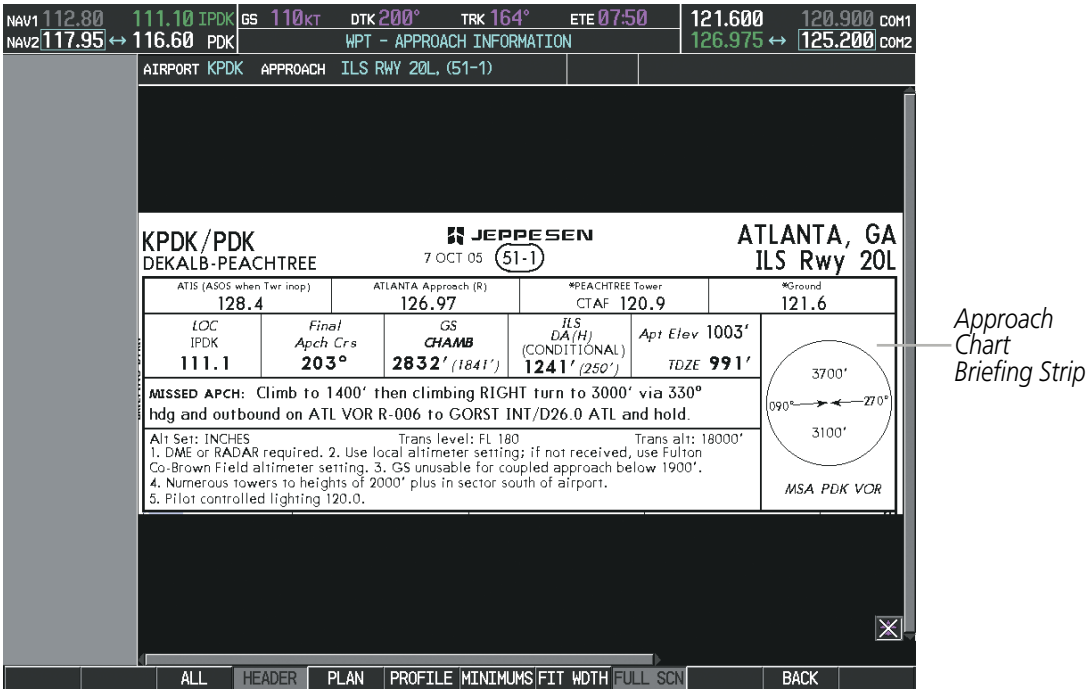


Figure 8-36 Approach Information Page, Header View

Pressing the **PLAN** Softkey shows the approach chart two dimensional plan view.

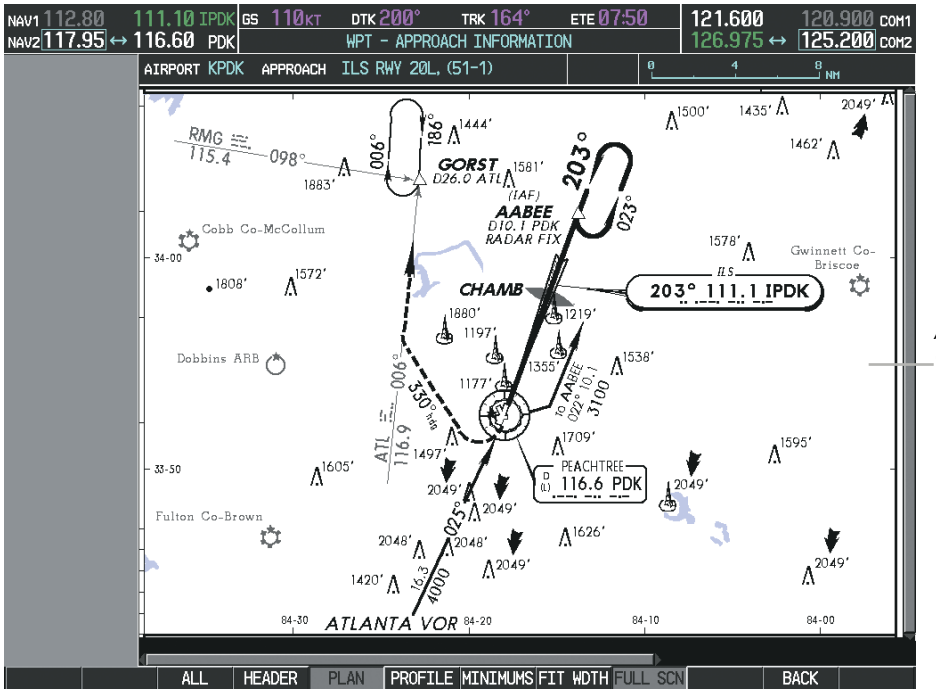


Figure 8-37 Approach Information Page, Plan View

Pressing the **PROFILE** Softkey displays the approach chart descent profile strip.

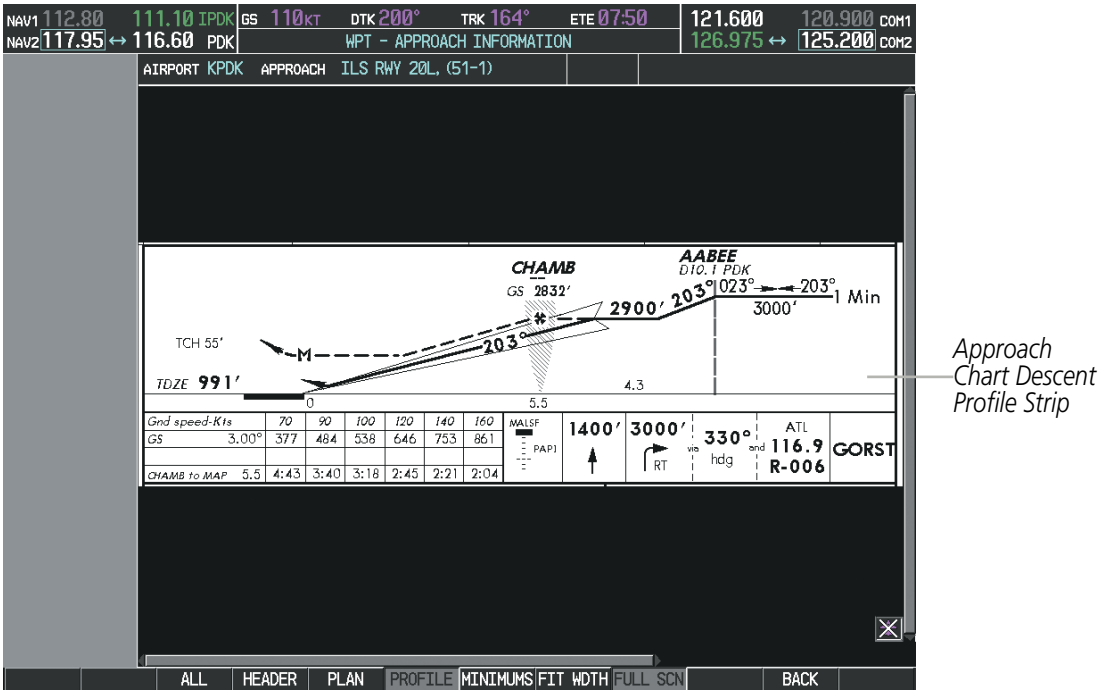


Figure 8-38 Approach Information Page, Profile View, Full Screen Width

Pressing the **MINIMUMS** Softkey displays the minimum descent altitude/visibility strip at the bottom of the approach chart.

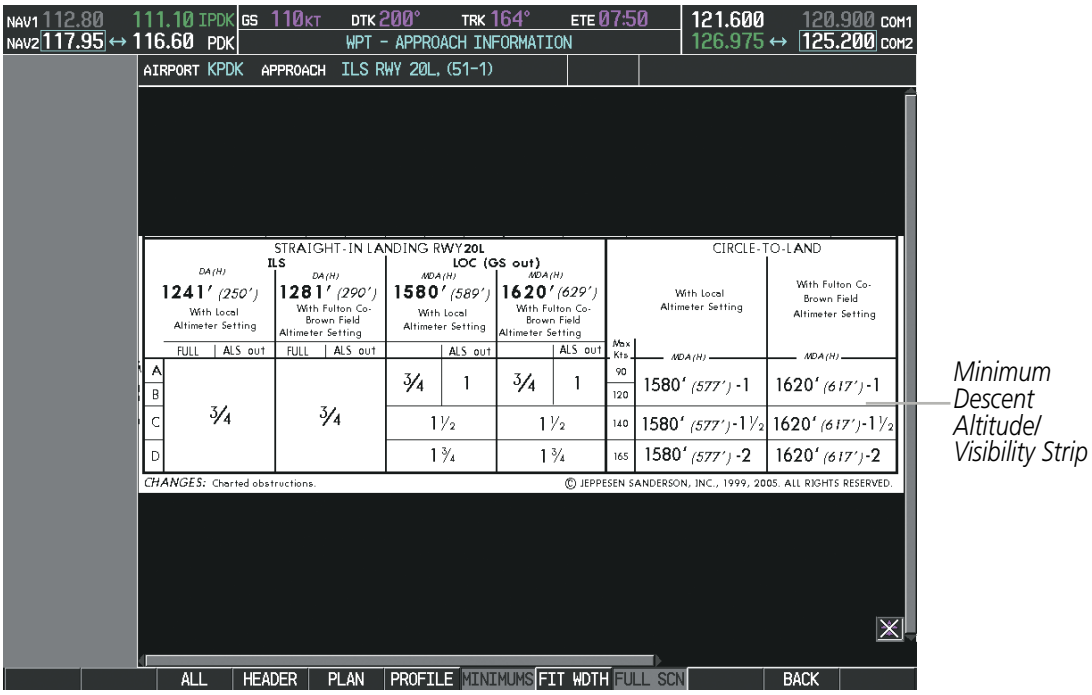
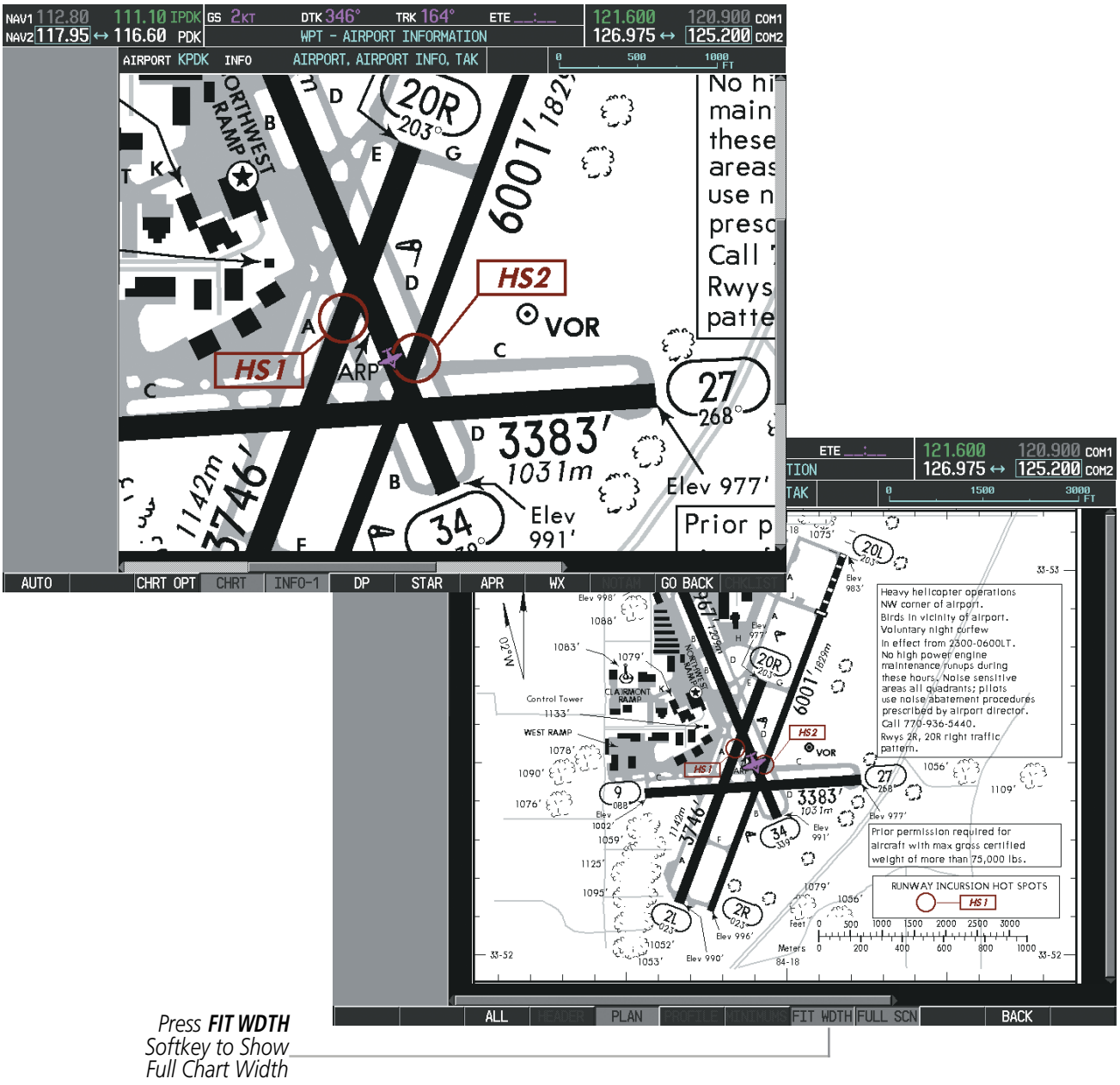


Figure 8-39 Approach Information Page, Minimums View, Full Screen Width

If the chart scale has been adjusted to view a small area of the chart, pressing the **FIT WIDTH** Softkey changes the chart size to fit the available screen width.



*Press **FIT WDTH** Softkey to Show Full Chart Width*

Figure 8-40 Airport Information Page, FIT WDTH Softkey Selected

Pressing the **FULL SCN** Softkey alternates between removing and replacing the data window to the right.

Selecting Additional Information:

1) While viewing the Airport Taxi Diagram, press the **FULL SCN** Softkey to display the information windows (AIRPORT, INFO).
2) Press the **FMS** Knob to activate the cursor.
3) Turn the large **FMS** Knob to highlight the AIRPORT, INFO, RUNWAYS, or FREQUENCIES Box (INFO Box shown).
4) Turn the small **FMS** Knob to select the INFO Box choices. If multiple choices are available, scroll to the desired choice with the large **FMS** Knob and press the **ENT** Key to complete the selection.
5) Press the **FMS** Knob again to deactivate the cursor.

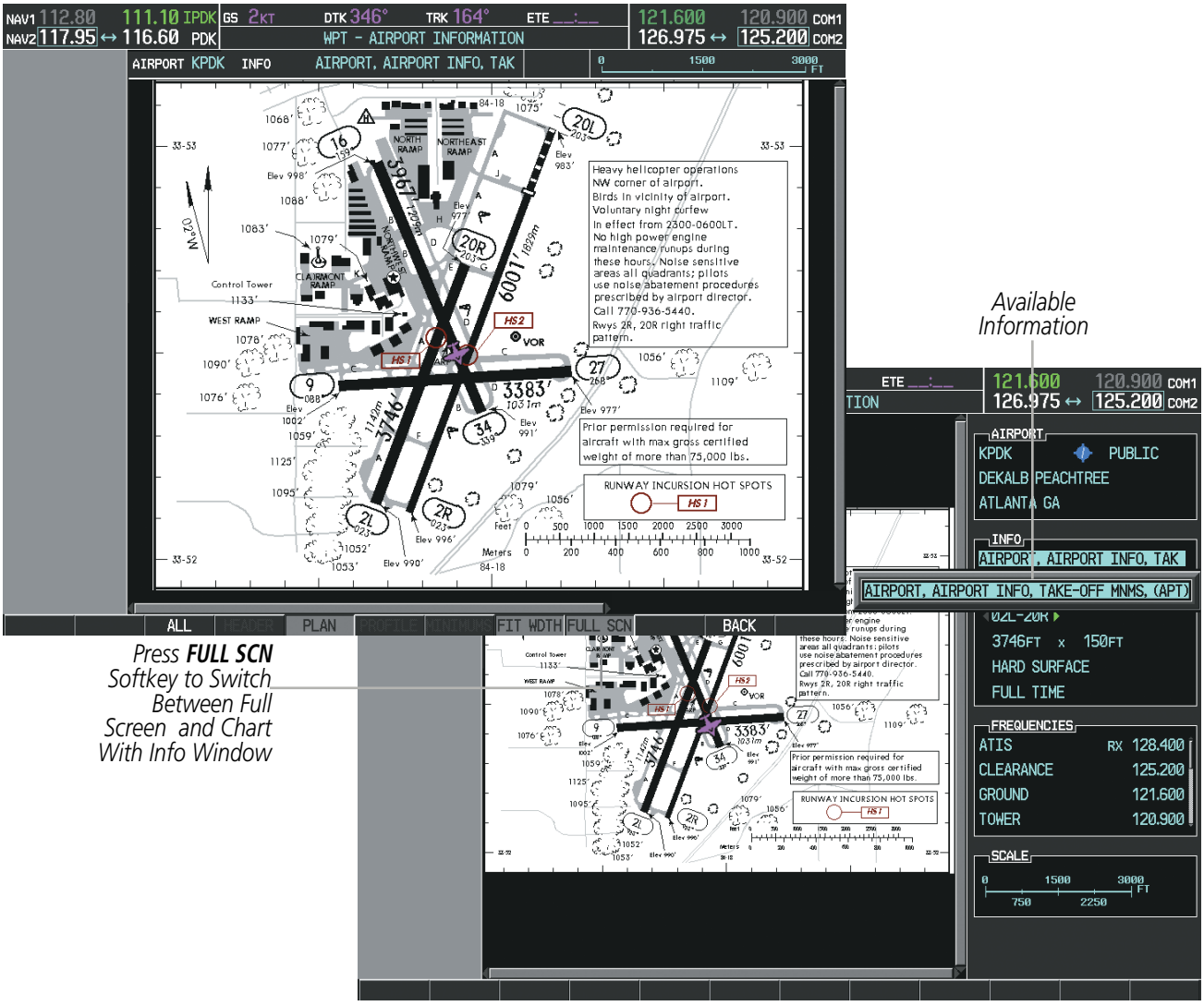


Figure 8-41 Airport Information Page, Full Screen and Info Window

Pressing the **BACK** Softkey, or waiting for 45 seconds reverts to the chart selection softkeys.

The full screen view can also be selected by using the page menu option.

Selecting full screen On or Off:

1) While viewing a terminal chart press the **MENU** Key to display the Page Menu OPTIONS.
2) Turn the large **FMS** Knob to highlight the Chart Setup Menu Option and press the **ENT** Key.
3) Turn the large **FMS** Knob to move between the FULL SCREEN and COLOR SCHEME Options.
4) Turn the small **FMS** Knob to choose between the On and Off Full Screen Options.

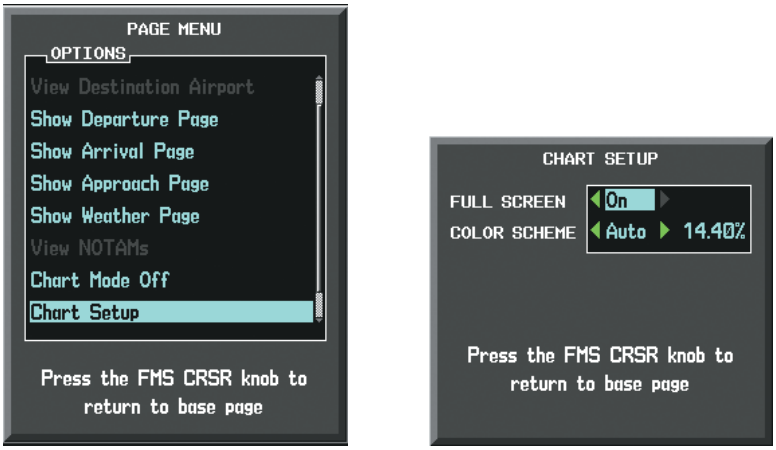


Chart Setup Option *Full Screen On/Off Selection*

Figure 8-42 Page Menus

DAY/NIGHT VIEW

ChartView can be displayed on a white or black background for day or night viewing. The Day View offers a better presentation in a bright environment. The Night View gives a better presentation for viewing in a dark environment. When the CHART SETUP Box is selected the G900X softkeys are blank.

Selecting Day, Night, or Automatic View:

1) While viewing a terminal chart press the **MENU** Key to display the Page Menu OPTIONS.
2) Turn the large **FMS** Knob to highlight the Chart Setup Menu Option and press the **ENT** Key.

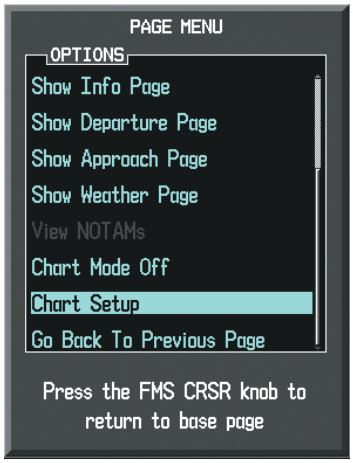


Figure 8-43 Waypoint Information Page, OPTIONS Menu

3) Turn the large **FMS** Knob to move to the COLOR SCHEME Option (Figure 8-44).
4) Turn the small **FMS** Knob to choose between Day, Auto, and Night Options.
5) If Auto Mode is selected, turn the large **FMS** Knob to select the percentage field. Use the small **FMS** Knob to change the percentage value. The percentage value is the day/night crossover point based on the percentage of backlighting intensity. For example, if the value is set to 15%, the day/night display changes when the display backlight reaches 15% of full brightness.

   The display must be changed in order for the new setting to become active. This may be accomplished by selecting another page or changing the display range.
6) Press the **FMS** Knob when finished to remove the Chart Setup Menu.

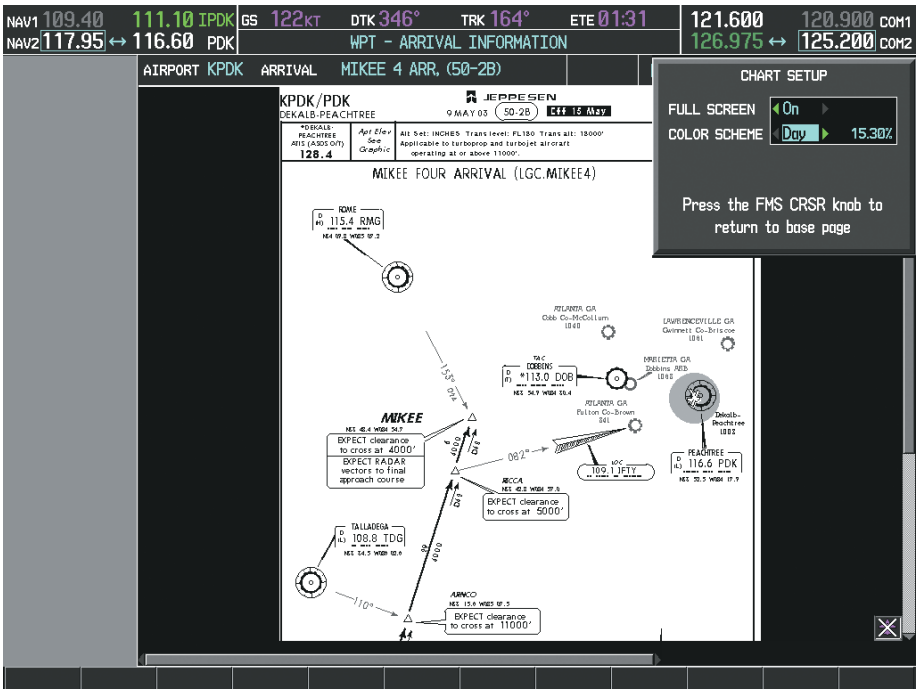


Figure 8-44 Arrival Information Page, Day View

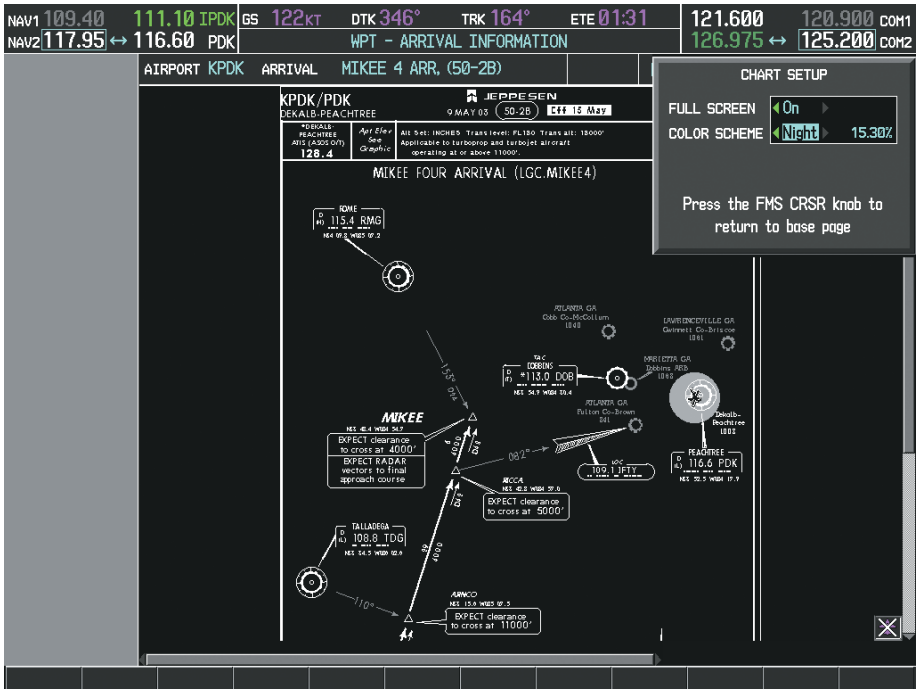


Figure 8-45 Arrival Information Page, Night View

CHARTVIEW CYCLE NUMBER AND EXPIRATION DATE

ChartView database is revised every 14 days. Charts are still viewable during a period that extends from the cycle expiration date to the disables date. ChartView is disabled 70 days after the expiration date and is no longer available for viewing. When turning on the system, the Power-up Page displays the current status of the ChartView database. See the table below for the various ChartView Power-up Page displays and the definition of each.



Figure 8-46 Power-up Page, ChartView Database

Power-up Page Display	Definition
	Blank Line. system is not configured for ChartView. Contact a Garmin-authorized service center for configuration.
Chart Data: N/A	System is configured for ChartView but no chart database is installed. Contact Jeppesen for a ChartView database.
ChartView Disables 28-APR-2012	Normal operation. ChartView database is valid and within current cycle.
Chart data update available.	ChartView database is within 1 week after expiration date. A new cycle is available for update.
Chart data is out of date!	ChartView database is beyond 1 week after expiration date, but still within the 70 day viewing period.
Chart data is disabled.	ChartView database has timed out. Database is beyond 70 days after expiration date. ChartView database is no longer available for viewing.
Verify chart database cycle.	System time is not available. GPS satellite data is unknown or the system has not yet locked onto satellites. Check database cycle number for effectivity.
Verifying Chart data	System is verifying chart database when new cycle is installed for the first time.
Chart Data is Corrupt!	After verifying, chart database is found to be corrupt. ChartView is not available.

Table 8-2 ChartView Power-up Page Annunciations and Definitions

The ChartView time critical information can also be found on the AUX - System Status page. The database CYCLE number, EXPIRES, and DISABLES dates of the ChartView subscription appear in either blue or yellow text. When the ChartView EXPIRES date is reached, ChartView becomes inoperative 70 days later. This is shown as the DISABLES date. When the DISABLES date is reached, charts are no longer available for viewing. The **SHW CHRT** Softkey label then appears subdued and is disabled until a revised issue of ChartView is installed.

NOTE: *A subdued softkey label indicates the function is disabled.*

Press the **MFD1 DB** Softkey to place the cursor in the DATABASE window. Scroll through the listed information by turning the **FMS** Knob or pressing the **ENT** Key until the ChartView database information is shown.

The ChartView database cycle number shown in the figure, 1203, is deciphered as follows:

12 – Indicates the year 2012

03 – Indicates the third issue of the ChartView database for the year

The EXPIRES date 17–FEB–12 is the date that this database should be replaced with the next issue.

The DISABLES date 28–APR–12 is the date that this database becomes inoperative.

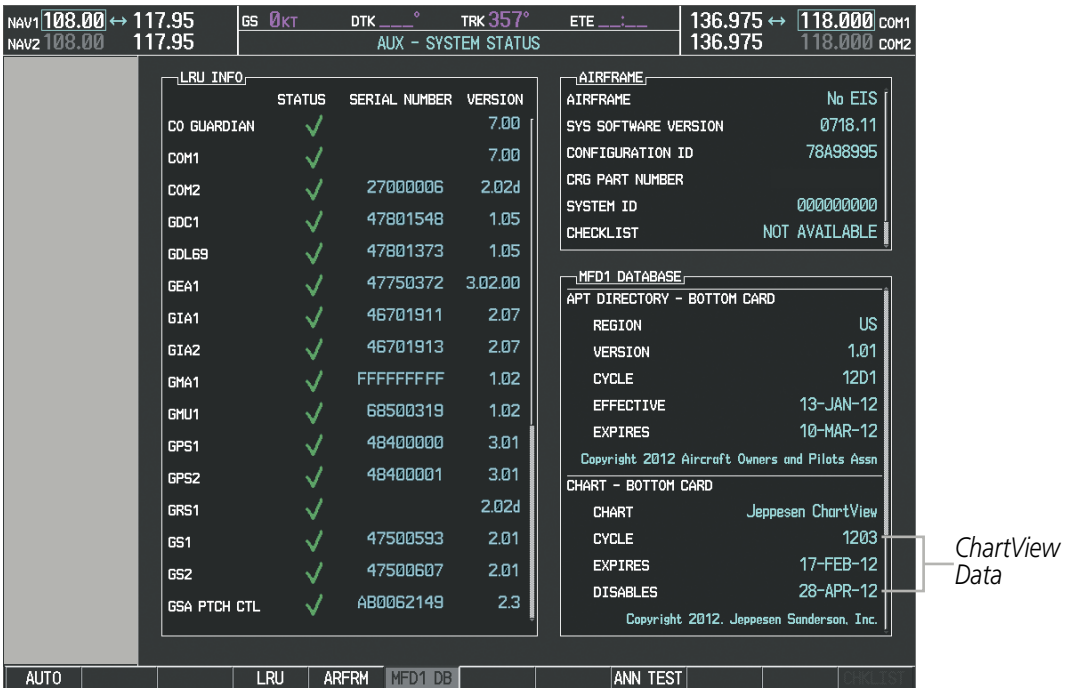
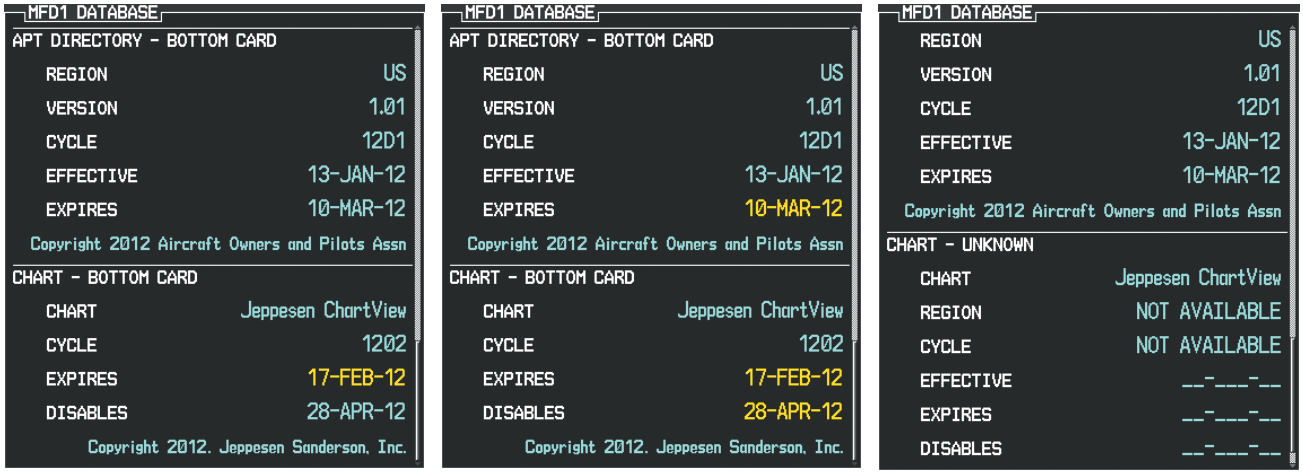


Figure 8-47 AUX – System Status Page, ChartView Current and Available

The ChartView database is obtained directly from Jeppesen. Refer to Updating Jeppesen Databases in Appendix B for instructions on revising the ChartView database.

Other possible AUX - System Status page conditions are shown in Figure 8-48. The EXPIRES date, in yellow, is the revision date for the next database cycle. The DISABLES date, in yellow, is the date that this database cycle is no longer viewable. CYCLE NOT AVAILABLE in blue, indicates no ChartView data is available on the database card or no database card is inserted.



ChartView has Expired, but is not Disabled *ChartView Database is Disabled* *ChartView Database is Not Available*

Figure 8-48 AUX – System Status Page, ChartView Database Status

8.4 FLITECHARTS

FliteCharts resemble the paper version of AeroNav Services terminal procedures charts. The charts are displayed with high-resolution and in color for applicable charts. FliteCharts database subscription is available from Garmin. Available data includes:

- Arrivals (STAR)
- Departure Procedures (DP)
- Approaches
- Airport Diagrams

FLITECHARTS SOFTKEYS

FliteCharts functions are displayed on three levels of softkeys. While on the Navigation Map Page, Nearest Airports Page, or Flight Plan Page, pressing the **SHW CHRT** Softkey displays the available terminal chart and advances to the chart selection level of softkeys: **CHRT OPT**, **CHRT**, **INFO**, **DP**, **STAR**, **APR**, **WX**, and **GO BACK**. The chart selection softkeys appear on the Airport Information Page.

Pressing the **GO BACK** Softkey reverts to the top level softkeys and previous page.

Pressing the **CHRT OPT** Softkey displays the available terminal chart and advances to the next level of softkeys: **ALL**, **FIT WDTH**, **FULL SCN**, and **BACK**.

While viewing the **CHRT OPT** Softkeys, after 45 seconds of softkey inactivity, the system reverts to the chart selection softkeys.

NOTAMs are not available with FliteCharts. The NOTAM Softkey label appears subdued and is disabled.

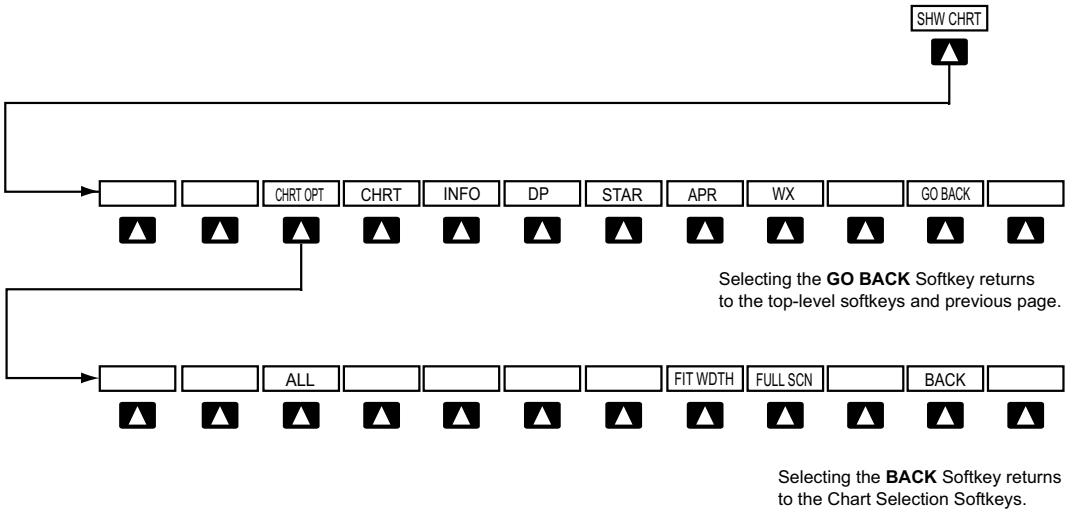


Figure 8-49 FliteCharts SHW CHRT, Chart Selection, and Chart Option Softkeys

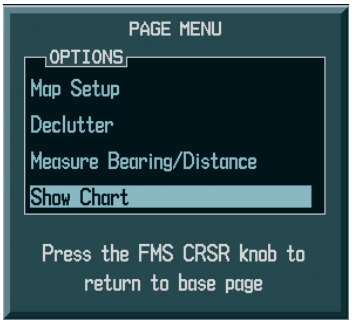
TERMINAL PROCEDURES CHARTS

Selecting Terminal Procedures Charts:

While viewing the Navigation Map Page, Nearest Airport Page, or Flight Plan Page, press the **SHW CHRT** Softkey.

Or:

1) Press the **MENU** Key to display the PAGE MENU.
2) Turn the large **FMS** Knob to scroll through the OPTIONS Menu to Show Chart.
3) Press the **ENT** Key to display the chart.



Navigation Map Page OPTIONS Menu



Waypoint Airport Information Page OPTIONS Menu

Figure 8-50 Option Menus

When no terminal procedure chart is available, the banner CHART NOT AVAILABLE appears on the screen. The CHART NOT AVAILABLE banner does not refer to the FliteCharts subscription, but rather the availability of a particular airport chart selection or procedure for a selected airport.



Figure 8-51 Chart Not Available Banner

If there is a problem in rendering the data (such as a data error or a failure of an individual chart), the banner UNABLE TO DISPLAY CHART is then displayed.



Figure 8-52 Unable To Display Chart Banner

When a chart is not available by pressing the **SHW CHRT** Softkey or selecting a Page Menu Option, charts may be obtained for other airports from the WPT Pages or Flight Plan Pages.

If a chart is available for the destination airport, or the airport selected in the active flight plan, the chart appears on the screen. When no flight plan is active, or when not flying to a direct-to destination, pressing the **SHW CHRT** Softkey displays the chart for the nearest airport, if available.

The chart shown is one associated with the WPT – Airport Information page. Usually this is the airport runway diagram. Where no runway diagram exists, but Take Off Minimums or Alternate Minimums are available, that page appears. If Airport Information pages are unavailable, the Approach Chart for the airport is shown.

Selecting a chart:

1) While viewing the Navigation Map Page, Flight Plan Page, or Nearest Airports Page, press the **SHW CHRT** Softkey. The airport diagram or approach chart is displayed on the Airport Information Page.
2) Press the **FMS** Knob to activate the cursor.
3) Turn the large **FMS** Knob to select either the Airport Identifier Box or the Approach Box. (Press the **APR** Softkey if the Approach Box is not currently shown).
4) Turn the small and large **FMS** Knob to enter the desired airport identifier.
5) Press the **ENT** Key to complete the airport selection.
6) Turn the large **FMS** Knob to select the Approach Box.
7) Turn the small **FMS** Knob to show the approach chart selection choices.
8) Turn either **FMS** Knob to scroll through the available charts.
9) Press the **ENT** Key to complete the chart selection.

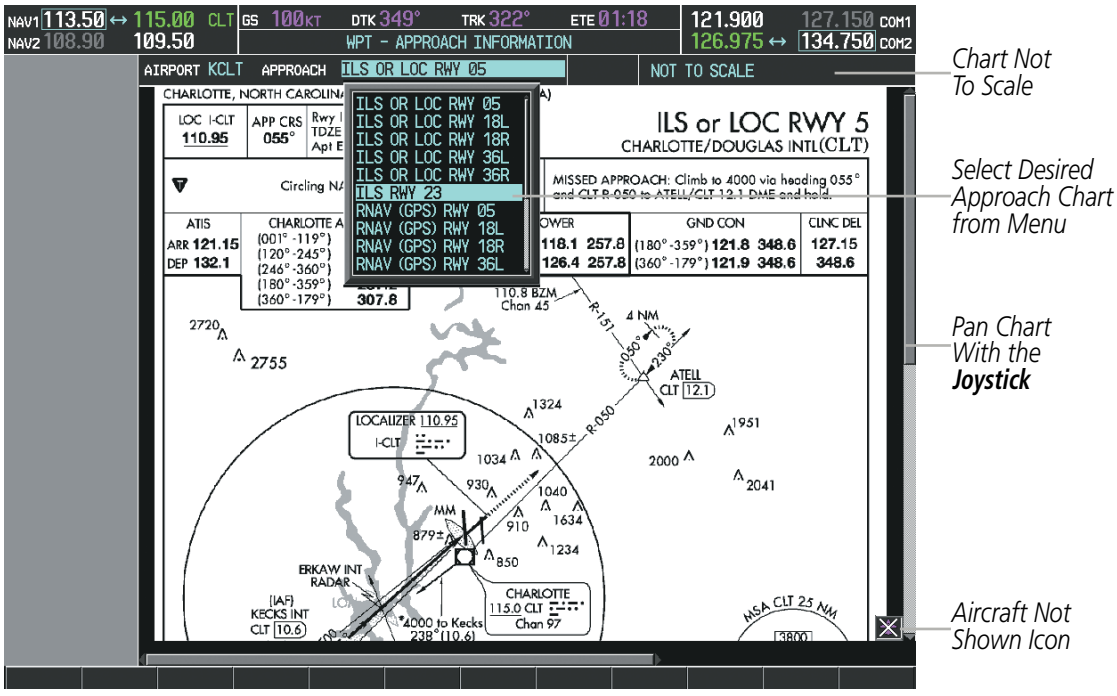


Figure 8-53 Approach Information Page, Chart Selection

While the APPROACH Box is selected using the **FMS** Knob, the G900X softkeys are blank. Once the desired chart is selected, the chart scale can be changed and the chart can be panned using the **Joystick**. Pressing the **Joystick** centers the chart on the screen.

The aircraft symbol is not shown on FliteCharts. The Chart Scale Box displays a banner NOT TO SCALE, and the Aircraft Not Shown Icon is displayed in the lower right corner of the screen.

Pressing the **CHRT** Softkey alternates between the FliteCharts diagram and the associated map in the WPT page group. In the example shown, the **CHRT** Softkey switches between the Charlotte, NC (KCLT) Airport Diagram and the navigation map on the WPT – Airport Information page.

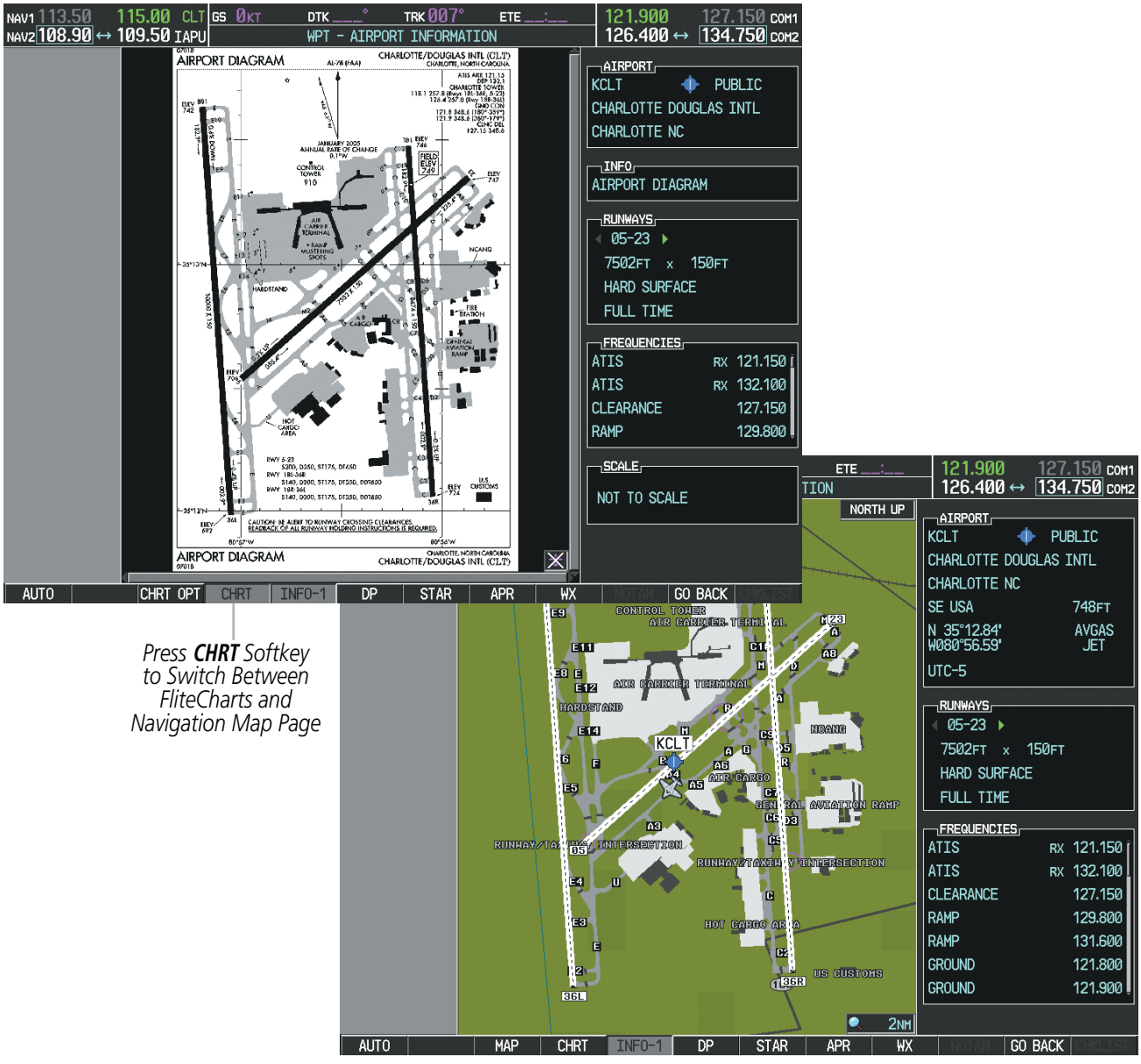


Figure 8-54 CHRT Softkey, Airport Information Page

Pressing the **INFO-1** or **INFO-2** Softkey returns to the airport diagram chart when the view is on a terminal procedure chart. If the displayed chart is the airport diagram chart, pressing the **INFO-1** or **INFO-2** Softkey returns to the Airport Information Page.

Another source for additional airport information is from the INFO Box above the chart (Figure 8-54) or to the right of the chart (Figure 8-55) for certain airports. This information source is not related to the **INFO-1** or **INFO-2** Softkey. When the INFO Box is selected using the **FMS** Knob, the softkeys are blank. The Charlotte, NC airport has three additional charts offering information: the Airport Diagram, Alternate Minimums, and Take-off Minimums.

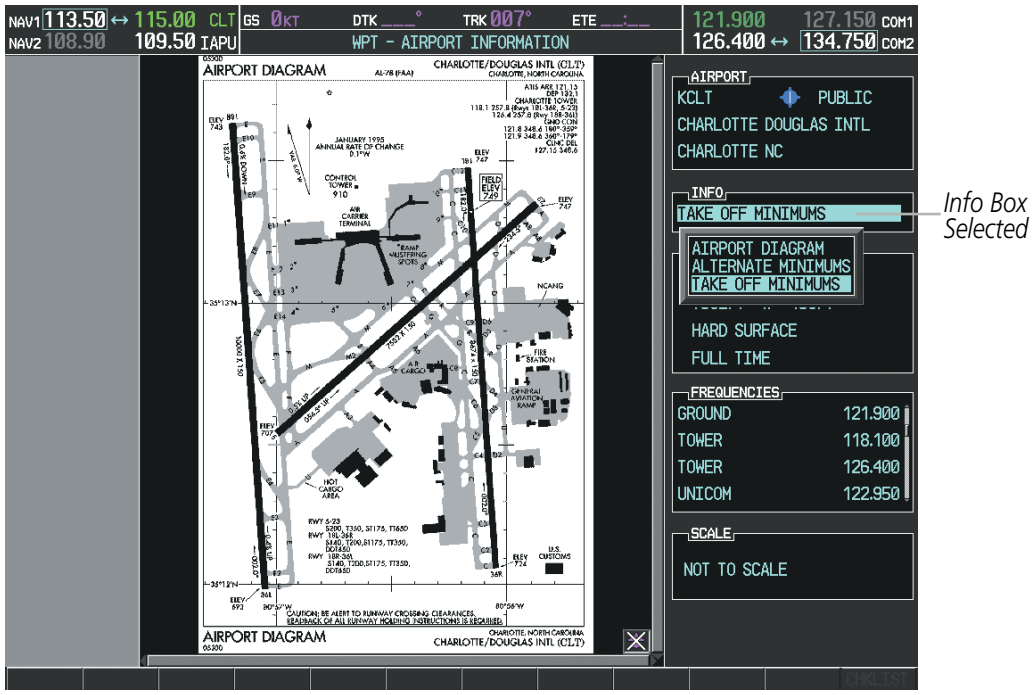


Figure 8-55 Airport Information Page, INFO View with Airport Information

In the example shown in Figure 8-55, TAKE OFF MINIMUMS is selected. Pressing the **ENT** Key displays the Take-off Minimums and Departure Procedures Chart (Figure 8-56).

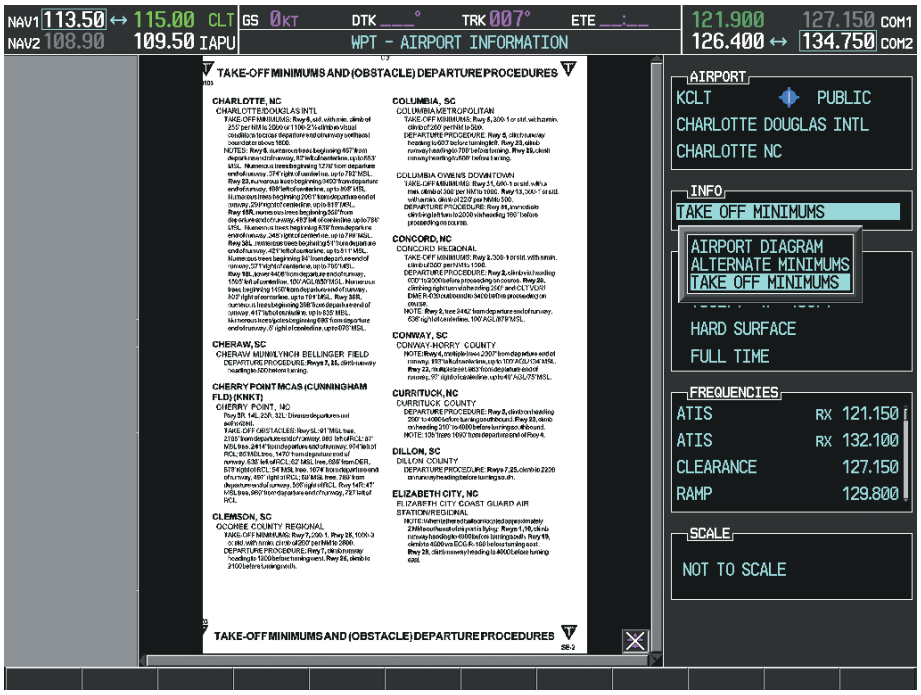


Figure 8-56 Airport Information Page, TAKE OFF MINIMUMS Selected from INFO View

Pressing the **DP** Softkey displays the Departure Procedure Chart if available.

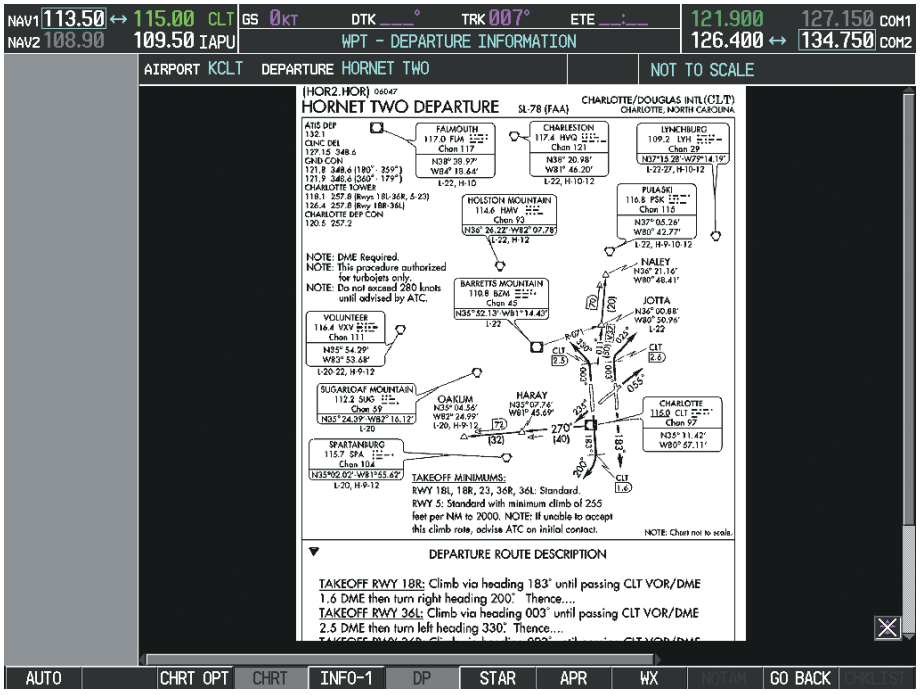


Figure 8-57 Departure Information Page

Pressing the **STAR** Softkey displays the Standard Terminal Arrival Chart if available.

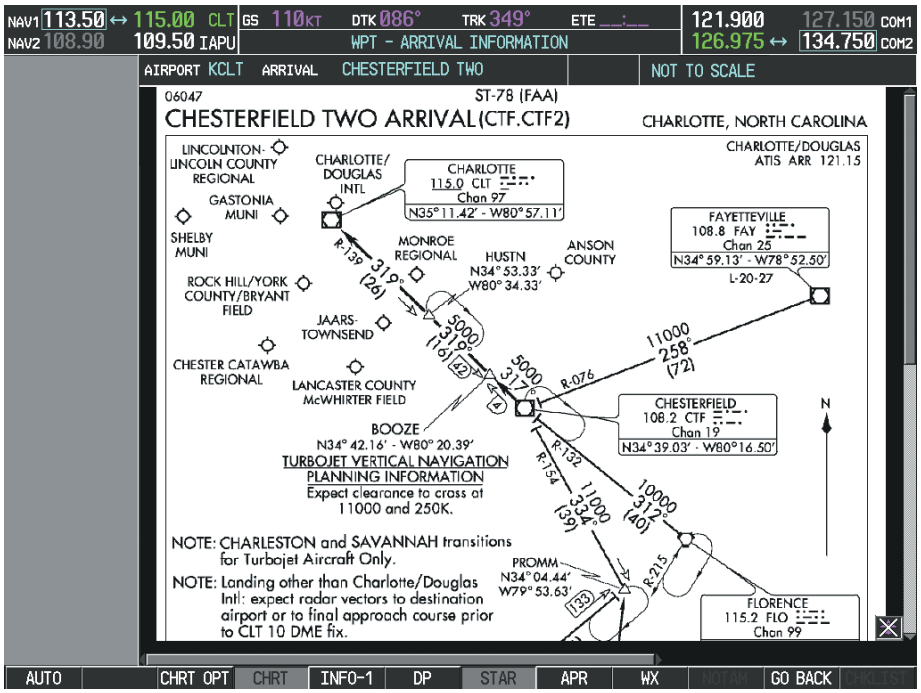


Figure 8-58 Arrival Information Page

Pressing the **APR** Softkey displays the approach chart for the airport if available.

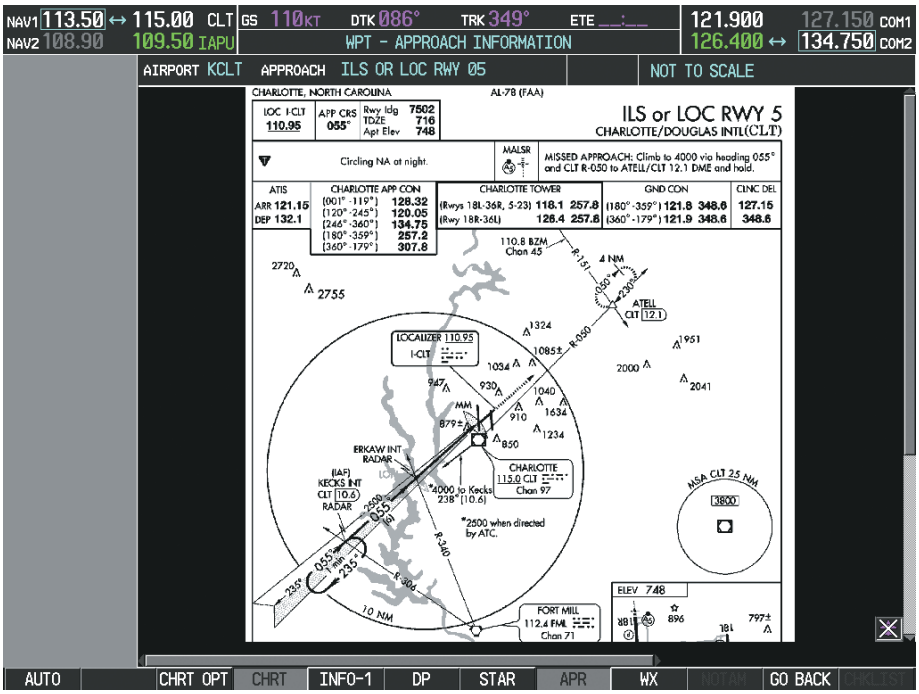


Figure 8-59 Approach Information Page

Pressing the **WX** Softkey shows the airport weather frequency information, when available, and includes weather data such as METAR and TAF from the XM Data Link Receiver. Weather information is available only when an XM Data Link Receiver is installed and the XM WX Satellite Weather subscription is current.

Selecting Additional Information:

1) While viewing the Airport Taxi Diagram, press the **WX** Softkey to display the information windows (AIRPORT, INFO).
2) Press the **FMS** Knob to activate the cursor.
3) Turn the large **FMS** Knob to highlight the INFO Box.
4) Turn the small **FMS** Knob to select the INFO Box choices. When the INFO Box is selected the G900X softkeys are blank. If multiple choices are available, scroll to the desired choice with the large **FMS** Knob and press the **ENT** Key to complete the selection.
5) Press the **FMS** Knob again to deactivate the cursor.

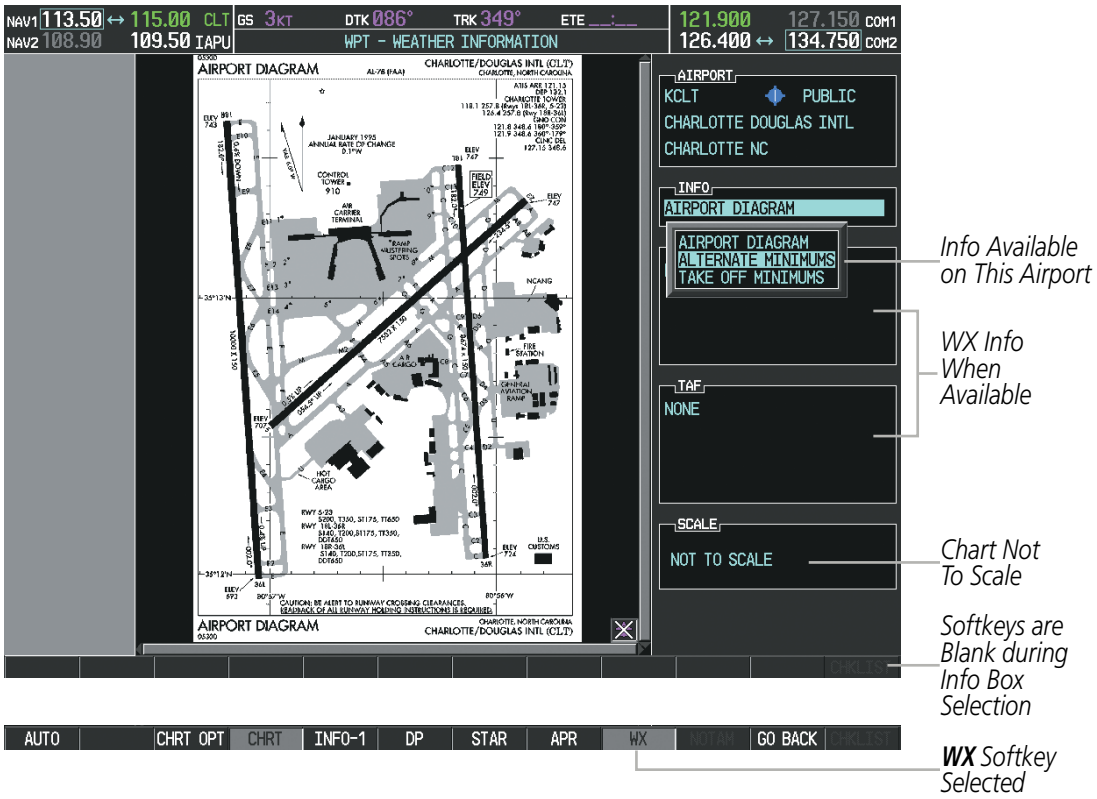


Figure 8-60 Weather Information Page, WX Softkey Selected

Pressing the **GO BACK** Softkey reverts to the previous page (Navigation Map Page or Flight Plan Page).

CHART OPTIONS

Pressing the **CHRT OPT** Softkey displays the next level of softkeys, the chart options level (Figure 8-49).

Pressing the **ALL** Softkey shows the complete chart on the screen.

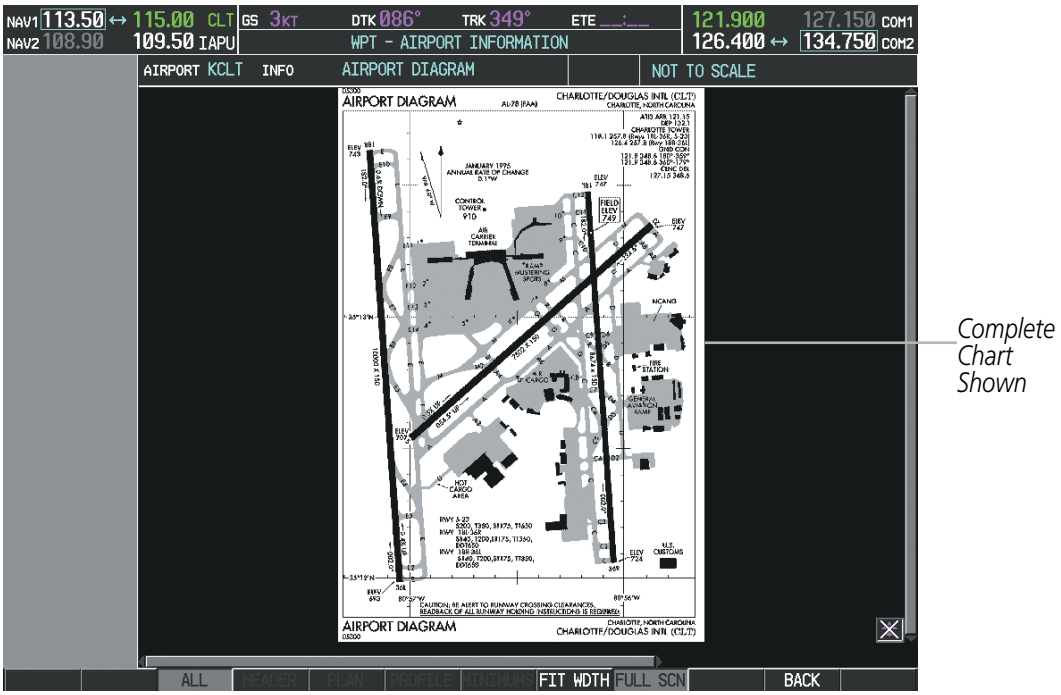


Figure 8-61 Airport Information Page, ALL View Selected

Pressing the **FIT WIDTH** Softkey fits the width of the chart in the display viewing area. In the example shown, the chart at close range is replaced with the full width chart.

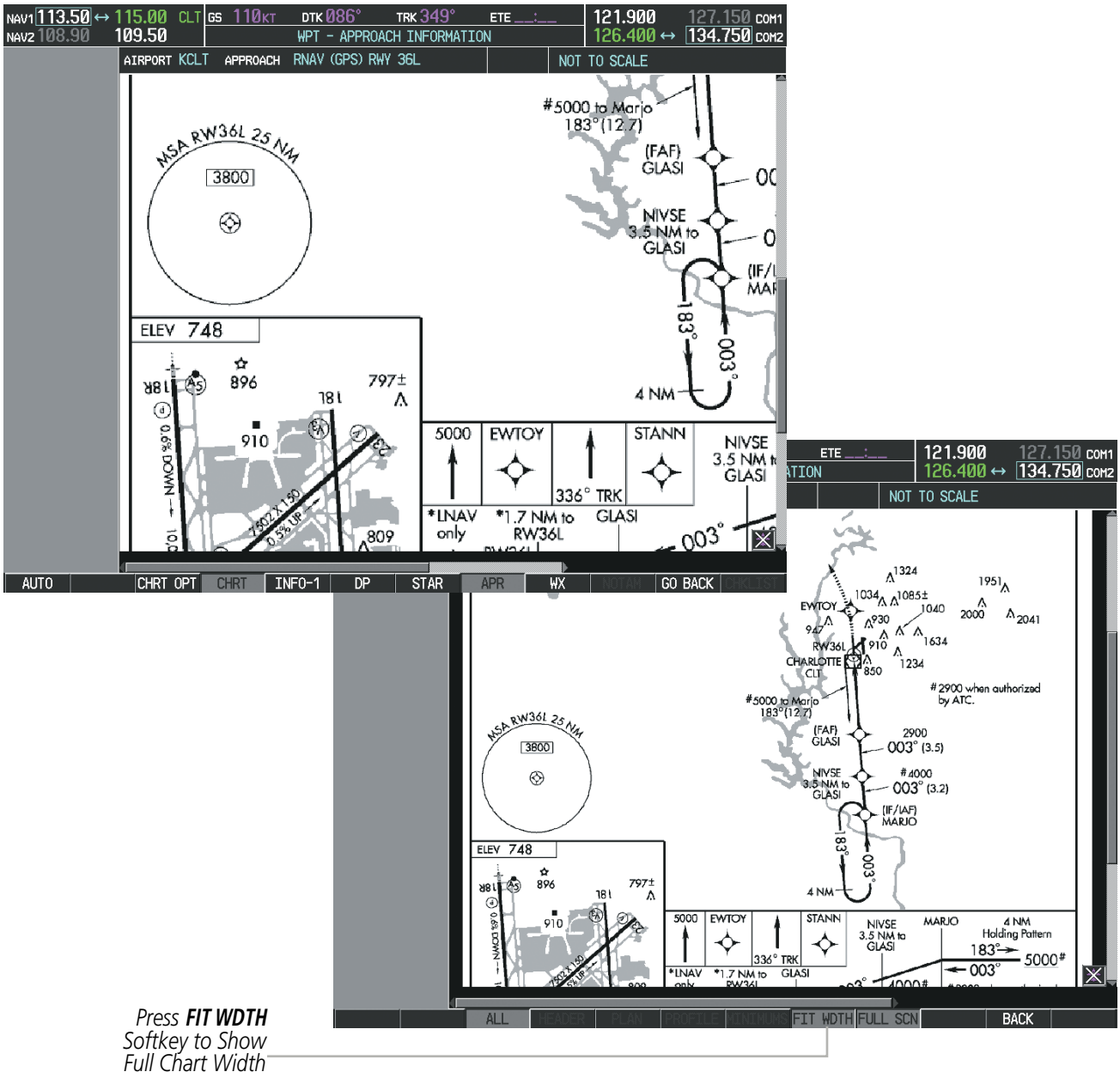


Figure 8-62 Approach Information Page, FIT WDTH Softkey Selected

Pressing the **FULL SCN** Softkey alternates between removing and replacing the data window to the right.

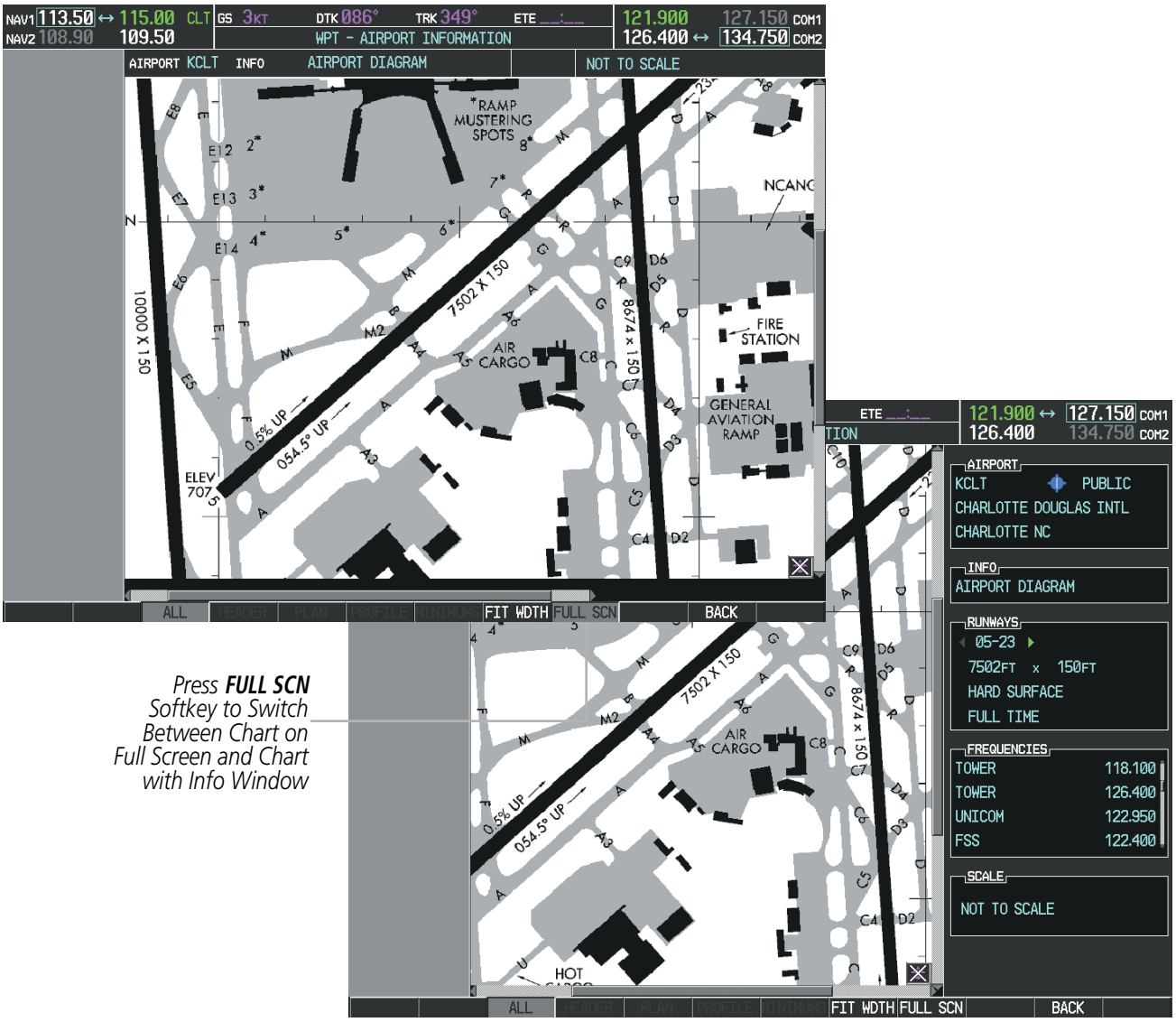


Figure 8-63 Airport Information Page, Full Screen and Info Window

Pressing the **BACK** Softkey, or waiting for 45 seconds reverts to the chart selection softkeys.

The full screen view can also be selected by using the page menu option.

Selecting full screen On or Off:

1) While viewing a terminal chart press the **MENU** Key to display the Page Menu OPTIONS.
2) Turn the large **FMS** Knob to highlight the Chart Setup Menu Option and press the **ENT** Key.
3) Turn the large **FMS** Knob to move between the FULL SCREEN and COLOR SCHEME Options.
4) Turn the small **FMS** Knob to choose between the On and Off Full Screen Options.

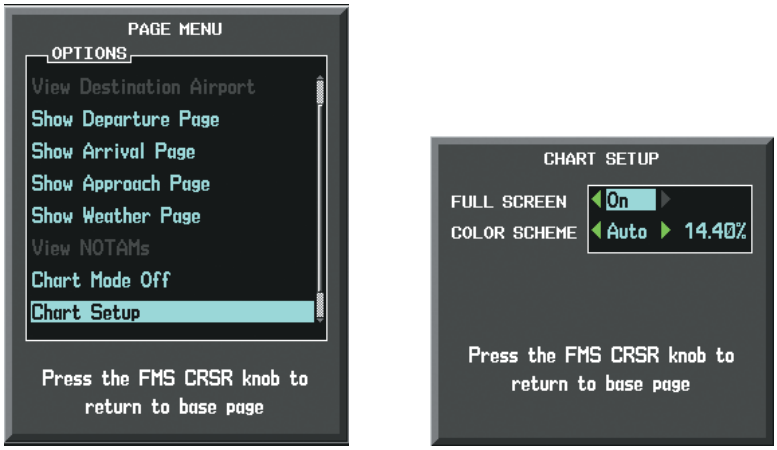


Chart Setup Option *Full Screen On/Off Selection*

Figure 8-64 Page Menus

DAY/NIGHT VIEW

FliteCharts can be displayed on a white or black background for day or night viewing. The Day View offers a better presentation in a bright environment. The Night View gives a better presentation for viewing in a dark environment. When the CHART SETUP Box is selected the G900X softkeys are blank.

Selecting Day, Night, or Automatic View:

1) While viewing a terminal chart press the **MENU** Key to display the Page Menu OPTIONS.
2) Turn the large **FMS** Knob to highlight the Chart Setup Menu Option and press the **ENT** Key.

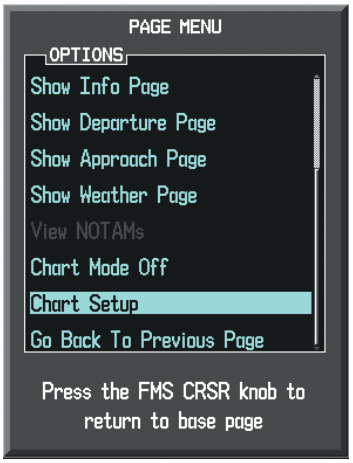


Figure 8-65 Waypoint Information Page, OPTIONS Menu

3) Turn the large **FMS** Knob to move to the COLOR SCHEME Option (Figure 8-66).
4) Turn the small **FMS** Knob to choose between Day, Auto, and Night Options.
5) If Auto Mode is selected, turn the large **FMS** Knob to select the percentage field. Use the small **FMS** Knob to change the percentage value. The percentage value is the day/night crossover point based on the percentage of backlighting intensity. For example, if the value is set to 15%, the day/night display changes when the display backlight reaches 15% of full brightness.

   The display must be changed in order for the new setting to become active. This may be accomplished by selecting another page or changing the display range.
6) Press the **FMS** Knob when finished to remove the Chart Setup Menu.

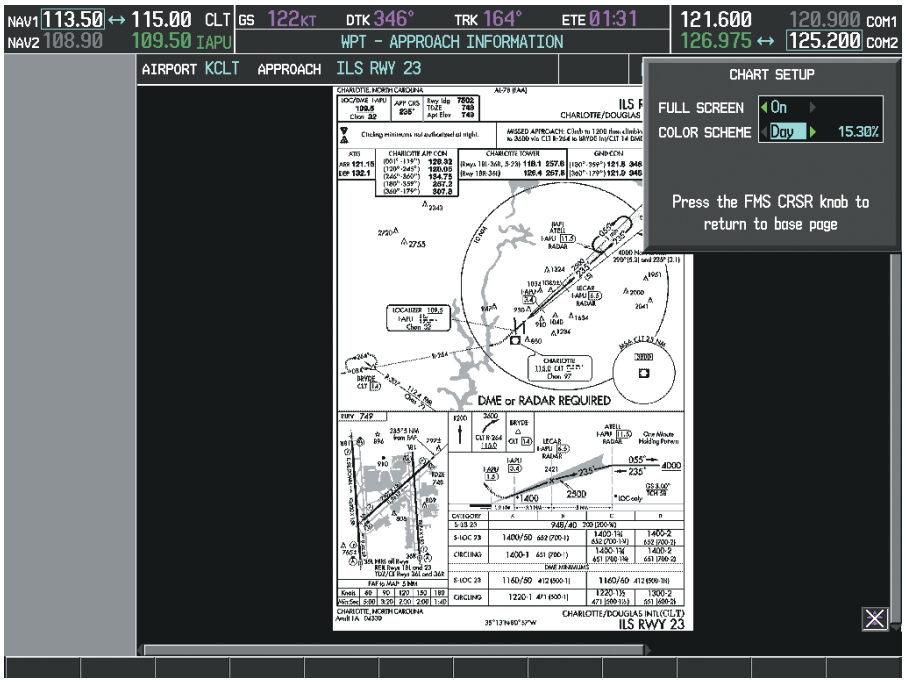


Figure 8-66 Approach Information Page, Day View

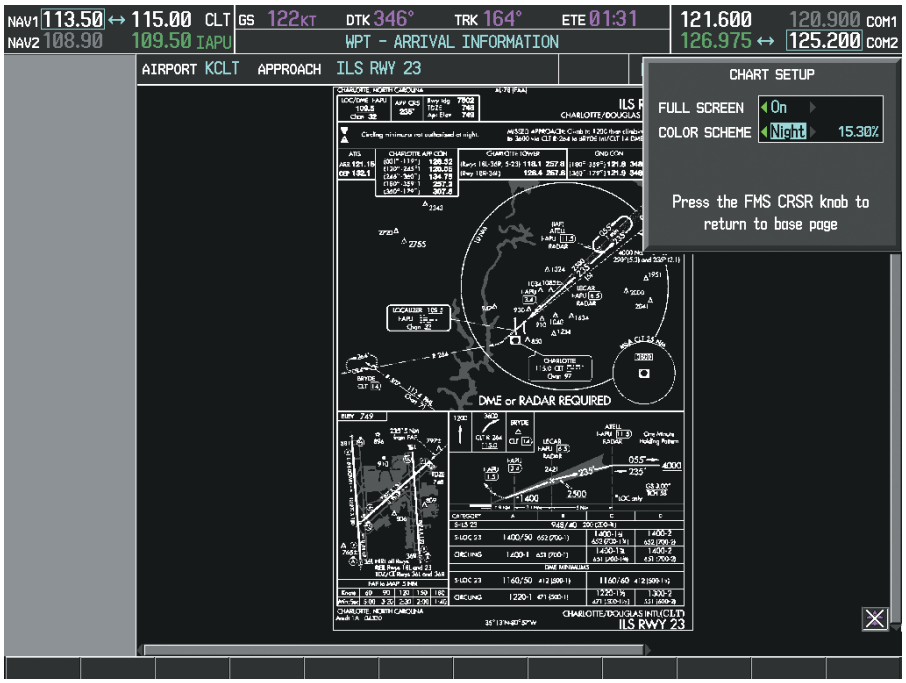


Figure 8-67 Approach Information Page, Night View

FLITECHARTS CYCLE NUMBER AND EXPIRATION DATE

FliteCharts data is revised every 28 days. Charts are still viewable during a period that extends from the cycle expiration date to the disables date. FliteCharts are disabled 180 days after the expiration date and are no longer available for viewing upon reaching the disables date. When turning on the system, the Power-up Page displays the current status of the FliteCharts database. See the table below for the various FliteCharts Power-up Page displays and the definition of each.



Figure 8-68 Power-up Page, FliteCharts Database

Power-up Page Display	Definition
	Blank Line. system is not configured for FliteCharts. Contact a Garmin-authorized service center for configuration.
Chart Data: N/A	System is configured for FliteCharts but no chart database is installed. Refer to Updating Garmin Databases in Appendix B for the FliteCharts database
FliteCharts Expires 10-MAR-2012	Normal operation. FliteCharts database is valid and within current cycle.
Chart data is out of date!	FliteCharts database is beyond the expiration date, but still within the 180 day viewing period.
Chart data is disabled.	FliteCharts database has timed out. Database is beyond 180 days after expiration date. FliteCharts database is no longer available for viewing.

Table 8-3 FliteCharts Power-up Page Annunciations and Definitions

Other possible AUX - System Status page conditions are shown in Figure 8-69. 'FliteCharts Expires' plus a date in white, indicates the chart database is current. 'Chart data is out of date!' in yellow, indicates charts are still viewable, but approaching the disable date.

When the 180 day grace period has expired, 'Chart data is disabled.' in yellow indicates that the FliteCharts database has expired and is no longer viewable. 'Chart Data: N/A' appears in white if no FliteCharts data is available on the database card or no database card is inserted.

FliteCharts time critical information can also be found on the AUX - System Status page. The FliteCharts database REGION, CYCLE number, EFFECTIVE, EXPIRES, and DISABLES dates of the subscription appear in either blue or yellow text. Dates shown in blue are current data. Dates shown in yellow indicate the data is not within the current subscription period.

FliteCharts becomes inoperative 180 days after the FliteCharts EXPIRES date is reached, and is no longer available for viewing. This date is shown as the DISABLES date. After the disable date the **SHW CHRT** Softkey label appears subdued and is unavailable until a revised issue of FliteCharts is installed.

NOTE: *A subdued softkey label indicates the function is disabled.*

Press the **MFD1 DB** Softkey to place the cursor in the DATABASE window. Scroll through the listed information by turning the **FMS** Knob or pressing the **ENT** Key until the FliteCharts database information is shown.

The FliteCharts database cycle number shown in the figure, 1202, is deciphered as follows:

12 – Indicates the year 2012

02 – Indicates the second issue of the FliteCharts database for the year

The FliteCharts EFFECTIVE date 10–FEB–12 is the first date that this database is current.

The FliteCharts EXPIRES date 10–MAR–12 is the last date that this database is current.

The DISABLES date 06–SEP–12 is the date that this database becomes inoperative.

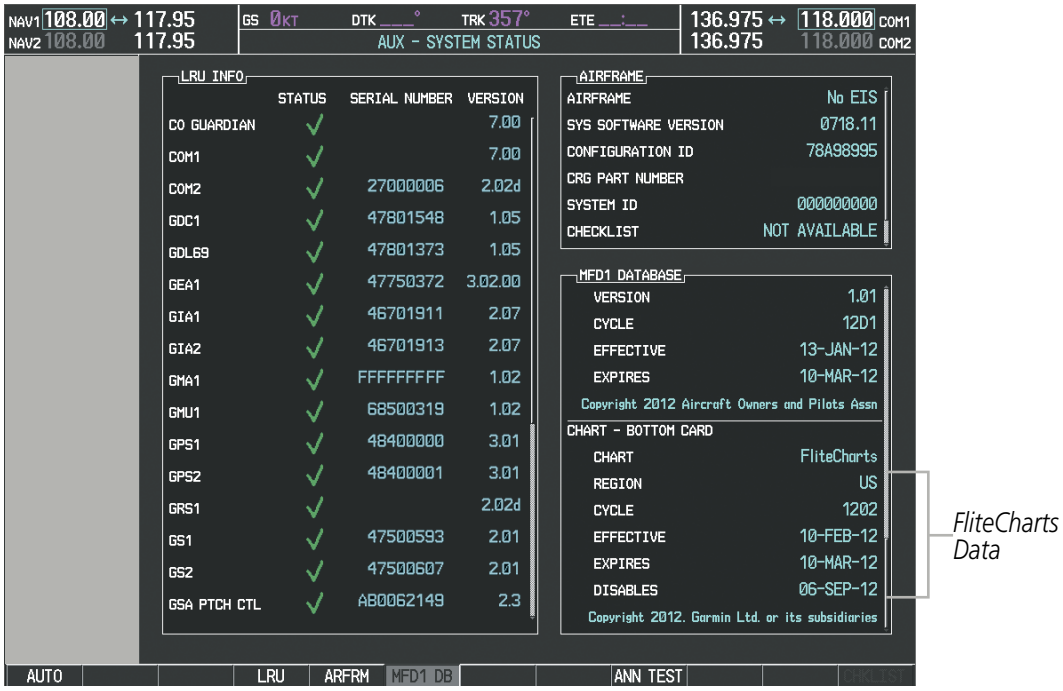
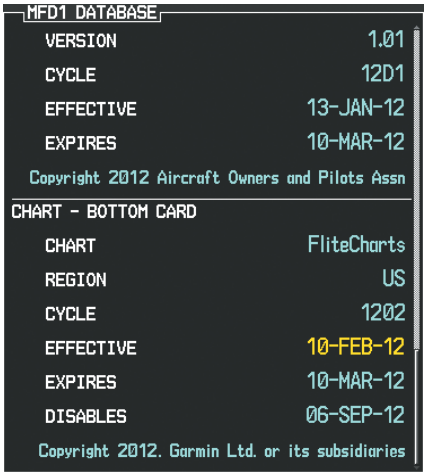


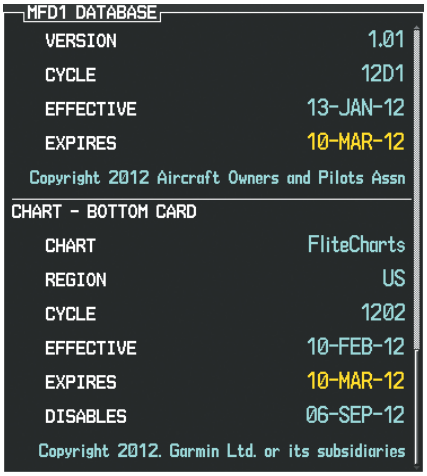
Figure 8-69 AUX – System Status Page, FliteCharts Current and Available

The FliteCharts database is provided from Garmin. Refer to Updating Garmin Databases in Appendix B for instructions on revising the FliteCharts database.

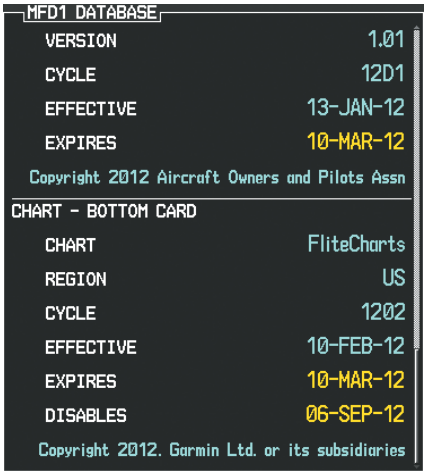
The other four possible AUX - System Status page conditions are shown here. The EFFECTIVE date, in yellow, indicates the current date preceeds the date the FliteCharts database becomes effective. The EXPIRES date, in yellow, is the revision date for the next database cycle. The DISABLES date, in yellow, is the date that this database cycle is no longer viewable. NOT AVAILABLE in blue, indicate the FliteCharts database is not available on the database card or no database card is inserted.



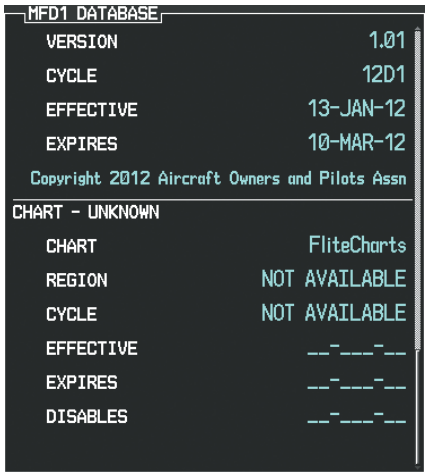
Current Date is Before Effective Date



FliteCharts Expired, but is not Disabled



FliteCharts Database is Disabled



FliteCharts Database is Not Available

Figure 8-70 AUX – System Status Page, FliteCharts Datbase Status

8.5 AIRPORT DIRECTORY

The Aircraft Owners and Pilots Association (AOPA) and optional AC-U-KWIK Airport Directory databases offer detailed information regarding services, hours of operation, lodging options, and more. This information is viewed on the Airport Information Page by selecting the INFO Softkey until **INFO-2** is displayed as shown in Figure 8-71.

Both Airport Directories are available for downloading at flygarmin.com. However, copy only one of the databases to the Supplemental Data Card. The system cannot recognize both databases simultaneously.

Selecting the Airport Directory Page:

1) Turn the large **FMS** Knob to select the 'WPT' page group.
2) Turn the small **FMS** Knob to select the AIRPORT INFORMATION Page. Initially, information for the airport closest to the aircraft's present position is displayed.
3) If necessary, select the INFO softkey until **INFO-2** is displayed.

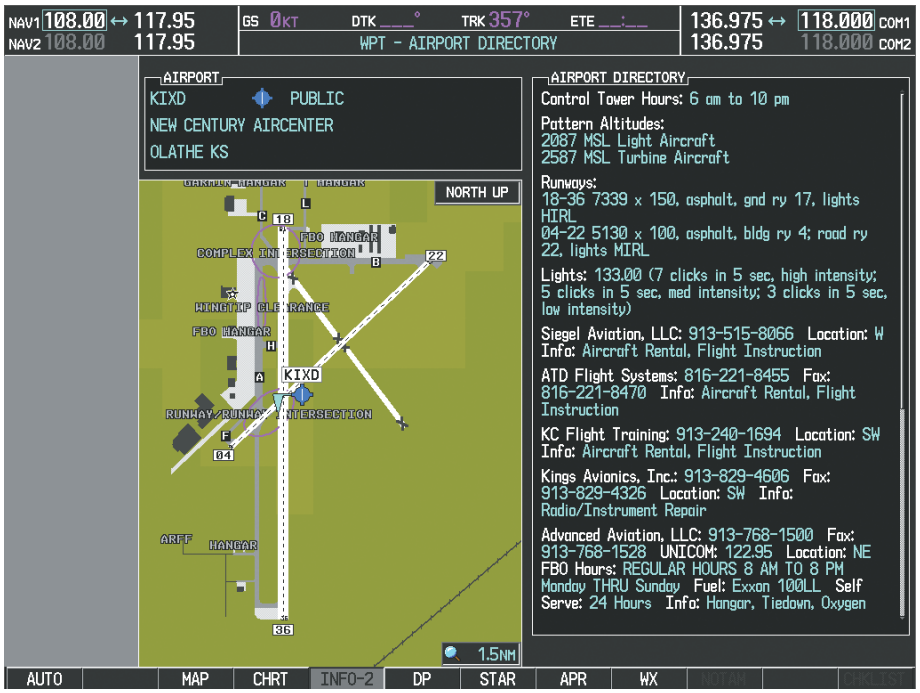


Figure 8-71 AOPA Information on the Airport Information Page

AIRPORT DIRECTORY DATABASE CYCLE NUMBER AND REVISION

The Airport Directory databases are revised every 56 days and offered on a subscription basis. Check fly.garmin.com for the current database. The Airport Directory is always available for use after the expiration date. When turning on the system, the Power-up Page indicates whether the databases are current, out of date, or not available.



Figure 8-72 Power-up Page, Airport Directory Database

Power-up Page Display	Definition
Apt Directory Expires 10-MAR-2012	Normal operation. Airport Directory database is valid and within current cycle.
Apt Directory Expires 10-MAR-2012	Airport Directory database has expired.
Apt Directory N/A	Database card contains no Airport Directory data.

Table 8-4 Airport Directory Annunciation Definitions

The Airport Directory Region, Version, Cycle, Effective date and Expires date of the database cycle can also be found on the AUX - System Status page, as seen in Figure 8-73.

Press the **MFD1 DB** Softkey to place the cursor in the DATABASE window. Scroll through the listed information by turning the **FMS** Knob or pressing the **ENT** Key until the Airport Directory database information is shown.

The Airport Directory database cycle number shown in the figure, 12D1, is deciphered as follows:

12 – Indicates the year 2012

D – Indicates the data is for Airport Directory

1 – Indicates the first issue of the Airport Directory database for the year

The Airport Directory EFFECTIVE date 13–JAN–12 is the beginning date for the current database cycle. The Airport Directory EXPIRES date 10–MAR–12 is the revision date for the next database cycle.

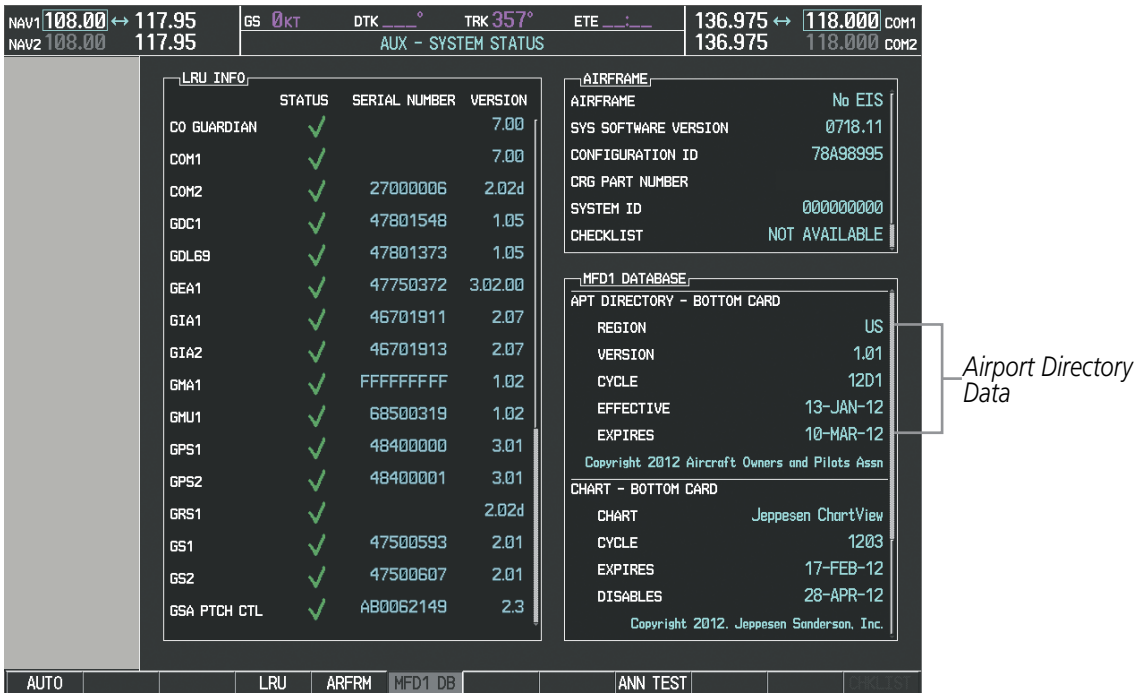


Figure 8-73 AUX – System Status Page, Airport Directory Current Information

Airport Directory information appears in blue and yellow text. The EFFECTIVE date appears in blue when data is current and in yellow when the current date is before the effective date. The EXPIRES date appears in blue when data is current and in yellow when expired (Table 8-4). NOT AVAILABLE appears in blue in the REGION field if Airport Directory data is not available on the database card. An expired Airport Directory database is not disabled and will continue to function indefinitely.

8.6 SATELLITE TELEPHONE SERVICES

The optional GSR 56 Iridium Transceiver provides airborne Iridium Satellite Telephone and SMS Messaging service. Iridium telephone and text meassaging are available to the flight crew through the MFD, audio panel, and headset.

Operation of these features is accomplished through the AUX-AUXILIARY COMMUNICATIONS Pages.

REGISTERING THE SYSTEM

A subscriber account must be established for each Iridium transceiver prior to using the Iridium Satellite System for telephone services. Before setting up an Iridium account, obtain the serial number of the Iridium Transceiver (GSR1) and the System ID by selecting the AUX- SYSTEM STATUS Page as shown in Figure 8-74. Contact Garmin Flight Data Services at 1-866-739-5687 in the United States or 913-397-8200, ext. 1135.

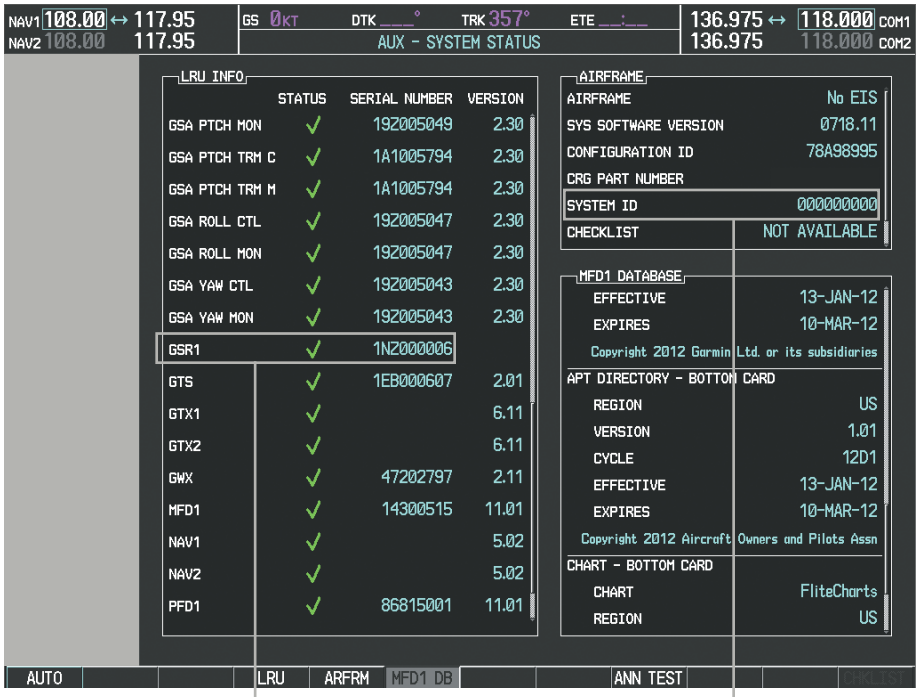


Figure 8-74 Identification Needed for Iridium Registration

TELEPHONE COMMUNICATION

The pilot or copilot can place and answer calls on the Iridium satellite network as well as to or from the telephone handset in the cabin, when installed. Calls can also be answered or made from the cabin phone, however, only actions initiated from the cockpit phone will be discussed here. See the cabin handset user guide for more information. Control and monitoring of telephone functions are accomplished through the AUX-TELEPHONE Page.

To view the Telephone Page:

1) Turn the large **FMS** Knob on the MFD to select the AUX page group.
2) Turn the small **FMS** Knob to select the AUX-TELEPHONE Page.

The PHONE STATUS display, as shown in Figure 8-75, gives a graphical representation of the current disposition of voice and/or data transmissions. Table 8-5 describes symbology used on PHONE STATUS display.

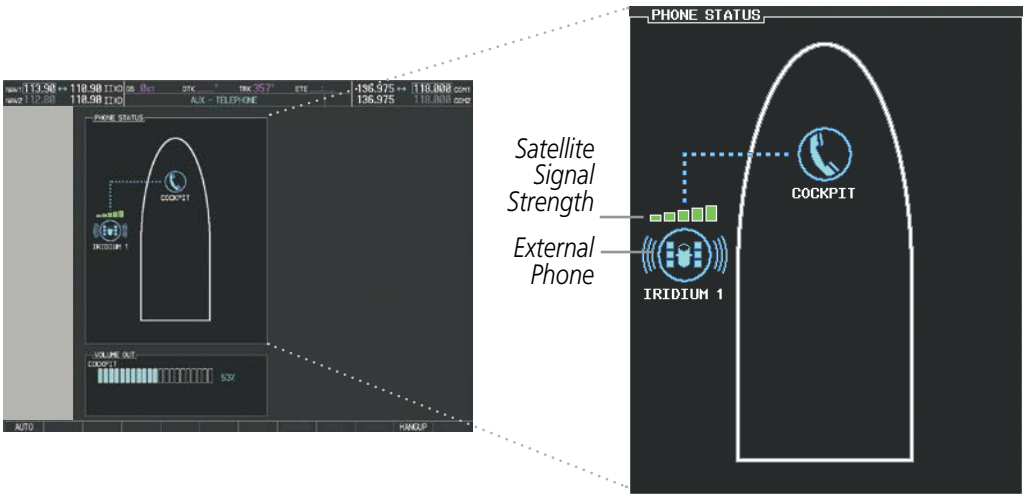


Figure 8-75 Phone Status Display

ENABLE/DISABLE THE IRIDIUM TELEPHONE SYSTEM

The Iridium Satellite Telephone System may be turned on or off by using the page menu.

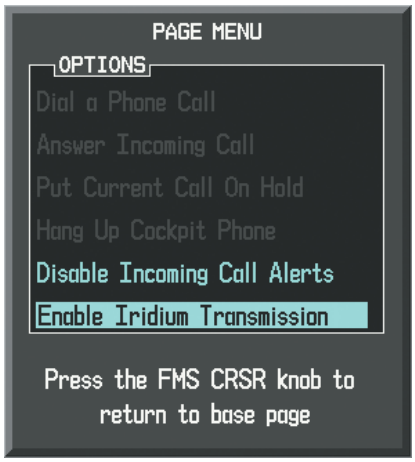


Figure 8-76 Enable Iridium Telephone System

To enable the Iridium telephone system:

1) With the AUX-TELEPHONE Page displayed, select the **MENU** Key on the MFD to display the Page Menu.
2) Turn either **FMS** Knob to place the cursor on 'Enable Iridium Transmission'.
3) Press the **ENT** Key.

To disable the Iridium telephone system:

1) With the AUX-TELEPHONE Page displayed, select the **MENU** Key on the MFD to display the Page Menu.
2) Turn either **FMS** Knob to place the cursor on 'Disable Iridium Transmission'.
3) Press the **ENT** Key.

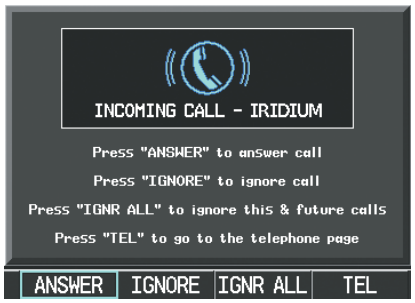
Internal Phone	External Phone	Description
		Phone is Idle
		Phone is ringing
		Phone has a dial tone (off hook) or connected to another phone
		Phone dialed is busy
		Phone is dialing another phone
		Phone has failed
		Phone status not known
		Phone is disabled
		Phone is reserved for data transmission
		Calling other phone or incoming call from other phone
		Other phone is on hold
		Phones are connected

Table 8-5 Telephone Symbols

INCOMING CALLS

NOTE: *Outside callers should dial 00 + 8816 or 8817 + aircraft phone number when calling the aircraft Iridium Telephone System.*

When viewing MFD pages other than the AUX-TELEPHONE Page, a pop-up alert similar to Figure 8-77 will be displayed. If the call is from the cabin, CABIN will be displayed as seen in this figure. If the incoming call is an Iridium network call, IRIDIUM will be displayed. In addition to the pop-up alert, a voice alert, "Incoming Call", will be heard on the selected cockpit audio.



Incoming Call Pop-up



Incoming Call Symbol on MFD Page

Figure 8-77 Incoming Call

To answer an incoming call in the cockpit:

1) Press the **TEL** Key on the appropriate audio panel.
2) Press the **ANSWER** Softkey on the MFD.

   Or:

   While viewing the AUX-TELEPHONE Page

1) Press the **TEL** Key on the appropriate audio panel.
2) Press the **MENU** Key to display the Page Menu.
3) Turn either **FMS** Knob to place the cursor on 'Answer Incoming Call'.
4) Press the **ENT** Key.

Selecting the **IGNORE** Softkey will extinguish the pop-up window and leave the call unanswered. Selecting the **TEL** Softkey will display the AUX-TELEPHONE allowing additional call information to be viewed before answering.

To mute incoming call alerts:

1) With the AUX-TELEPHONE Page displayed, press the **MENU** Key on the MFD to display the Page Menu.
2) Turn either **FMS** Knob to place the cursor on 'Mute Incoming Call Alerts'.
3) Press the **ENT** Key. The voice and pop-up alert will not be displayed now when an incoming call is received. The mute condition is annunciated on the Telephone Page as shown in Figure 8-78.

OUTGOING CALLS

Voice calls can be made from the cockpit to an external phone through the Iridium Satellite Network.

NOTE: *The Push-to-Talk switch is not utilized for telephone communication. The microphone is active after selecting the* ***ANSWER*** *Softkey, and stays active until the call is terminated.*

To make a call:

1) Press the **TEL** Key on the audio panel.

2) Press the **DIAL** Softkey on the MFD. A display similar to Figure 8-78 will be shown.

Or:

While viewing the AUX-TELEPHONE Page:

a) Press the **TEL** Key on the audio panel.

b) Press the **MENU** Key to display the Page Menu.

c) Turn either **FMS** Knob to place the cursor on 'Dial a Phone Call'.

d) Press the **ENT** Key.

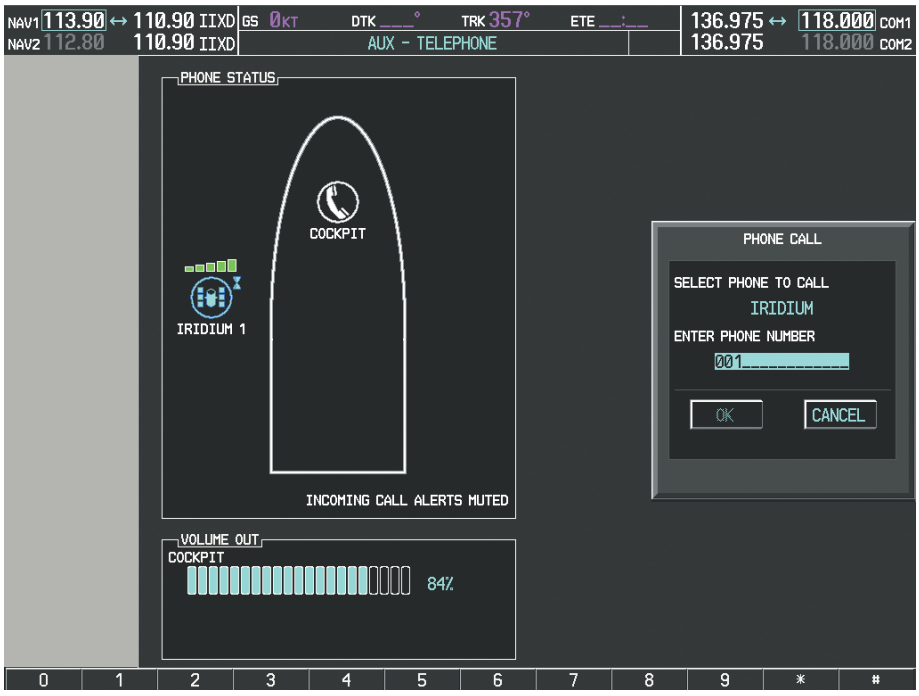


Figure 8-78 Initiating a Call

3) Enter the desired number string (typically, country code + area code + phone number) by selecting the number softkeys on the MFD, pressing the numeric keys on the PFD/MFD Controller, or turning the **FMS** Knobs. The system may be configured by an authorized repair facility to automatically enter a default country code when the dialing window is displayed. To replace the default country code, move the cursor to the first (furthest left) number in the dialing window and enter the desired country code.

4) Press the **ENT** Key. 'OK' is highlighted as in Figure 8-79.

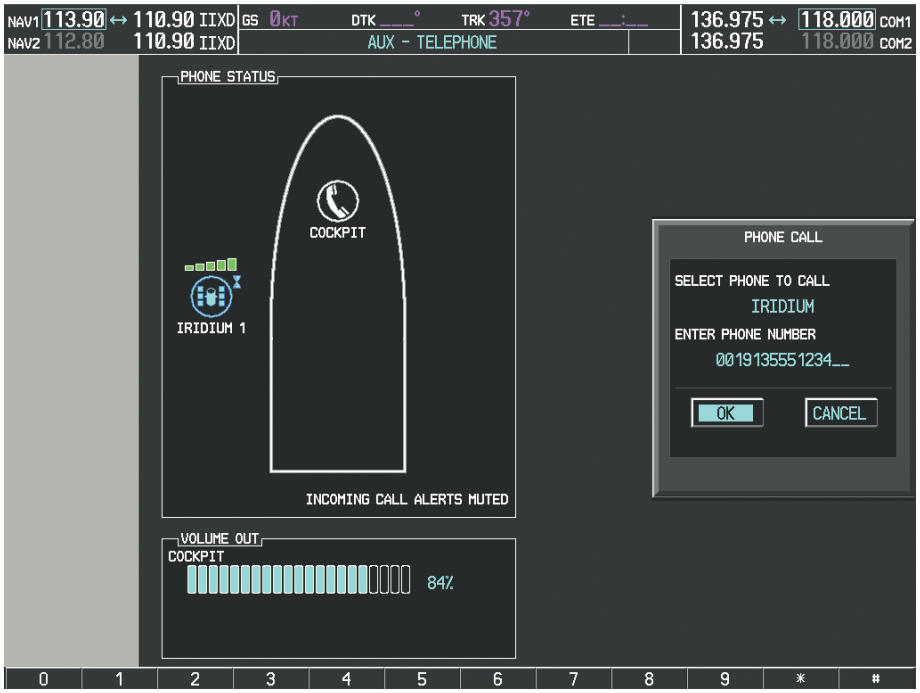


Figure 8-79 Make the Call

5) Press the **ENT** Key. The system will begin calling the number, as in Figure 8-80.

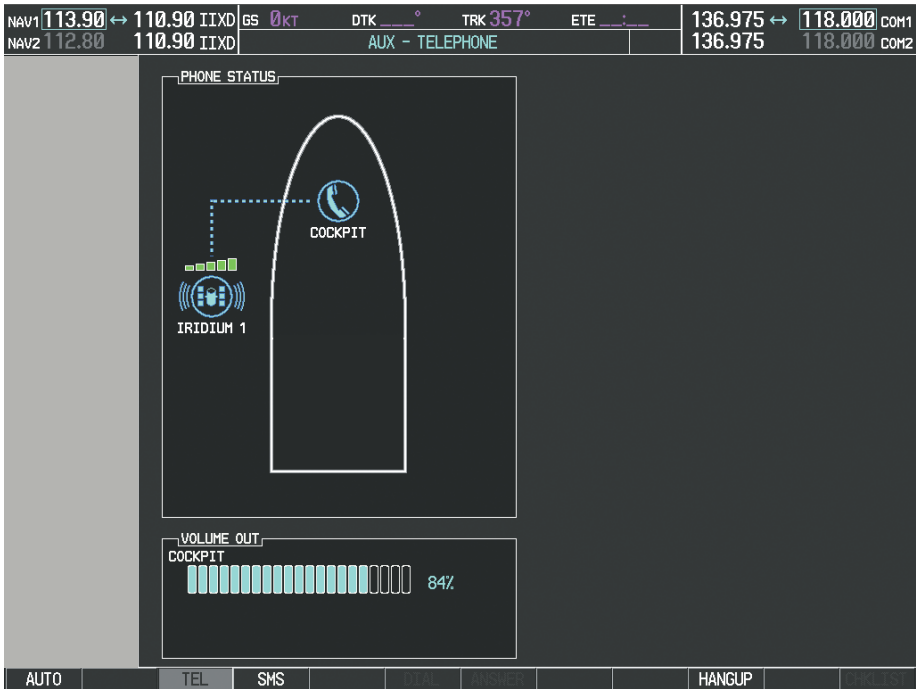


Figure 8-80 System is Making the Connection

When the phone is answered, the connection is established as shown in Figure 8-81. To exit the call, press the **HANGUP** Softkey.

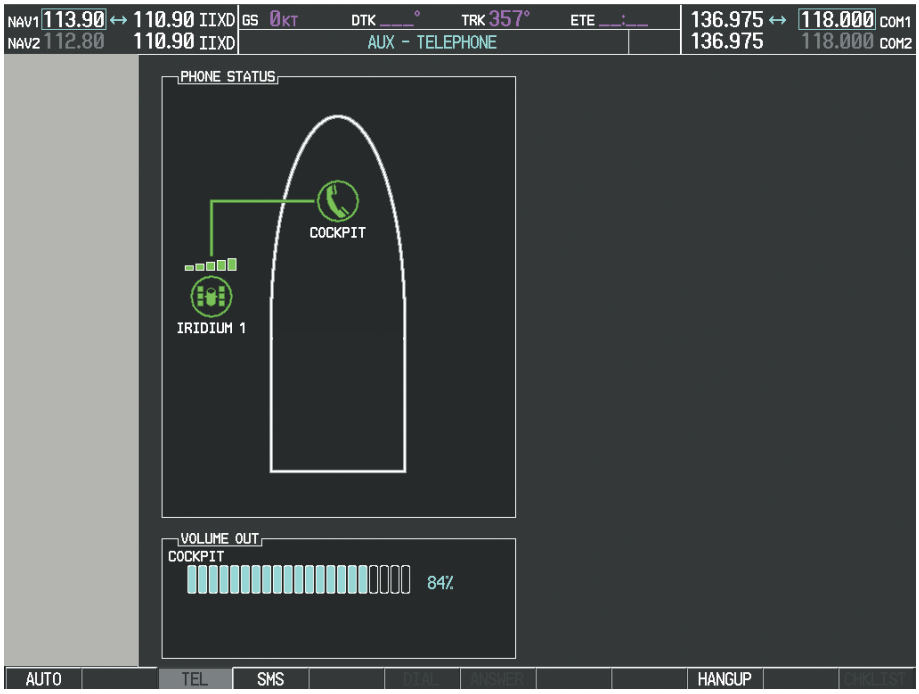


Figure 8-81 Phone is Answered, Connection Complete

TEXT MESSAGING (SMS)

The pilot or copilot can send and receive text messages on the Iridium satellite network. Messages may be sent to an email address or text message capable cellular telephone. Message length is limited to 160 characters, including the email address.

The text messaging user interface is mainly through the AUX-TEXT MESSAGING Page.

Viewing the Text Messaging Page:

1) Turn the large **FMS** Knob on the MFD to select the AUX page group.
2) Turn the small **FMS** Knob to select the SATELLITE PHONE.
3) If necessary, press the **SMS** Softkey to display the AUX-TEXT MESSAGING Page as shown in Figure 8-82.

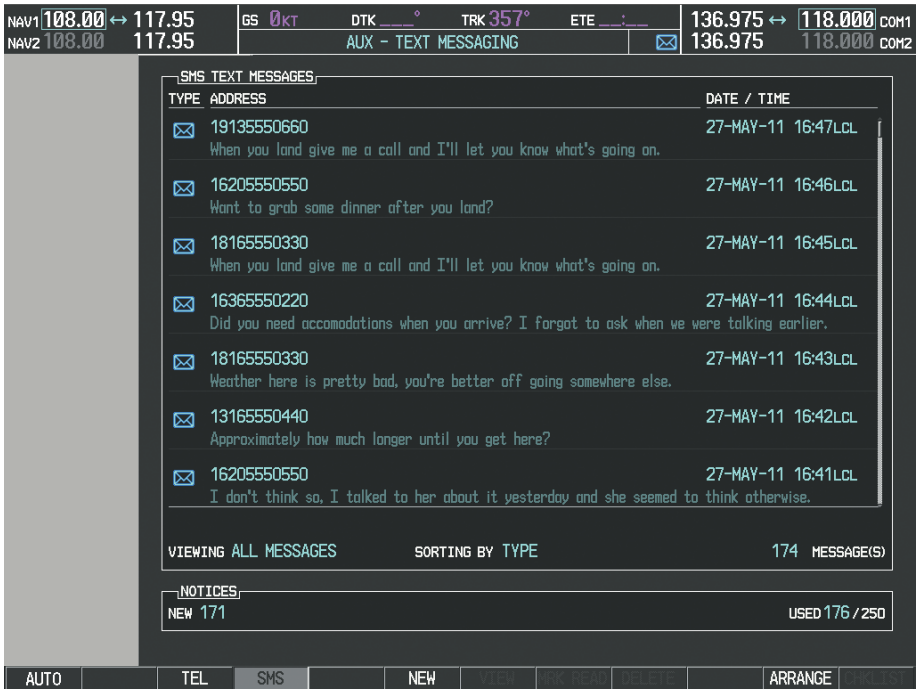


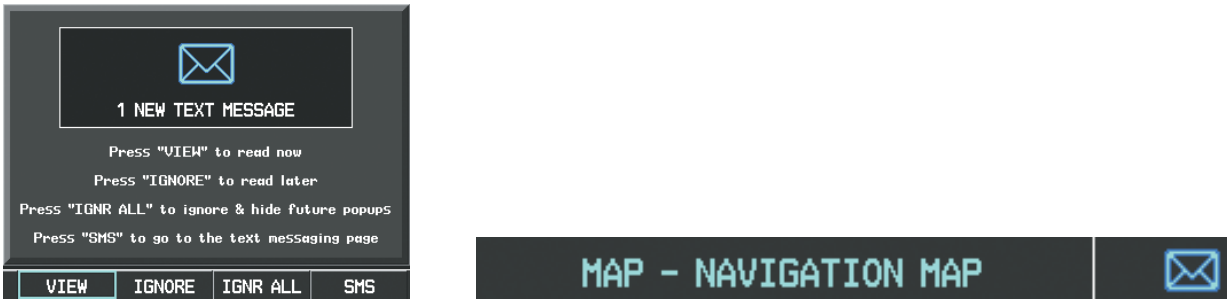
Figure 8-82 Text Messaging Page

Message Symbol	Description
	Received text message that has not been opened
	Received text message that has been opened
	Saved text message, draft not sent
	System is sending text message
	Text message has been sent
	System failed to send text message
	Predefined text message

Table 8-6 Text Message Symbols

VIEWING A TEXT MESSAGE WHEN RECEIVED

When viewing MFD pages other than the AUX-TEXT MESSAGING Page, a pop-up alert similar to Figure 8-83 will be displayed when a new text message is received.



New Text Message Pop-up *New Text Message Symbol on MFD Page*

Figure 8-83 New Text Message Received

Press the **VIEW** Softkey to view the message (Figure 8-84). Selecting the **IGNORE** Softkey will extinguish the pop-up window and leave the text message unopened. Selecting the **IGNR ALL** Softkey will extinguish the pop-window and ignore all future incoming text messages. Selecting the **SMS** Softkey will display the AUX-TEXT MESSAGING Page.



Figure 8-84 Text Message Displayed from Pop-Up Alert

The pop-up alerts may be enabled or disabled through the Page Menu.

Enabling/disabling incoming text message pop-up alerts:

1) With the AUX-TEXT MESSAGING Page displayed, press the **MENU** Key on the MFD to display the Page Menu.
2) Turn either **FMS** Knob to place the cursor on 'Disable New Message Popups' or 'Enable New Message Popups'.
3) Press the **ENT** Key. The pop-up alert will not be displayed when an incoming text message is received.



Figure 8-85 Disabling New Text Message Pop-Ups

REPLY TO A TEXT MESSAGE

After reading a text message, a reply may be sent.

Replying to a text message:

While viewing the text message, press the **REPLY** Softkey.

Or:

1) Press the **MENU** Key to display the Page Menu.

2) Turn either **FMS** Knob to place the cursor on 'Reply To Message'.

3) Press the **ENT** Key.

SENDING A TEXT MESSAGE

Text messages may be sent from the AUX-TEXT MESSAGING Page.

Sending a new text message:

1) While viewing the AUX-TEXT MESSAGING Page, press the **NEW** Softkey.

Or:

a) Press the **MENU** Key to display the Page Menu.

b) Turn either **FMS** Knob to place the cursor on 'Draft New Message'.

c) Press the **ENT** Key.

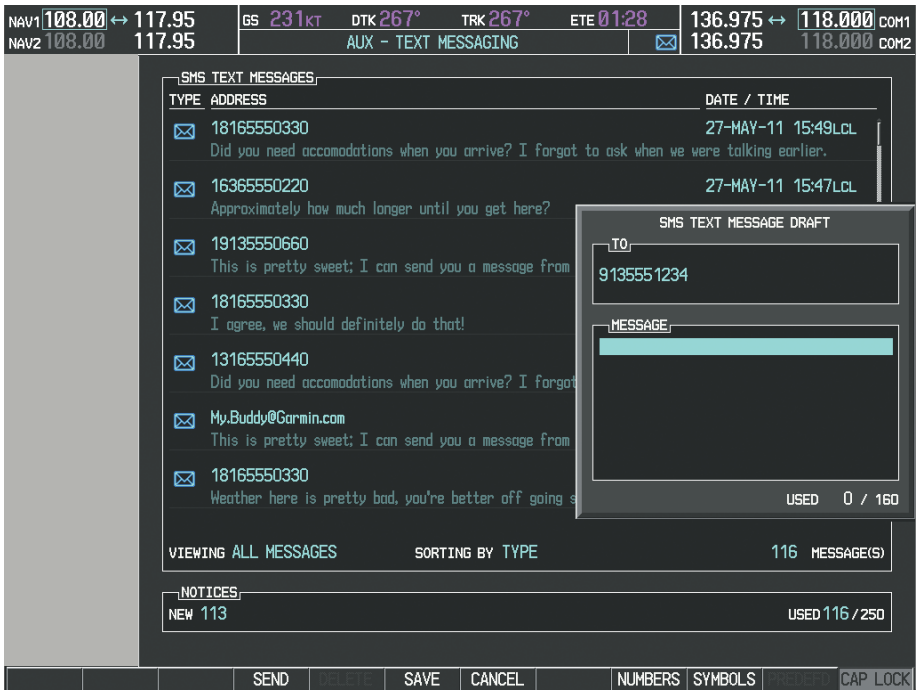


Figure 8-86 Composing a New Text Message

2) The TEXT MESSAGE DRAFT Window is now displayed with the cursor in the 'TO' field. Enter the desired telephone number or email address. Entry can be accomplished through the alphanumeric keys on the MFD Controller, or combination of the **FMS** Knob on the controller and softkeys on the MFD. The **FMS** Knob is used to enter letters and numbers, or numbers can be entered from the MFD by selecting the **NUMBERS** Softkey. Press the **CAP LOCK** Softkey to create upper and lower case alpha characters. Special characters can be accessed by selecting the **SYMBOLS** Softkey. See Figure 8-86.

3) Press the **ENT** Key. The cursor is now displayed in the 'MESSAGE' field.

4) Enter the desired message using any combination of entry methods as described in step 2.

5) Press the **ENT** Key.

6) Press the **SEND** Softkey to send the message immediately, or press the **SAVE** Softkey to save the message in Outbox for sending at a later time. Press the **CANCEL** Softkey to delete the message.

PREDEFINED TEXT MESSAGES

Time and effort can be saved in typing text messages that are used repeatedly by saving these messages as a predefined message.

Creating a predefined text message:

1) While viewing the AUX-TEXT MESSAGING Page, press the **MENU** Key to display the Page Menu.



Figure 8-87 Creating/Editing Predefined Messages

2) Turn either **FMS** Knob to select 'Edit Predefined Messages' as shown in Figure 8-87.

3) Press the **ENT** Key. The PREDEFINED MESSAGES view is now displayed.

4) Press the **NEW** Softkey.

Or:

a) Press the **MENU** Key to display the Page Menu.

b) Turn either **FMS** Knob to place the cursor on 'Draft New Predefined Message'.

c) Press the **ENT** Key. The PREDEFINED SMS TEXT MESSAGE Window is now displayed as shown in Figure 8-88.

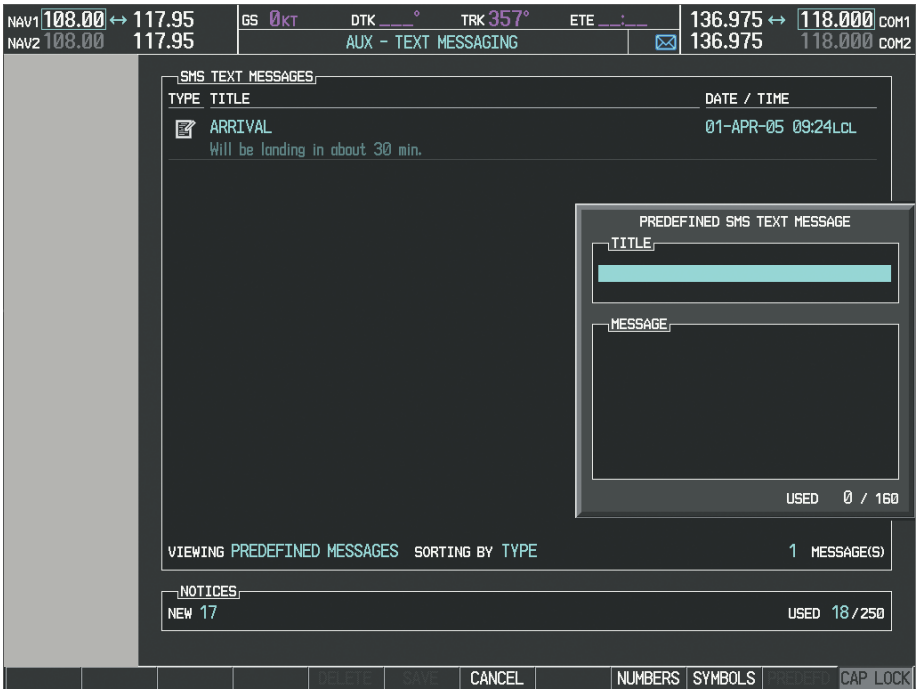


Figure 8-88 Composing a Predefined Message

5) The cursor is displayed in the 'TITLE' field. Enter the desired message title. Entry can be accomplished through the alphanumeric keys on the MFD Controller, or combination of the **FMS** Knob on the controller and softkeys on the MFD. The **FMS** Knob is used to enter letters and numbers, or numbers can be entered from the MFD by selecting the **NUMBERS** Softkey. Press the **CAP LOCK** Softkey to create upper and lower case alpha characters. Special characters can be accessed by selecting the **SYMBOLS** Softkey.

6) Press the **ENT** Key. The cursor is now displayed in the 'MESSAGE' field.

7) Enter the desired message using any combination of entry methods as described in step 5.

8) Press the **ENT** Key.

9) Press the **SAVE** Softkey. The new predefined message is now shown in the displayed list. Selecting the **CANCEL** Softkey will delete the message without saving.

10) Press the **MENU** Key to display the Page Menu.

11) Turn either **FMS** Knob to place the cursor on 'Stop Editing Predefined Message'.

12) Press the **ENT** Key.

Sending a predefined text message:

1) While viewing the AUX-TEXT MESSAGING Page, press the **NEW** Softkey.

2) The TEXT MESSAGE DRAFT Window is now displayed with the cursor in the 'TO' field. Enter the desired telephone number or email address. Entry can be accomplished through the alphanumeric keys on the MFD Controller, or combination of the **FMS** Knob on the controller and softkeys on the MFD. The **FMS** Knob is used to enter letters and numbers, or numbers can be entered from the MFD by selecting the **NUMBERS** Softkey. Press the **CAP LOCK** Softkey to create upper and lower case alpha characters. Special characters can be accessed by selecting the **SYMBOLS** Softkey. See Figure 8-89.

3) Press the **ENT** Key. The cursor is now displayed in the 'MESSAGE' field (Figure 8-89).

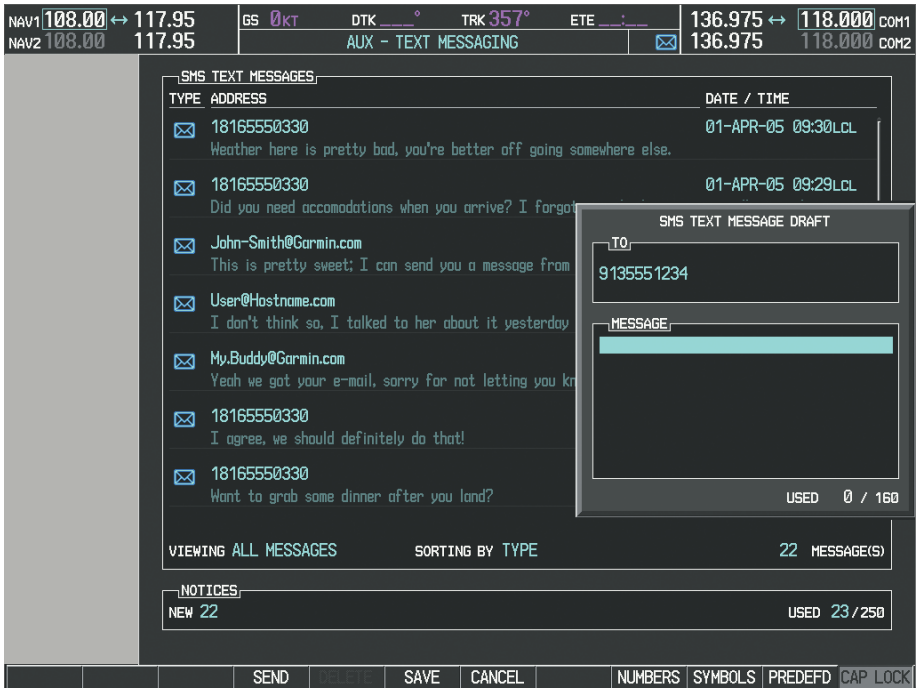


Figure 8-89 Composing a New Text Message

4) Press the **PREDEFD** Softkey. The PREDEFINED MESSAGE MENU Window is displayed as seen in Figure 8-90.

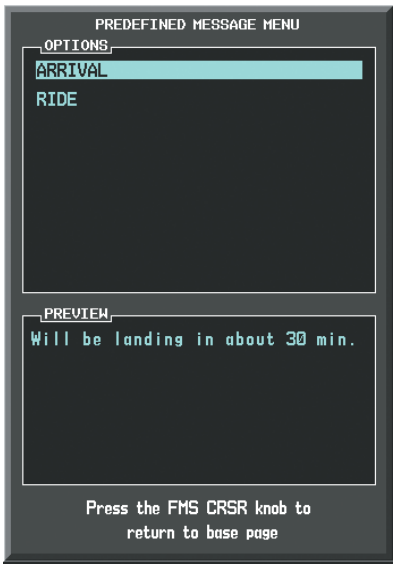


Figure 8-90 Predefined Message List

5) Turn either **FMS** Knob to select the desired predefined message.

6) Press the **ENT** Key. The predefined message text is inserted into the message field. If desired, the message can be edited by using the FMS Knobs.

7) Press the **ENT** Key.

8) Press the **SEND** Softkey to transmit the message.

TEXT MESSAGE BOXES

Received text messages reside in the Inbox as 'Read' or 'Unread' messages. The Outbox contains 'Sent" and 'Unsent' text messages. Saved messages that are meant to be sent later are stored as Drafts. Each text message box may be viewed separately, or together in any combination.

Show Inbox messages:

While viewing the AUX-TEXT MESSAGING Page, press the **ARRANGE** Softkey, then press the **INBOX** Softkey (Figure 8-91).

Or:

1) Press the **MENU** Key to display the Page Menu.

2) Turn either **FMS** Knob to place the cursor on 'Show Inbox Messages'.

3) Press the **ENT** Key. The message box selected for viewing is indicated at the bottom left of the list window.

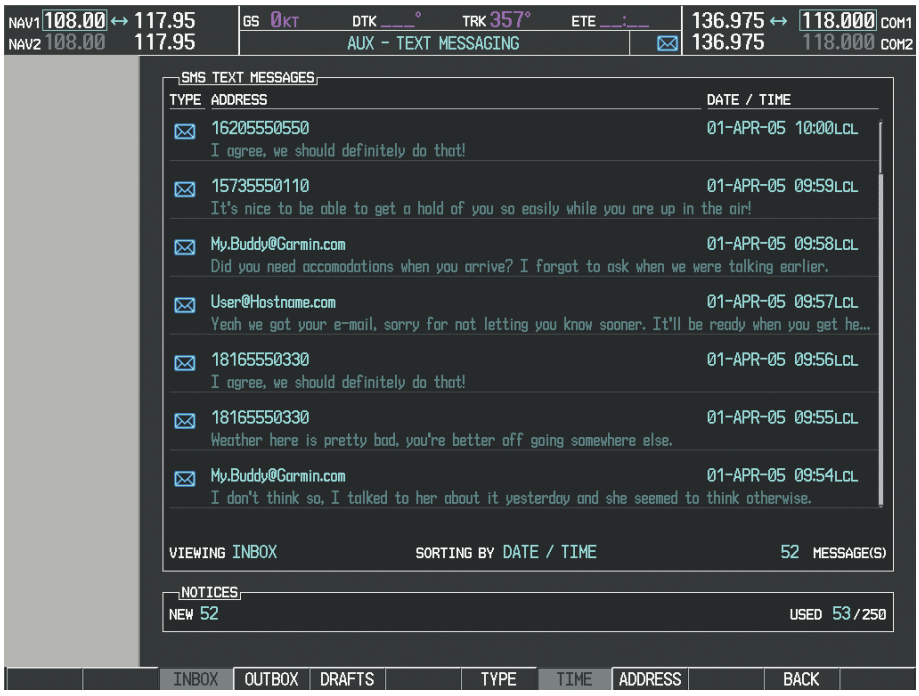


Figure 8-91 Text Message Inbox

Show Outbox messages:

While viewing the AUX-TEXT MESSAGING Page, press the **ARRANGE** Softkey, then press the **OUTBOX** Softkey.

Or:

1) Press the **MENU** Key to display the Page Menu.

2) Turn either **FMS** Knob to place the cursor on 'Show Outbox Messages'.

3) Press the **ENT** Key. The message box selected for viewing is indicated at the bottom left of the list window.

Show Draft messages:

While viewing the AUX-TEXT MESSAGING Page, press the **ARRANGE** Softkey, then press the **DRAFTS** Softkey.

Or:

1) Press the **MENU** Key to display the Page Menu.

2) Turn either **FMS** Knob to place the cursor on 'Show Draft Messages'.

3) Press the **ENT** Key. The message box selected for viewing is indicated at the bottom left of the list window.

MANAGING TEXT MESSAGES

The viewed messages may be listed according to the date/time the message was sent or received, the type of message (read, unread, sent, unsent, etc.), or by message address.

Viewing messages sorted by message date/time:

While viewing the AUX-TEXT MESSAGING Page, press the **ARRANGE** Softkey, then press the **TIME** Softkey (Figure 8-91).

Or:

1) Press the **MENU** Key to display the Page Menu.

2) Turn either **FMS** Knob to place the cursor on 'Sort By Date/Time'.

3) Press the **ENT** Key. The sorting selection is indicated at the bottom center of the list window (Figure 8-91).

Viewing messages sorted by message type:

While viewing the AUX-TEXT MESSAGING Page, press the **ARRANGE** Softkey, then press the **TYPE** Softkey.

Or:

1) Press the **MENU** Key to display the Page Menu.

2) Turn either **FMS** Knob to place the cursor on 'Sort By Type'.

3) Press the **ENT** Key. The sorting selection is indicated at the bottom center of the list window.

Viewing messages sorted by address:

While viewing the AUX-TEXT MESSAGING Page, press the **ARRANGE** Softkey, then press the **ADDRESS** Softkey.

Or:

1) Press the **MENU** Key to display the Page Menu.

2) Turn either **FMS** Knob to place the cursor on 'Sort By Address'.

3) Press the **ENT** Key. The sorting selection is indicated at the bottom center of the list window.

Viewing the content of a text message:

1) While viewing the AUX-TEXT MESSAGING Page, select the desired message box.

2) Press the **FMS** Knob to activate the cursor.

3) Turn either **FMS** Knob to select the desired message.

4) Press the **VIEW** Softkey.

Or:

Press the **ENT** Key.

Or:

a) Press the **MENU** Key to display the Page Menu.

b) Turn either **FMS** Knob to place the cursor on 'View Selected Message'.

c) Press the **ENT** Key.

Message content is displayed as shown in Figure 8-92.

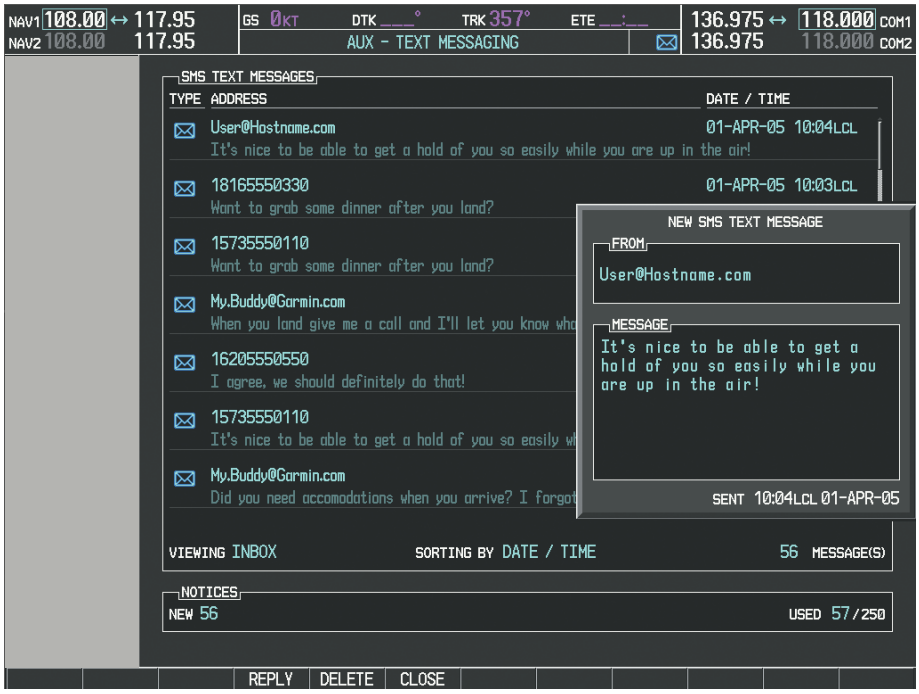


Figure 8-92 Viewing Message Content

5) To close the text message, press the **CLOSE** Softkey.

Or:

a) Press the **MENU** Key to display the Page Menu.

b) Turn either **FMS** Knob to place the cursor on 'Close Message'.

c) Press the **ENT** Key.

Marking selected message as read:

1) While viewing the Inbox on the AUX-TEXT MESSAGING Page, press the **FMS** Knob to activate the cursor.
2) Turn either **FMS** Knob to select the desired message.
3) Press the **MRK READ** Softkey.

   Or:

   a) Press the **MENU** Key to display the Page Menu.

   b) Turn either **FMS** Knob to place the cursor on 'Mark Selected Message As Read'.

   c) Press the **ENT** Key.

   The message symbol now indicates the message has been opened.

Marking all messages as read:

1) While viewing the Inbox on the AUX-TEXT MESSAGING Page, press the **MENU** Key to display the Page Menu.
2) Turn either **FMS** Knob to place the cursor on 'Mark All New Messages As Read'.
3) Press the **ENT** Key. A confirmation window is displayed.
4) With cursor highlighting 'YES', press the **ENT** Key. The message symbols now indicate all the message have been opened.

Delete a message:

1) While viewing the Inbox on the AUX-TEXT MESSAGING Page, press the **FMS** Knob to activate the cursor.
2) Turn either **FMS** Knob to select the desired message.
3) Press the **DELETE** Softkey.

   Or:

   a) Press the **MENU** Key to display the Page Menu.

   b) Turn either **FMS** Knob to place the cursor on 'Delete Selected Message'.

   c) Press the **ENT** Key.

8.7 SIRIUSXM SATELLITE RADIO ENTERTAINMENT

NOTE: *Refer to the Hazard Avoidance Section for information about XM WX Satellite Weather products.*

The optional SiriusXM Satellite Radio entertainment feature of the GDL 69A Data Link Receiver is available for the pilot's and passengers' enjoyment. The GDL 69A can receive SiriusXM Satellite Radio entertainment services at any altitude throughout the Continental U.S. Entertainment audio is not available on the GDL 69 Data Link Receiver.

SiriusXM Satellite Radio offers a variety of radio programming over long distances without having to constantly search for new stations. Based on signals from satellites, coverage far exceeds land-based transmissions. SiriusXM Satellite Radio services are subscription-based. For more information on specific service packages, visit www.siriusxm.com.

ACTIVATING SIRIUSXM SATELLITE RADIO SERVICES

The service is activated by providing SiriusXM Satellite Radio with either one or two coded IDs, depending on the equipment. Either the Audio Radio ID or the Data Radio ID, or both, must be provided to SiriusXM Satellite Radio to activate the entertainment subscription.

It is not required to activate both the entertainment and weather service subscriptions with the GDL 69A. Either or both services can be activated. SiriusXM Satellite Radio uses one or both of the coded IDs to send an activation signal that, when received by the GDL 69A, allows it to play entertainment programming.

These IDs are located:

- On the label on the back of the Data Link Receiver
- On the XM Information Page on the MFD (Figure 8-93)
- On the XM Satellite Radio Activation Instructions included with the unit (available at www.garmin.com, P/N 190-00355-04)

Contact the installer if the Data Radio ID and the Audio Radio ID cannot be located.

NOTE: *The **LOCK** Softkey on the XM Information Page (Auxiliary Page Group) is used to save GDL 69A activation data when the SiriusXM services are initially set up. It is not used during normal SiriusXM Radio operation, but there should be no adverse effects if inadvertently selected during flight. Refer to the GDL 69/69A XM Satellite Radio Activation Instructions (190-00355-04, Rev H or later) for further information.*

Activating the SiriusXM Satellite Radio services:

1) Contact SiriusXM Satellite Radio. Follow the instructions provided by SiriusXM Satellite Radio services.
2) Select the Auxiliary Page Group.
3) Select the XM RADIO page in the AUX Page Group.
4) Press the **INFO** Softkey to display the XM Information Page.
5) Verify that the desired services are activated.

6) Press the **LOCK** Softkey.

7) Turn the large **FMS** Knob to highlight YES.

8) To complete activation, press the **ENT** Key.

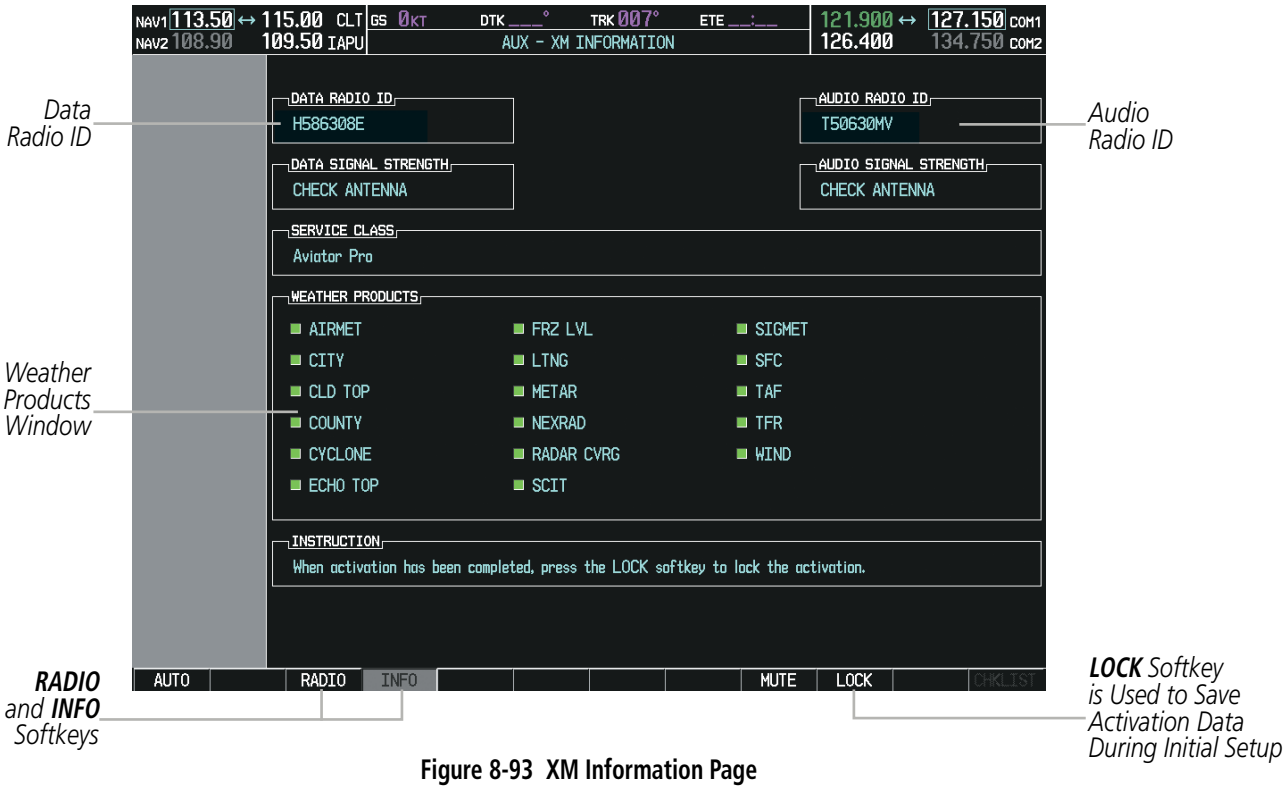


Figure 8-93 XM Information Page

If XM WX Satllite Weather services have not been activated, all the weather product boxes are blank on the XM Information Page and a yellow Activation Required message is displayed in the center of the Weather Data Link Page (Map Page Group). The Service Class refers to the groupings of weather products available for subscription.

USING SIRIUSXM RADIO

The XM Radio Page provides information and control of the audio entertainment features of the SiriusXM Satellite Radio.

Selecting the XM Radio Page:

1) Turn the large **FMS** Knob to select the Auxiliary Page Group.
2) Turn the small **FMS** Knob to select the displayed AUX - XM RADIO Page.
3) Press the **RADIO** Softkey to show the XM Radio Page where audio entertainment is controlled.



Figure 8-94 XM Radio Page

ACTIVE CHANNEL AND CHANNEL LIST

The Active Channel Box on the XM Radio Page displays the currently selected channel that the SiriusXM Radio is using.

The Channels List Box of the XM Radio Page shows a list of the available channels for the selected category. Channels can be stepped through one at a time or may be selected directly by channel number.

Selecting a channel from the channel list:

1) While on the XM Radio Page, press the **CHNL** Softkey.
2) Press the **CH +** Softkey to go up through the list in the Channel Box, or move down the list with the **CH –** Softkey.

Or:

1) Press the **FMS** Knob to highlight the channel list and turn the large **FMS** Knob to scroll through the channels.
2) Press the **ENT** Key to activate the selected channel.

Selecting a channel directly:

1) While on the XM Radio Page, press the **CHNL** Softkey.
2) Press the **DIR CH** Softkey. The channel number in the Active Channel Box is highlighted.
3) Press the numbered softkeys located on the bottom of the display to directly enter the desired channel number.
4) Press the **ENT** Key to activate the selected channel.

CATEGORY

The Category Box of the XM Radio Page displays the currently selected category of audio. Categories of channels such as jazz, rock, or news can be selected to list the available channels for a type of music or other contents. One of the optional categories is PRESETS to view channels that have been programmed.

Selecting a category:

1) Press the **CATGRY** Softkey on the XM Radio Page.
2) Press the **CAT +** and **CAT -** Softkeys to cycle through the categories.

   Or:

   Turn the small **FMS** Knob to display the Categories list. Highlight the desired category with the small **FMS** Knob and press the **ENT** Key. Selecting All Categories places all channels in the list.



Figure 8-95 Categories List

PRESETS

Up to 15 channels from any category can be assigned a preset number. The preset channels are selected by pressing the **PRESETS** and **MORE** Softkeys. Then the preset channel can be selected directly and added to the channel list for the Presets category.

Setting a preset channel number:

1) On the XM Radio Page, while listening to an Active Channel that is wanted for a preset, press the **PRESETS** Softkey to access the first five preset channels (**PS1 - PS5**).
2) Press the **MORE** Softkey to access the next five channels (**PS6 – PS10**), and again to access the last five channels (**PS11 – PS15**). Pressing the **MORE** Softkey repeatedly cycles through the preset channels.
3) Press any one of the (**PS1 - PS15**) softkeys to assign a number to the active channel.
4) Press the **SET** Softkey on the desired channel number to save the channel as a preset.

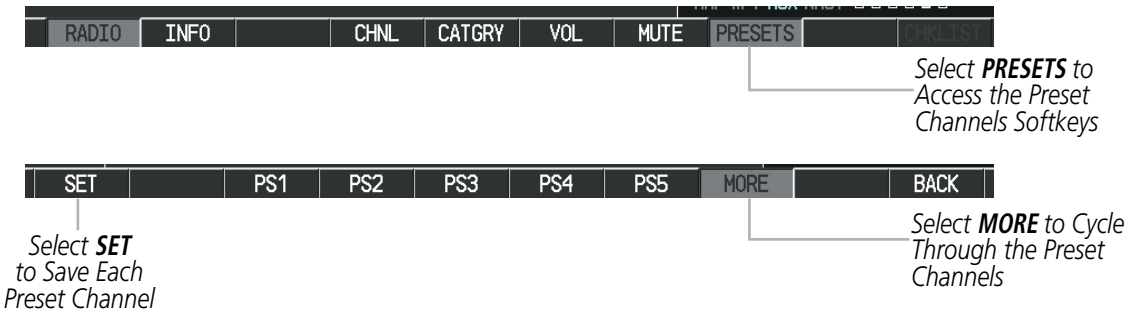


Figure 8-96 Accessing and Selecting XM Preset Channels

Pressing the **BACK** Softkey, or waiting during 45 seconds of softkey inactivity, returns the system to the top level softkeys.

VOLUME

Radio volume is shown as a percentage. Volume level is controlled by selecting the **VOL** Softkey, which brings up the **MUTE** Softkey and the volume increase and decrease softkeys.

Adjusting the volume:

1) With the XM Radio Page displayed, press the **VOL** Softkey.
2) Press the **VOL –** Softkey to reduce volume or press the **VOL +** Softkey to increase volume. (Once the **VOL** Softkey is pressed, the volume can also be adjusted using the small **FMS** Knob.)

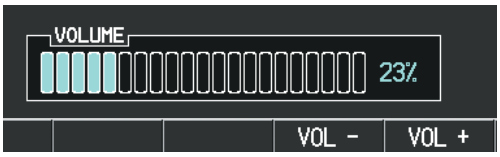


Figure 8-97 Volume Control

Radio volume may also be adjusted at each passenger station.

Mute SiriusXM audio:

1) Select the XM Radio Page or XM Information Page.
2) Press the **MUTE** Softkey to mute the audio. Press the **MUTE** Softkey again to unmute the audio.

BLANK PAGE

8.8 BLUETOOTH® MANAGEMENT

The Bluetooth Management Page allows for setting up the installed optional Flight Stream device for a Bluetooth connection between the G900X and a mobile device running the Garmin Pilot™ application. When connected, GPS, AHRS, ADS-B, and FIS-B weather data is shared with the mobile device. Also, flight plans can be transferred from the mobile device to the G900X. See the Flight Planning discussion in the Flight Management section of this manual and the Garmin Pilot User Guide for more details regarding flight plans.

The mobile device must be 'paired' with the G900X in order to use the various functions. Pairing is accomplished by first placing the G900X in pairing mode by displaying the Bluetooth Management Page as shown in Figure 8-98. Note the 'PAIRING MODE' field shows 'ENABLED'. The G900X is 'discoverable' whenever this page is displayed. The pairing operation is completed from the mobile device and the Garmin Pilot application. See the device Bluetooth pairing instructions and the connection instructions in the Garmin Pilot application.

The following functions are also available on this page display:

- Changing the Bluetooth name
- Enabling and disabling import of flight plans from a mobile device
- Enabling and disabling automatic reconnection to individual paired devices
- Removal of specific paired devices



Figure 8-98 Bluetooth Management Page

Viewing the Bluetooth Management Page:

1) Turn the large **FMS** Knob on the MFD to select the AUX page group.
2) Turn the small **FMS** Knob to select the BLUETOOTH MANAGEMENT page.

Changing the Bluetooth name:

1) While viewing the Bluetooth Management Page, press the **FMS** Knob to activate the cursor.
2) Turn the large **FMS** Knob to place the cursor in the 'BLUETOOTH NAME' field.
3) Enter the desired name by using the large **FMS** Knob to select the character field, and the small **FMS** Knob select the desired alphanumeric character for that field.
4) Press the **ENT** Key. The cursor is removed and the new name is displayed.

Enabling/Disabling Flight Plan importing from Garmin Pilot:

1) While viewing the Bluetooth Management Page, press the **FMS** Knob to activate the cursor.
2) Turn the large **FMS** Knob to place the cursor in the 'FLIGHT PLAN IMPORT' field.
3) Turn the small **FMS** Knob to select 'ENABLED' or 'DISABLED'.
4) Press the **FMS** Knob to remove the cursor.

Enabling/Disabling automatic reconnection of a specific paired device:

1) While viewing the Bluetooth Management Page, press the **FMS** Knob to activate the cursor.
2) Turn the large **FMS** Knob to highlight the desired paired device.
3) Turn the small **FMS** Knob to select 'ENABLED' or 'DISABLED'. Selecting 'ENABLED' allows the G900X to automatically connect to a previously paired device when detected.
4) Press the **FMS** Knob to remove the cursor.

Removing a specific paired device from the list of paired devices:

1) While viewing the Bluetooth Management Page, press the **FMS** Knob to activate the cursor.
2) Turn the large **FMS** Knob to highlight the desired paired device.
3) Press the **REMOVE** Softkey. A confirmation screen is displayed as seen in Figure 8-99.



Figure 8-99 Device Removal Confirmation

4) If necessary, turn the large **FMS** Knob to select 'YES'.
5) Press the **ENT** Key to remove the device from the list of paired devices.

8.9 SCHEDULER

The Scheduler feature can be used to enter and display reminder messages (e.g., Change oil, Altimeter-Transponder, or Hot Section Inspection or Phase 1 Maintenance Check) in the Messages Window on the PFD. Messages can be set to display based on a specific date and time (event), once the message timer reaches zero (one-time; default setting), or recurrently whenever the message timer reaches zero (periodic). Message timers set to periodic alerting automatically reset to the original timer value once the message is displayed. When power is cycled, all messages are retained until deleted, and message timer countdown is resumed.

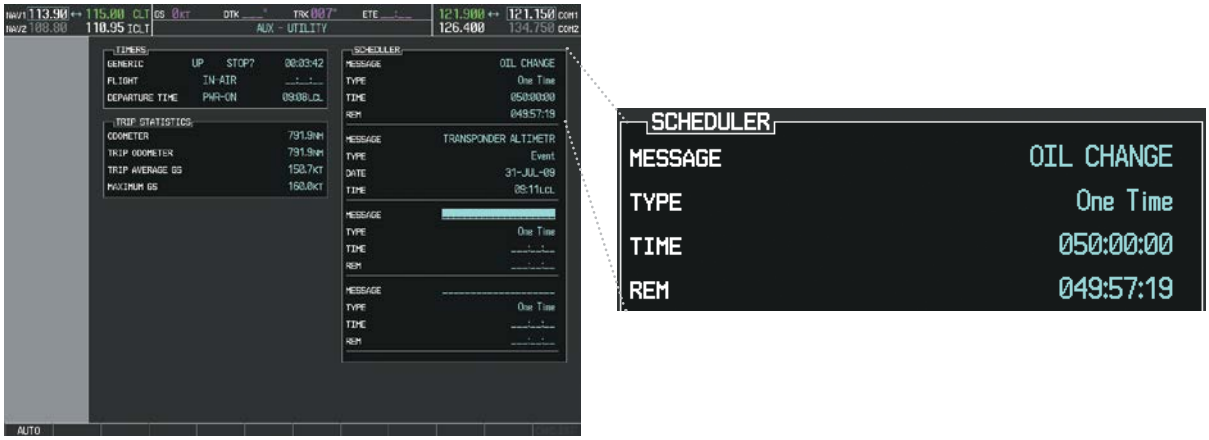


Figure 8-100 Scheduler (Utility Page)

Entering a scheduler message:

1) Select the AUX - Utility Page.
2) Press the **FMS** Knob momentarily to activate the flashing cursor.
3) Turn the large **FMS** Knob to highlight the first empty scheduler message naming field.
4) Use the **FMS** Knob to enter the message text to be displayed in the Messages Window and press the **ENT** Key.
5) Press the **ENT** Key again or use the large **FMS** Knob to move the cursor to the field next to Type.
6) Turn the small **FMS** Knob to select the message type:
   - Event—Message issued at the specified date/time
   - One-time—Message issued when the message timer reaches zero (default setting)
   - Periodic—Message issued each time the message timer reaches zero
7) Press the **ENT** Key again or use the large **FMS** Knob to move the cursor to the next field.
8) For periodic and one-time message, use the **FMS** Knob to enter the timer value (HH:MM:SS) from which to countdown and press the **ENT** Key.

9) For event-based messages:

a) Use the **FMS** Knob to enter the desired date (DD-MM-YY) and press the **ENT** Key.

b) Press the **ENT** Key again or use the large **FMS** Knob to move the cursor to the next field.

c) Use the **FMS** Knob to enter the desired time (HH:MM) and press the **ENT** Key.

10) Press the **ENT** Key again or use the large **FMS** Knob to move the cursor to enter the next message.

Deleting a scheduler message:

1) Select the AUX - Utility Page.

2) Press the **FMS** Knob momentarily to activate the flashing cursor.

3) Turn the large **FMS** Knob to highlight the name field of the scheduler message to be deleted.

4) Press the **CLR** Key to clear the message text. If the **CLR** Key is pressed again, the message is restored.

5) Press the **ENT** Key while the message line is cleared to clear the message time.

Scheduler messages appear in the Messages Window on the PFD. When a scheduler message is waiting, the **ALERTS** Softkey label changes to ADVISORY. Pressing the **ADVISORY** Softkey opens the Alerts Window and acknowledges the scheduler message. The softkey label reverts to ALERTS when selected. Pressing the **ALERTS** Softkey again removes the Alerts Window from the display, and the scheduler message is deleted from the message queue.

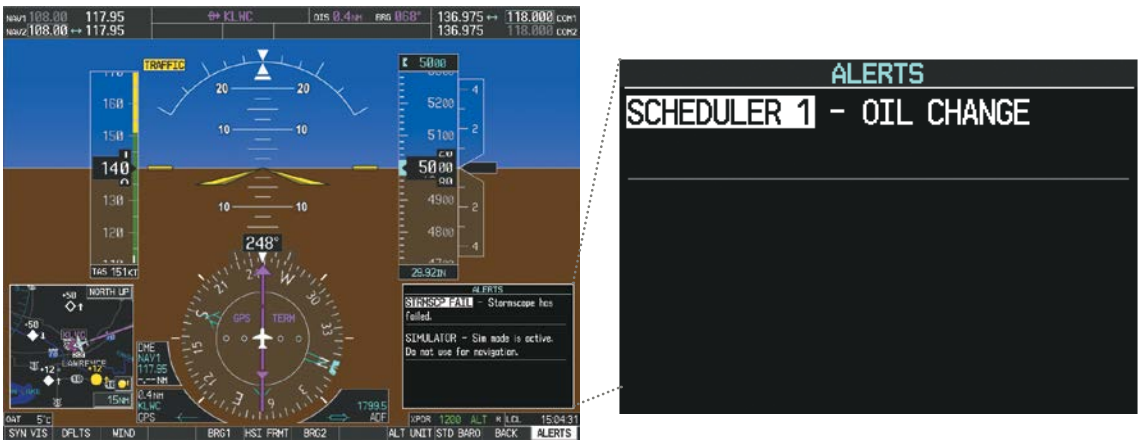


Figure 8-101 PFD Messages Window

8.10 FLIGHT DATA LOGGING

NOTE: *Some aircraft installations may not provide all aircraft/engine data capable of being logged by the system.*

The Flight Data Logging feature will automatically store critical flight and engine data on an SD data card (up to 16GB) inserted into the top card slot of the MFD. Approximately 1,000 flight hours can be recorded for each 1GB of available space on the card.

Data is written to the SD card once each second while the MFD is powered on. All flight data logged on a specific date is stored in a file named in a format which includes the date, time, and nearest airport identifier. The file is created automatically each time the G1000 system is powered on, provided an SD card has been inserted.

The status of the Flight Data Logging feature can be viewed on the AUX-UTILITY Page. If no SD card has been inserted, "NO CARD" is displayed. When data is being written to the SD card, "LOGGING DATA" is displayed.

The .csv file may be viewed with Microsoft Excel® or other spreadsheet applications.

The following is a list of data parameters the G900X system is capable of logging.

- Date
- Time
- GPS altitude (MSL)
- GPS altitude (WGS84 datum)
- Baro-Corrected altitude (feet)
- Baro Correction (in/Hg)
- Indicated airspeed (kts)
- Vertical speed (fpm)
- GPS vertical speed (fpm)
- OAT (degrees C)
- True airspeed (knots)
- Pitch Attitude Angle (degrees)
- Roll Attitude Angle (degrees)
- Lateral and Vertical G Force (g)
- Ground Speed (kts)
- Ground Track (degrees magnetic)
- Latitude (degrees; geodetic; +North)
- Longitude (degrees; geodetic; +East)
- Magnetic Heading (degrees)
- HSI source
- Selected course
- Com1/Com2 frequency
- Nav1/Nav2 frequency
- CDI deflection
- VDI/GP/GS deflection
- Wind Direction (degrees)
- Wind Speed (knots)
- Active Waypoint Identifier
- Distance to next waypoint (nm)
- Bearing to next waypoint (degrees)
- Magnetic variation (degrees)
- GPS fix
- GPS horizontal alert limit
- GPS vertical alert limit
- SBAS GPS horizontal protection level
- SBAS GPS vertical protection level
- Fuel Qty (right & left)(gals)
- Fuel Flow (gph)
- Oil Pressure (psi)
- Oil Temperature (deg. F)
- Manifold Pressure
- Propeller RPM
- Turbine Inlet Temperature

The file containing the recorded data will appear in the format shown in Figure 8-102. This file can be imported into most computer spreadsheet applications.

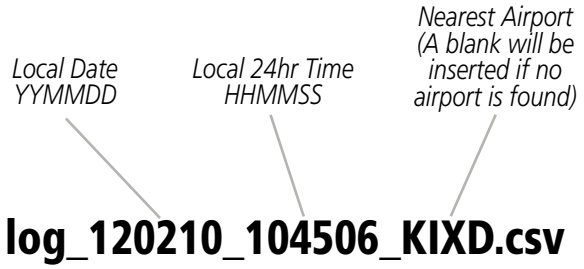


Figure 8-102 Log File Format

Data logging status can be monitored on the AUX-UTILITY Page.

8.11 ABNORMAL OPERATION

SVT TROUBLESHOOTING

SVT is intended to be used with traditional attitude, heading, obstacle, terrain, and traffic inputs. SVT is disabled when valid attitude or heading data is not available for the display. In case of invalid SVT data, the PFD display reverts to the standard blue-over-brown attitude display.

SVT becomes disabled without the following data resources:

- Attitude data
- Heading data
- GPS position data
- 9 Arc-second Terrain data
- Obstacle data
- Terrain-SVT or TAWS function is not available, in test mode, or failed
- The position of the aircraft exceeds the range of the terrain database.

REVERSIONARY MODE

SVT can be displayed on the Multifunction Display (MFD) in Reversionary Mode. If it is enabled when switching to Reversionary Mode, SVT will take up to 30 seconds to be displayed. The standard, non-SVT PFD display will be shown in the interim.

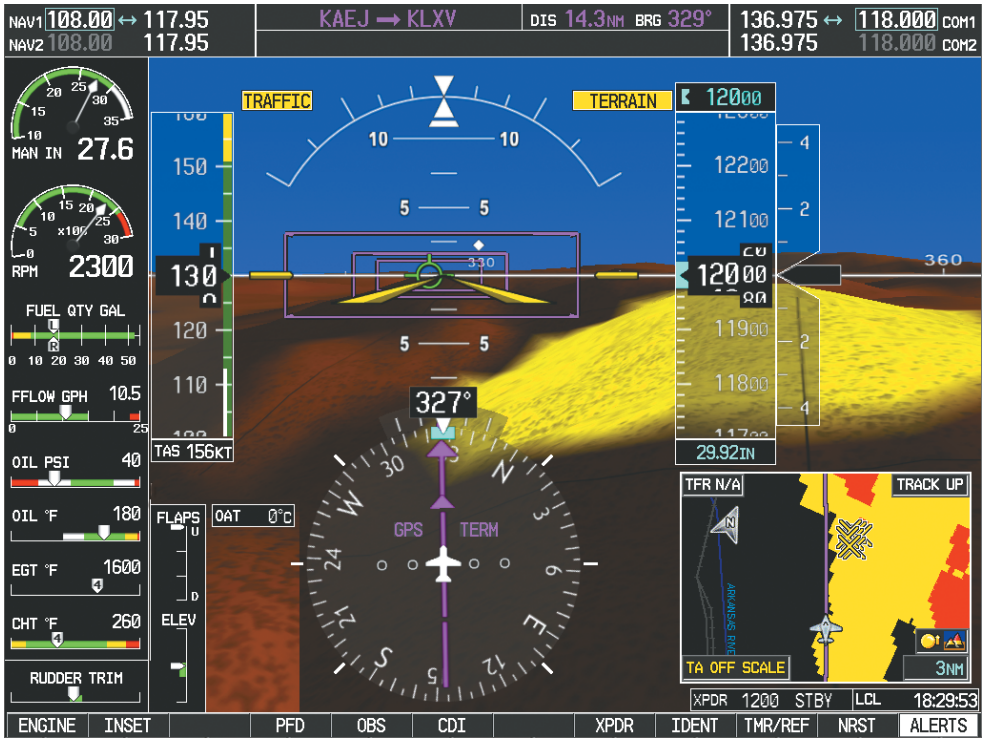


Figure 8-103 SVT Reversionary Mode

UNUSUAL ATTITUDES

Unusual attitudes are displayed with red chevrons overlaid on the display indicating the direction to fly to correct the unusual attitude condition. The display shows either a brown or blue colored bar at the top or bottom of the screen to represent earth or sky. This is intended to prevent losing sight of the horizon during extreme pitch attitudes.

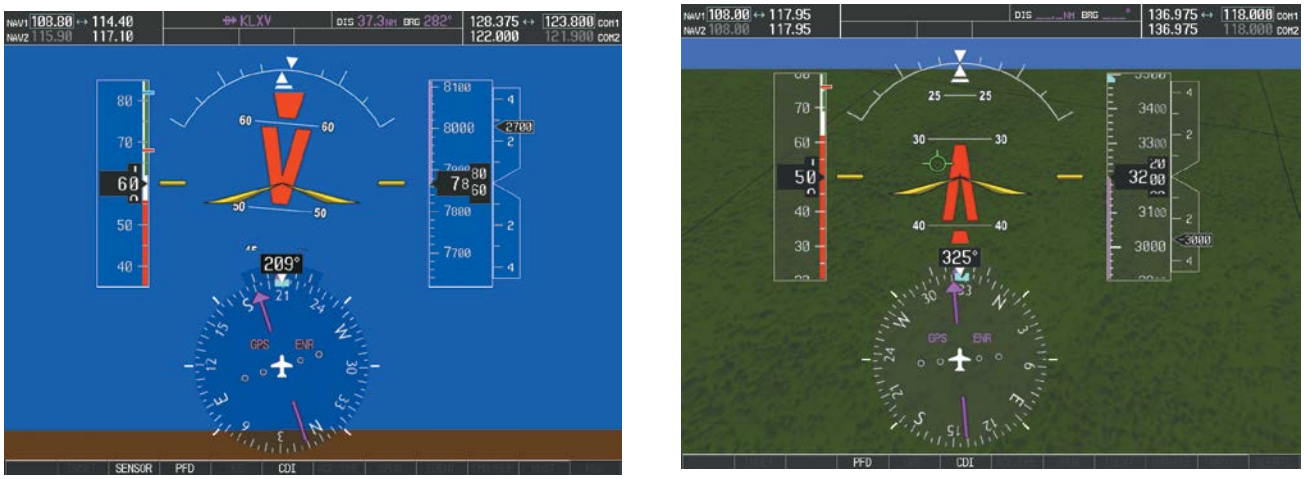


Figure 8-104 Unusual Attitude Display

The blue colored bar is also displayed when terrain gradient is great enough to completely fill the display.



Figure 8-105 Blue Sky Bar with Full Display Terrain

GDL 69/69A DATA LINK RECEIVER TROUBLESHOOTING

Some quick troubleshooting steps listed below can be performed to find the possible cause of a failure.

- Ensure the owner/operator of the aircraft in which the Data Link Receiver is installed has subscribed to SiriusXM
- Ensure the SiriusXM subscription has been activated
- Perform a quick check of the circuit breakers to ensure that power is applied to the Data Link Receiver
- Ensure that nothing is plugged into the Aux Audio In jack(s) because this would prevent SiriusXM Satellite Radio from being heard

For troubleshooting purposes, check the LRU Information Box on the AUX - System Status Page for Data Link Receiver (GDL 69/69A) status, serial number, and software version number. If a failure has been detected in the GDL 69/69A the status is marked with a red X.

Selecting the System Status Page:

1) Turn the large **FMS** Knob to select the AUX Page Group.
2) Turn the small **FMS** Knob to select the System Status Page (the last page in the AUX Page Group).



Figure 8-106 LRU Information Window on System Status Page

If a failure still exists, the following messages may provide insight as to the possible problem:

Message	Message Location	Description
CHECK ANTENNA	XM Radio Page - active channel field	Data Link Receiver antenna error; service required
UPDATING	XM Radio Page - active channel field	Data Link Receiver updating encryption code
NO SIGNAL	XM Radio Page - active channel field Weather Datalink Page - center of page	Loss of signal; signal strength too low for receiver
LOADING	XM Radio Page - active channel field	Acquiring channel audio or information
OFF AIR	XM Radio Page - active channel field	Channel not in service
---	XM Radio Page - active channel field	Missing channel information
WEATHER DATA LINK FAILURE	Weather Datalink Page - center of page	No communication from Data Link Receiver within last 5 minutes
ACTIVATION REQUIRED	Weather Datalink Page - center of page	SiriusXM subscription is not activated

Table 8-7 GDL 69/69A Data Link Receiver Error Messages

ANNUNCIATIONS AND ALERTS

NOTE: Kitplane builder should establish appropriate pilot actions in response to all G900X annunciations in the aircraft-specific pilot's operating handbook (POH).

The G900X Alerting System conveys alerts using the following:

- **Annunciation Window:** The Annunciation Window displays abbreviated annunciation text. Text color is based on alert levels described in the following section. The Annunciation Window is located to the right of the Altimeter and Vertical Speed Indicator. All aircraft annunciations can be displayed simultaneously in the Annunciation Window. A white horizontal line separates annunciations that are acknowledged from annunciations that are not yet acknowledged. Higher priority annunciations are displayed towards the top of the window.
- **Alerts Window:** The Alerts Window displays text messages for up to 64 prioritized alert messages. Pressing the **ALERTS** Softkey displays the Alerts Window. Pressing the **ALERTS** Softkey a second time removes the Alerts Window from the display. When the Alerts Window is displayed, the **FMS** Knob can be used to scroll through the alert message list.
- **Softkey Annunciation:** During certain alerts, the **ALERTS** Softkey may appear as a flashing annunciation to accompany an alert. The **ALERTS** Softkey assumes a new label consistent with the alert level (WARNING, CAUTION, or ADVISORY). By pressing the softkey when flashing an annunciation, the alert is acknowledged. The softkey label then returns to **ALERTS**. If alerts are still present, the **ALERTS** label is displayed in white with black text. Pressing the **ALERTS** Softkey a second time views the alert text messages.
- **System Annunciations:** Typically, a large red 'X' appears over instruments whose information is supplied by a failed Line Replaceable Unit (LRU). See the G900X System Annunciations Section for more information.

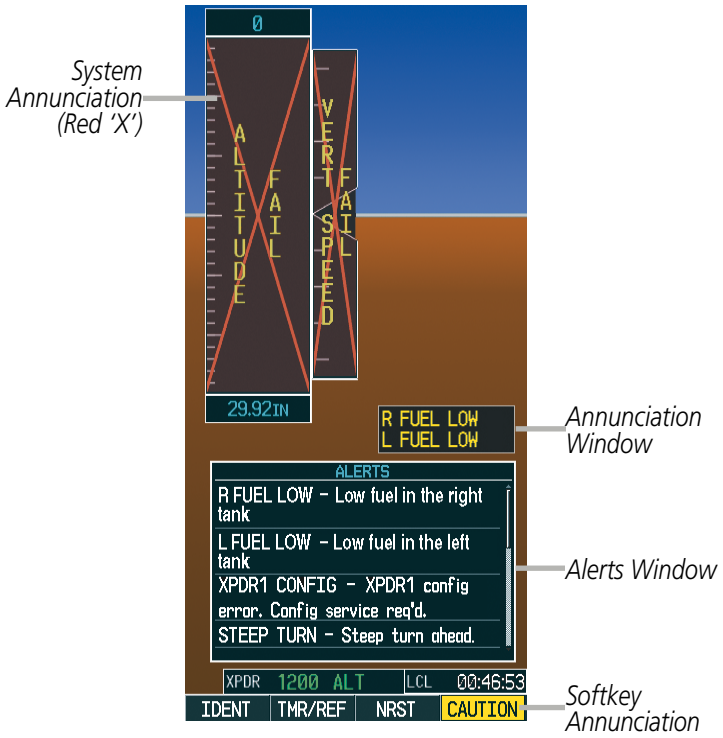


Figure A-1 G900X Alerting System

- **Audio Alerting System:** The G900X System issues audio alert tones when specific system conditions are met. See the Alert Level Definitions Section for more information. Should the #1 GIA 63W fail, audio and voice alerts are not generated. The annunciation tone may be tested from the AUX - System Status Page.

Testing the system annunciation tone:

1) Use the **FMS** Knob to select the AUX - System Status Page.
2) Press the **ANN TEST** Softkey.

   Or:

   a) Press the **MENU** Key.

   b) Highlight 'Enable Annunciator Test Mode' and press the **ENT** Key.

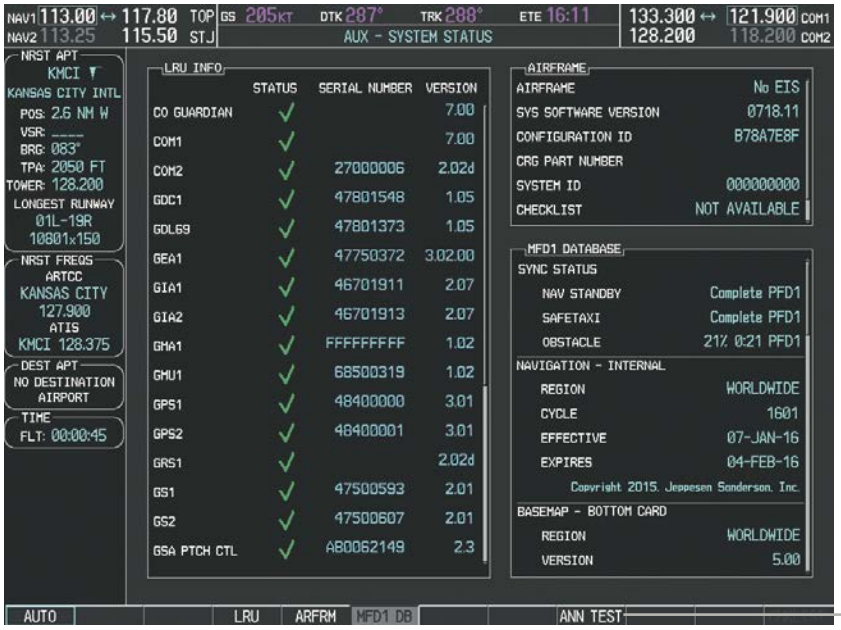


Figure A-2 System Status Page, Annunciation Tone Testing

ALERT LEVEL DEFINITIONS

The G900X Alerting System uses three alert levels.

- **WARNING:** This level of alert requires immediate attention.

  Warning alert text is shown in red in the Annunciation Window and is accompanied by a continuous chime and a flashing **WARNING** Softkey annunciation (see Figure A-3). Pressing the **WARNING** Softkey acknowledges the presence of the warning alert and stops the aural chime.

  Warning voice alerts repeat continuously until acknowledged by pressing the **WARNING** Softkey.

- **CAUTION:** This level of alert indicates the existence of abnormal conditions on the aircraft that may require intervention.

  Caution alert text is shown in yellow in the Annunciation Window and is accompanied by a single chime and a flashing **CAUTION** Softkey annunciation (see Figure A-3). Pressing the **CAUTION** Softkey acknowledges the presence of the caution alert.

  Caution voice alerts repeat three times or until acknowledged by pressing the **CAUTION** Softkey.

- **ANNUNCIATION OR MESSAGE ADVISORY:** This level of alert provides general information.

  Annunciation alert text is shown in white in the Annunciation Window; no aural tone is generated. An annunciation alert is accompanied by a flashing **ADVISORY** Softkey annunciation (see Figure A-3). Pressing the **ADVISORY** Softkey acknowledges the presence of the annunciation alert.

  Message advisory alerts do not issue annunciations in the Annunciation Window. Instead, message advisory alerts only issue a flashing **ADVISORY** Softkey annunciation (see Figure A-3). Pressing the **ADVISORY** Softkey acknowledges the presence of the message advisory alert and displays the alert text message in the Alerts Window.

  Message advisory voice alerts generated when the message advisory is issued do not repeat.



Figure A-3 Softkey Annunciation (ALERTS Softkey Labels)

AIRCRAFT ALERTS

Red Annunciation Window text signifies warnings; yellow, cautions; white, annunciation advisories; and green, safe annunciations. This table defines the alerts that may be available in your installation. Message advisories do not appear in the Annunciation Window.

Annunciation Window Text	Alerts Window Message	Audio Alert
CABIN PRESSURE*	Cabin pressure out of normal operational limits.*	Repeating Chime
CO LVL HIGH*	Carbon monoxide level is too high.*	
DR/CANOPY OPEN*	Door or canopy not secured.*	
FUEL PRESS LOW	Low fuel pressure.	
LOW OIL PRESS	Low engine oil pressure.	
NP	Np is exceeding limits.	
NG	Ng is exceeding limits.	
PROP HEAT FAIL*		
TORQUE	ITT is exceeding limits.	
AUX ALT ON*	Auxiliary alternator on.*	Single Chime
BUS 1 VOLTS LOW	Low voltage on Bus 1.	
BUS 2 VOLTS LOW	Low voltage on Bus 2.	
CHECK GEAR	Too Low - Check Gear.	
CHIP DETECT*	N/A*	
DOOR SEAL*	Door seal pump is on.*	
ESS BUS ALT PWR*	Essential bus alternate power is active.*	
ESS BUS LO VLTS	Low voltage on the essential bus.	
FUEL PUMP OFF		
HYD PUMP ON*		
L FUEL LOW	Left fuel tank is low.	
LRG MAG VAR	The GDU's internal model cannot determine the exact magnetic variance for geographic locations near the magnetic poles. Displayed magnetic course angles may differ from the actual magnetic heading by more than 2°	
MN BUS LO VLTS	Low voltage on the main bus.	
R FUEL LOW	Right fuel tank is low.	
SLCT MAG	The system notifies the pilot to set the Nav Angle units on the Avioncs Settings Screen to Magnetic	
SLCT NON-MAG	The system notifies the pilot to set the Nav Angle units on the Avioncs Settings Screen to True	
STARTER ENGD*	Starter relay has power applied.*	
FUEL IMBALANCE*	Fuel imbalance is greater than 10 gallons.*	None
HYD PUMP ON*		
SPEED BRAKES*		
A/C ON*		
ALT AIR DOOR*		
DEICE ON*		
FUEL PUMP ON*		
LDG LIGHT ON*		

PITOT HEAT ON*		None
PROP HEAT ON*		
TAXI LIGHT ON*		
None	**CO DET SRVC** - The carbon monoxide detector needs serevice.**	
None	**CO DET FAIL** - The carbon monoxide detector is inoperable.**	

* *Optional alert* ** *Optional equipment alert*

Table A-1 Aircraft Alerts

COMPARATOR ANNUNCIATIONS (3 DISPLAY ONLY)

The Comparator monitors critical values generated by redundant sensors. If differences in the sensors exceed a specified amount, this discrepancy is annunciated in the Comparator Window as a 'MISCOMP' (miscompare) as seen in Figure A-1. If one or both of the sensed values are unavailable, it is annunciated as a 'NO COMP' (no compare). The following is a list of the possible annunciations:

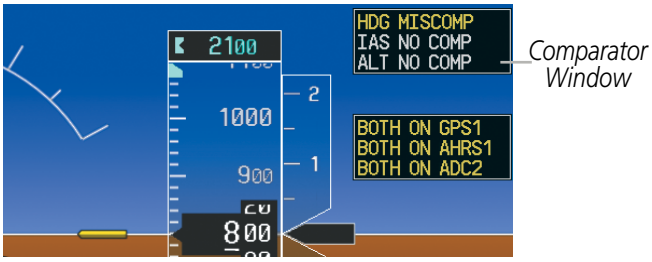


Figure A-1 Sensor Comparator Window

Comparator Window Text	Condition
ALT MISCOMP	Difference in altitude sensors is ≥ 200 ft.
IAS MISCOMP	If both airspeed sensors detect < 35 knots, this is inhibited.
	If either airspeed sensor detects ≥ 35 knots, and the difference in sensors is > 10 knots.
	If either airspeed sensor detects ≥ 80 knots, and the difference in sensors is > 7 knots.
HDG MISCOMP	Difference in heading sensors is > 6 degrees.
PIT MISCOMP	Difference in pitch sensors is > 5 degrees.
ROL MISCOMP	Difference in roll sensors is > 6 degrees.
ALT NO COMP	No data from one or both altitude sensors.
IAS NO COMP	No data from one or both airspeed sensors.
HDG NO COMP	No data from one or both heading sensors.
PIT NO COMP	No data from one or both pitch sensors.
ROL NO COMP	No data from one or both roll sensors..

REVERSIONARY SENSOR ANNUNCIATIONS (3 DISPLAY ONLY)

Reversionary sensor selection is annunciated in the Reversionary Sensor Window, as shown in Figure A-2. These annunciations reflect reversionary sensors selected on one or both PFDs. Pressing the **SENSOR** Softkey gives access to **ADC1**, **ADC2**, **AHRS1**, and **AHRS2** Softkeys. These softkeys allow manual switching of sensors. In the case of certain types of sensor failures, the G900X may make some sensor selections automatically. The GPS sensor cannot be switched manually.

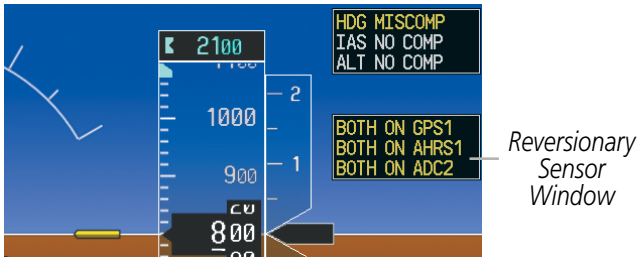


Figure A-2 Reversionary Sensor Windows

Reversionary Sensor Window Text	Condition
BOTH ON ADC1	Both PFDs are displaying data from the number one Air Data Computer.
BOTH ON ADC2	Both PFDs are displaying data from the number two Air Data Computer.
BOTH ON AHRS1	Both PFDs are displaying data from the number one Attitude & Heading Reference System.
BOTH ON AHRS2	Both PFDs are displaying data from the number two Attitude & Heading Reference System.
BOTH ON GPS1	Both PFDs are displaying data from the number one GPS receiver.
BOTH ON GPS2	Both PFDs are displaying data from the number two GPS receiver.
USING ADC1	PFD2 is displaying data from the #1 Air Data Computer.
USING ADC2	PFD1 is displaying data from the #2 Air Data Computer.
USING AHRS1	PFD2 is displaying data from the #1 AHRS.
USING AHRS2	PFD1 is displaying data from the #2 AHRS.
USING GPS1	PFD2 is displaying data from the #1 GPS.
USING GPS2	PFD1 is displaying data from the #2 GPS.

G900X SYSTEM ANNUNCIATIONS

NOTE: *Upon power-up, certain windows remain invalid as G900X equipment begins to initialize. All windows should be operational within one minute of power-up. If any window continues to remain flagged, the G900X System should be serviced by a Garmin-authorized repair facility.*

When an LRU or an LRU function fails, a large red 'X' is typically displayed on windows associated with the failed data (refer to Figure A-3 for all possible flags and the responsible LRUs). Refer to the Pilot's Operating Handbook (POH) for additional information regarding pilot responses to these annunciations.

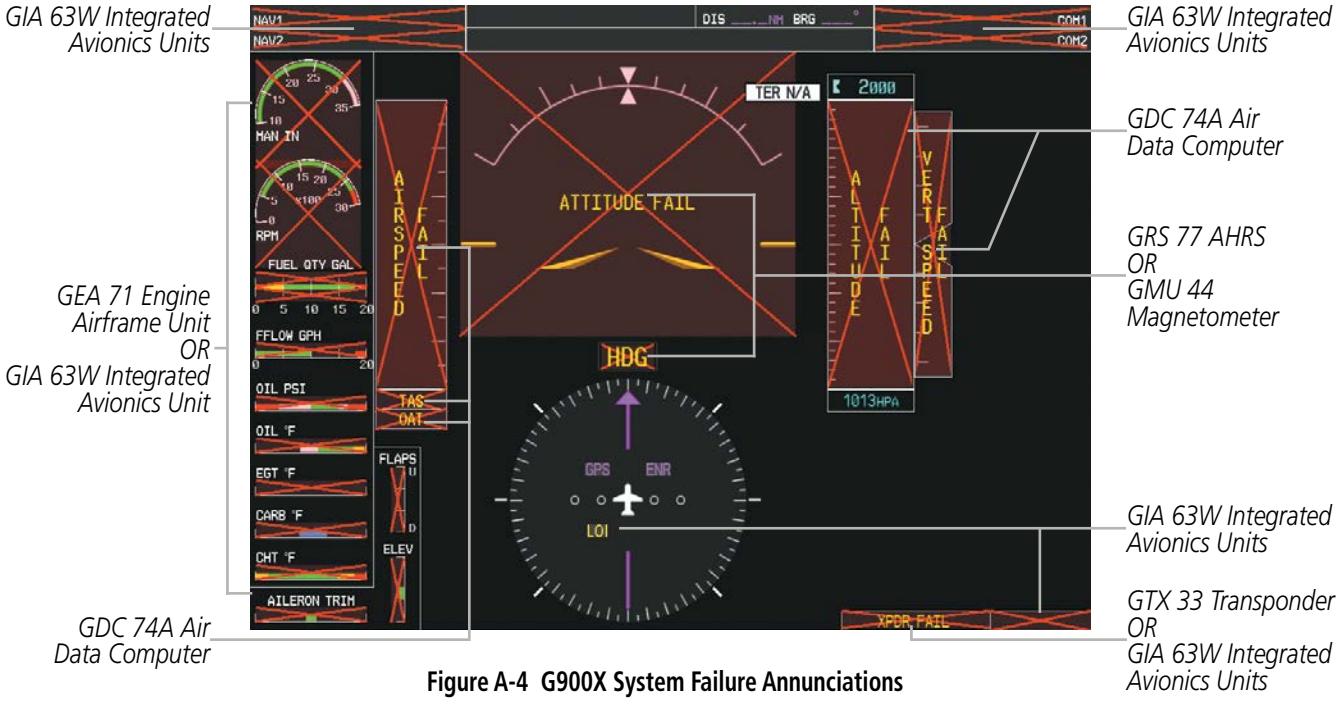


Figure A-4 G900X System Failure Annunciations

The status of detected LRUs can be checked on the AUX - System Status Page (Figure A-2). Active LRUs are indicated by green check marks; failed, by red 'X's. Failed LRUs should be noted and a service center or Garmin-authorized dealer informed.

Viewing LRU information:

1) Use the **FMS** Knob to select the AUX - System Status Page.

2) To place the cursor in the 'LRU Info' Box,

a) Press the **LRU** Softkey.

Or:

a) Press the **MENU** Key.

b) With 'Select LRU Window' highlighted, press the **ENT** Key.

3) Use the **FMS** Knob to scroll through the box to view LRU status information.

System Annunciation	Comment
	Attitude and Heading Reference System is aligning.
	Display system is not receiving attitude information from the AHRS.
	AHRS calibration incomplete or configuration module failure.
	GPS information is either not present or is invalid for navigation use. Note that AHRS utilizes GPS inputs during normal operation. AHRS operation may be degraded if GPS signals are not present (see POH).
	Display system is not receiving airspeed input from air data computer.

System Annunciation	Comment
	Display system is not receiving vertical speed input from the air data computer.
	Display system is not receiving valid heading input from AHRS.
	Display system is not receiving altitude input from the air data computer.
	Display system is not receiving valid true airspeed information from air data computer.
	Display system is not receiving valid OAT information from air data computer.
	Display system is not receiving valid transponder information.
Other Various Red X Indications	A red 'X' through any other display field (such as engine instrumentation fields) indicates that the field is not receiving valid data.

Table A-2 G900X System Annunciations

G900X SYSTEM MESSAGE ADVISORIES

This section describes various G900X system message advisories. Certain messages are issued due to an LRU or an LRU function failure. Such messages are normally accompanied by a corresponding red 'X' annunciation as shown previously in the G900X System Annunciation section. Two display configurations do not show any advisories pertaining to a second PFD or to a second sensor (e.g., AHRS).

NOTE: *This Section provides information regarding G900X message advisories that may be displayed by the system. Knowledge of the aircraft, systems, flight conditions, and other existing operational priorities must be considered when responding to a message. Always use sound pilot judgment. The Pilot's Operating Handbook (POH) takes precedence over any conflicting guidance found in this section.*

Message	Comments
ABORT APR – Loss of GPS navigation. Abort approach.	Abort approach due to loss of GPS navigation.
ADC1 AS EC – ADC1 airspeed error correction is unavailable.	GDC1 or GDC2 is reporting that the airspeed error correction is unavailable.
ADC2 AS EC – ADC2 airspeed error correction is unavailable.	
ADC1 ALT EC – ADC1 altitude error correction is unavailable.	GDC1 or GDC2 is reporting that the altitude error correction is unavailable.
ADC2 ALT EC – ADC2 altitude error correction is unavailable.	
AHRS1 GPS – AHRS1 using backup GPS source.	The #1 AHRS is using the backup GPS path. Primary GPS path has failed. The system should be serviced when possible.
AHRS2 GPS – AHRS2 using backup GPS source.	The #2 AHRS is using the backup GPS path. Primary GPS path has failed. The system should be serviced when possible.
AHRS1 GPS – AHRS1 not receiving any GPS information.	The #1 AHRS is not receiving any or any useful GPS information. Check AFMS limitations. The system should be serviced.
AHRS2 GPS – AHRS2 not receiving any GPS information.	The #2 AHRS is not receiving any or any useful GPS information. Check AFMS limitations. The system should be serviced.
AHRS1 GPS – AHRS1 not receiving backup GPS information.	The #1 AHRS is not receiving backup GPS information. The system should be serviced.
AHRS2 GPS – AHRS2 not receiving backup GPS information.	The #2 AHRS is not receiving backup GPS information. The system should be serviced.
AHRS1 GPS – AHRS1 operating exclusively in no-GPS mode.	The #1 AHRS is operating exclusively in no-GPS mode. The system should be serviced.
AHRS2 GPS – AHRS2 operating exclusively in no-GPS mode.	The #2 AHRS is operating exclusively in no-GPS mode. The system should be serviced.
AHRS MAG DB – AHRS magnetic model database version mismatch.	The #1 AHRS and #2 AHRS magnetic model database versions do not match.
AHRS1 SRVC – AHRS1 Magnetic-field model needs update.	The #1 AHRS earth magnetic field model is out of date. Update magnetic field model when practical.
AHRS2 SRVC – AHRS2 Magnetic-field model needs update.	The #2 AHRS earth magnetic field model is out of date. Update magnetic field model when practical.

Message	Comments
AHRS1 TAS – AHRS1 not receiving airspeed.	The #1 AHRS is not receiving true airspeed from the air data computer. The AHRS relies on GPS information to augment the lack of airspeed. The system should be serviced.
AHRS2 TAS – AHRS2 not receiving airspeed.	The #2 AHRS is not receiving true airspeed from the air data computer. The AHRS relies on GPS information to augment the lack of airspeed. The system should be serviced.
APR DWNGRADE – Approach downgraded.	Vertical guidance generated by SBAS is unavailable, use LNAV only minimums.
APR INACTV – Approach is not active.	The system notifies the pilot that the loaded approach is not active. Activate approach when required.
ARSPC AHEAD – Airspace ahead less than 10 minutes.	Special use airspace is ahead of aircraft. The aircraft will penetrate the airspace within 10 minutes.
ARSPC NEAR – Airspace near and ahead.	Special use airspace is near and ahead of the aircraft position.
ARSPC NEAR – Airspace near – less than 2 nm.	Special use airspace is within 2 nm of the aircraft position.
CHECK CRS – Database course for LOC1 / [LOC ID] is [CRS]°.	Selected course for LOC1 differs from published localizer course by more than 10 degrees.
CHECK CRS – Database course for LOC2 / [LOC ID] is [CRS]°.	Selected course for LOC2 differs from published localizer course by more than 10 degrees.
CNFG MODULE – PFD1 configuration module is inoperative.	The PFD1 configuration module backup memory has failed. The system should be serviced.
COM1 CONFIG – COM1 configuration error.	COM1 and/or COM2 configuration settings do not match backup configuration memory. The system should be serviced.
COM2 CONFIG– COM2 configuration error.	
COM1 MANIFEST– COM1 software mismatch.	COM1 and/or COM2 software mismatch, communication halted. The system should be serviced.
COM2 MANIFEST– COM2 software mismatch.	
COM1 PTT – COM1 push-to-talk key is stuck.	The COM1 and/or COM2 external push-to-talk switch is stuck in the enable (or "pressed") position. Press the PTT switch again to cycle its operation. If the problem persists, the system should be serviced.
COM2 PTT – COM2 push-to-talk key is stuck.	
COM1 RMT XFR – COM1 remote transfer key is stuck.	The COM1 and/or COM2 transfer switch is stuck in the enabled (or "pressed") position. Press the transfer switch again to cycle its operation. If the problem persists, the system should be serviced.
COM2 RMT XFR – COM2 remote transfer key is stuck.	

Message	Comments
COM1 SERVICE – COM1 needs service. Return unit for repair.	The system has detected a failure in COM1 and/or COM2. COM1 and/or COM2 may still be usable. The system should be serviced when possible.
COM2 SERVICE – COM2 needs service. Return unit for repair.	
COM1 TEMP – COM1 over temp. Reducing transmitter power.	The system has detected an over temperature condition in COM1 and/or COM2. The transmitter is operating at reduced power. If the problem persists, the system should be serviced.
COM2 TEMP – COM2 over temp. Reducing transmitter power.	
COURSE SEL – Current track will not intercept selected course.	The aircraft is flying away from the selected course and will not intercept.

DATA LOST – Pilot stored data was lost. Recheck settings.	The pilot profile data was lost. System reverts to default pilot profile and settings. The pilot may reconfigure the MFD & PFDs with preferred settings, if desired.
DB CHANGE – Database changed. Verify user modified procedures.	This occurs when a stored flight plan contains procedures that have been manually edited. This alert is issued only after an navigation database update. Verify that the user-modified procedures in stored flight plans are correct and up to date.
DB CHANGE – Database changed. Verify stored airways.	This occurs when a stored flight plan contains an airway that is no longer consistent with the navigation database. This alert is issued only after an navigation database update. Verify use of airways in stored flight plans and reload airways as needed.
DB MISMATCH – Obstacle database mismatch.	The PFDs and MFD have different obstacle database versions or regions installed. Check the AUX-SYSTEM STATUS Page to determine versions or regions. Also, check the AUX-SYSTEM STATUS Page for a database synchronization function not completed. After synchronization is complete, power must be turned off, then on.
DB MISMATCH – Navigation database mismatch. Xtalk is off.	The PFDs and MFD have different navigation database versions or regions installed. Crossfill is off. Check the AUX-SYSTEM STATUS Page to determine versions or regions. Also, check the AUX-SYSTEM STATUS Page for a database synchronization function not completed. After synchronization is complete, power must be turned off, then on.
DB MISMATCH – Standby Navigation database mismatch.	The PFDs and MFD have different standby navigation database versions or regions installed. Check the AUX-SYSTEM STATUS Page to determine versions or regions. Also, check the AUX-SYSTEM STATUS Page for a database synchronization function not completed. After synchronization is complete, power must be turned off, then on.
DB MISMATCH – Terrain database mismatch.	The PFDs and MFD have different terrain database versions or regions installed. Check the AUX-SYSTEM STATUS Page to determine versions or regions. Also, check the AUX-SYSTEM STATUS Page for a database synchronization function not completed. After synchronization is complete, power must be turned off, then on.

FAILED PATH – A data path has failed.	A data path connected to the GDU or the GIA 63/W has failed.
FPL TRUNC – Flight plan has been truncated.	This occurs when a newly installed navigation database eliminates an obsolete approach or arrival used by a stored flight plan. The obsolete procedure is removed from the flight plan. Update flight plan with current arrival or approach.

Message	Comments
FPL WPT LOCK – Flight plan waypoint is locked.	Upon power-up, the system detects that a stored flight plan waypoint is locked. This occurs when an navigation database update eliminates an obsolete waypoint. The flight plan cannot find the specified waypoint and flags this message. This can also occur with user waypoints in a flight plan that is deleted. Remove the waypoint from the flight plan if it no longer exists in any database, Or update the waypoint name/identifier to reflect the new information.
FPL WPT MOVE – Flight plan waypoint moved.	The system has detected that a waypoint coordinate has changed due to a new navigation database update. Verify that stored flight plans contain correct waypoint locations.

GCU CNFG – GCU Config error. Config service req'd.	GCU 476/477 configuration settings do not match those of backup configuration memory. The system should be serviced.
GCU FAIL – GCU is inoperative.	A failure has been detected in the GCU 476/477. The GCU 476/477 is unavailable.
GCU KEYSTK – GCU [keyname] Key is stuck	A key is stuck on the GCU 476/477 bezel. Attempt to free the stuck key by pressing it several times. The system should be serviced if the problem persists.
GDL69 CONFIG – GDL 69 config error. Config service req'd.	GDL 69 configuration settings do not match those of backup configuration memory. The system should be serviced.
GDL69 FAIL – GDL 69 has failed.	A failure has been detected in the GDL 69. The receiver is unavailable. The system should be serviced
GDL88 ADS-B 1090 - ADS-B fault. 1090 receiver failure.	A failure has been detected in the 1090 receiver.
GDL88 ADS-B NO POS - GDL88 is not receiving position information.	The GDL 88 is not able to receive position information.
GDL88 ADS-B NO TX - GDL88 unable to transmit ADS-B messages	Unable to transmit GDL 88 messages.
GDL88 ADS-B TRFC - GDL 88 ADS-B traffic has failed	The GDL 88 is incapable of processing traffic information.
GDL88 ADS-B UAT - ADS-B fault. UAT receiver failure.	A failure has been detected in the UAT receiver.
GDL88 CONFIG – GDL88 config error. Config service required.	The GDL 88 and GDU have incompatible configurations. This alert is also set when the GDL 88 has an invalid mode S address configured or the mode S address does not match both XPDR mode S addresses.
GDL88 CSA FAIL - ADS-B Airborne alerts failure.	GDL 88 ADS-B Conflict Situational Awareness (CSA) is unavailable.
GDL88 FAIL - Unable to transmit ADS-B messages.	The PFD has lost connection with the GDL 88.
GDL88 FAULT - GDL 88 Antenna fault	The GDL 88 Antenna has failed.
GDL88 MANIFEST - GDL 88 software mismatch, communication halted.	The GDL 88 has incorrect software installed. The system should be serviced.
GDL88 PRES ALT - GDL88 is not receiving pressure altitude.	The GDL 88 is not receiving pressure altitude data.

Message	Comments
GDL88 SERVICE – GDL88 needs service. Return unit for repair	The GDL88 is not operating properly and needs service. Return unit for repair
GDL88 XPDR - GDL88 not receiving XPDR code. Check XPDR mode.	The GDL 88 is not receiving transponder code. The transponder should be in ALT mode when airborne.
GEA1 CONFIG – GEA1 config error. Config service req'd.	The GEA1 configuration settings do not match those of backup configuration memory. The system should be serviced.
GEA2 CONFIG – GEA2 config error. Config service req'd.	The GEA2 configuration settings do not match those of backup configuration memory. The system should be serviced.
GEO LIMITS – AHRS1 too far North/ South, no magnetic compass.	The aircraft is outside geographical limits for approved AHRS operation. Heading is flagged as invalid.
GEO LIMITS – AHRS2 too far North/ South, no magnetic compass.	
GIA1 CONFIG – GIA1 config error. Config service req'd.	The GIA1 and/or GIA2 configuration settings do not match backup configuration memory. The system should be serviced.
GIA2 CONFIG – GIA2 config error. Config service req'd.	
GIA1 CONFIG – GIA1 audio config error. Config service req'd.	The GIA1 and/or GIA2 have an error in the audio configuration. The system should be serviced.
GIA2 CONFIG – GIA2 audio config error. Config service req'd.	
GIA1 COOLING – GIA1 temperature too low.	The GIA1 and/or GIA2 temperature is too low to operate correctly. Allow units to warm up to operating temperature.
GIA2 COOLING – GIA2 temperature too low.	
GIA1 COOLING – GIA1 over temperature.	The GIA1 and/or GIA2 temperature is too high. If problem persists, the system should be serviced.
GIA2 COOLING – GIA2 over temperature.	
GIA1 SERVICE – GIA1 needs service. Return the unit for repair.	The GIA1 and/or GIA2 self-test has detected a problem in the unit. The system should be serviced.
GIA2 SERVICE – GIA2 needs service. Return the unit for repair.	
GMA1 CONFIG – GMA1 configuration error. Config service req'd.	The audio panel configuration settings do not match backup configuration memory. The system should be serviced.
GMA1 FAIL – GMA1 is inoperative.	The audio panel self-test has detected a failure. The audio panel is unavailable. The system should be serviced.
GMA1 SERVICE – GMA1 needs service. Return unit for repair.	The audio panel self-test has detected a problem in the unit. Certain audio functions may still be available, and the audio panel may still be usable. The system should be serviced when possible.
GPS NAV LOST – Loss of GPS navigation. Insufficient satellites.	Loss of GPS navigation due to insufficient satellites.

Message	Comments
GPS NAV LOST – Loss of GPS navigation. Position error.	Loss of GPS navigation due to position error.
GPS NAV LOST – Loss of GPS navigation. GPS fail.	Loss of GPS navigation due to GPS failure.
GPS1 SERVICE – GPS1 needs service. Return unit for repair.	A failure has been detected in the GPS1 and/or GPS2 receiver. The receiver may still be available. The system should be serviced.
GPS2 SERVICE – GPS2 needs service. Return unit for repair.	
GSR1 FAIL – GSR1 has failed.	A failure has been detected in the #1 GSR 56. The system should be serviced.
G/S1 FAIL – G/S1 is inoperative.	A failure has been detected in glideslope receiver 1 and/or receiver 2. The system should be serviced.
G/S2 FAIL – G/S2 is inoperative.	
G/S1 SERVICE – G/S1 needs service. Return unit for repair.	A failure has been detected in glideslope receiver 1 and/or receiver 2. The receiver may still be available. The system should be serviced when possible.
G/S2 SERVICE – G/S2 needs service. Return unit for repair.	
GTS CONFIG – GTS config error. Config service req'd.	GWX 68 configuration settings do not match those of the GDU configuration. The system should be serviced.
GWX CONFIG – GWX config error. Config service req'd.	GWX 68 configuration settings do not match those of the GDU configuration. The system should be serviced.
GWX FAIL – GWX is inoperative.	The GDU is not recieving status packet from the GWX 68 or the GWX 68 is reporting a fault. The GWX 68 radar system should be serviced.
GWX SERVICE – Needs service. Return unit for repair.	A failure has been detected in the GWX 68. The GWX 68 may still be usable.

HDG FAULT – AHRS1 magnetometer fault has occurred.	A fault has occurred in the #1 GMU 44. Heading is flagged as invalid. The AHRS uses GPS for backup mode operation. The system should be serviced.
HDG FAULT – AHRS2 magnetometer fault has occurred.	A fault has occurred in the #2 GMU 44. Heading is flagged as invalid. The AHRS uses GPS for backup mode operation. The system should be serviced.
HW MISMATCH – GIA hardware mismatch. GIA1 communication halted.	A GIA mismatch has been detected, where only one is SBAS capable.
HW MISMATCH – GIA hardware mismatch. GIA2 communication halted.	

INSIDE ARSPC – Inside airspace.	The aircraft is inside the airspace.
INVALID ADM – Invalid ADM: ATN communication halted.	Data link avionics were not configured correctly and therefore will not be able to communicate with the ground network.

LOCKED FPL – Cannot navigate locked flight plan.	This occurs when the pilot attempts to activate a stored flight plan that contains locked waypoint. Remove locked waypoint from flight plan. Update flight plan with current waypoint.

Message	Comments
LOI – GPS integrity lost. Crosscheck with other NAVS.	GPS integrity is insufficient for the current phase of flight.

MANIFEST – GCU software mismatch, ommunication halted.	The GCU 476/477 has incorrect software installed. The system should be serviced.
MANIFEST – GDC1 software mismatch, communication halted.	The GDC 74A has incorrect software installed. The system should be serviced.
MANIFEST – GDC2 software mismatch, communication halted.	
MANIFEST – GDL software mismatch, communication halted.	The GDL 69 has incorrect software installed. The system should be serviced.
MANIFEST – GEA1 software mismatch, communication halted.	The #1 GEA 71 has incorrect software installed. The system should be serviced.
MANIFEST – GEA2 software mismatch, communication halted.	The #2 GEA 71 has incorrect software installed. The system should be serviced.
MANIFEST – GFC software mismatch, communication halted.	Incorrect servo software is installed, or gain settings are incorrect.
MANIFEST – GIA1 software mismatch, communication halted.	The GIA1 and/or GIA 2 has incorrect software installed. The system should be serviced.
MANIFEST – GIA2 software mismatch, communication halted.	
MANIFEST – GMA1 software mismatch. Communication halted.	The audio panel has incorrect software installed. The system should be serviced.
MANIFEST – GMU1 software mismatch, communication halted.	The GMU 44 has incorrect software installed. The system should be serviced.
MANIFEST – GMU2 software mismatch, communication halted.	
MANIFEST – GRS1 software mismatch, communication halted.	The #1 AHRS has incorrect software installed. The system should be serviced.
MANIFEST – GRS2 software mismatch, communication halted.	The #2 AHRS has incorrect software installed. The system should be serviced.
MANIFEST – GTX1 software mismatch, communication halted.	The transponder has incorrect software installed. The system should be serviced.
MANIFEST – GTX2 software mismatch, communication halted.	The transponder has incorrect software installed. The system should be serviced.
MANIFEST – GWX software mismatch, communication halted.	The GWX 68 has incorrect software installed. The system should be serviced.

Message	Comments
MANIFEST – PFD1 software mismatch, communication halted.	The PFD and/or MFD has incorrect software installed. The system should be serviced.
MANIFEST – PFD2 software mismatch, communication halted.	
MANIFEST – MFD1 software mismatch, communication halted.	
MFD1 CONFIG – MFD1 config error. Config service req'd.	The MFD configuration settings do not match backup configuration memory. The system should be serviced.
MFD1 DB ERR – MFD1 Airport Directory database error exists.	The MFD and/or PFD detected a failure in the Airport Directory database. Ensure that the data card is properly inserted. Replace data card. If problem persists, the system should be serviced.
PFD1 DB ERR – PFD1 Airport Directory database error exists.	
PFD2 DB ERR – PFD2 Airport Directory database error exists.	
MFD1 DB ERR – MFD1 basemap database error exists.	The MFD and/or PFD detected a failure in the basemap database.
PFD1 DB ERR – PFD1 basemap database error exists.	
PFD2 DB ERR – PFD2 basemap database error exists.	
MFD1 DB ERR – MFD1 Chartview database error exists.	The MFD and/or PFD detected a failure in the ChartView database (optional feature). Ensure that the data card is properly inserted. Replace data card. If problem persists, the system should be serviced.
MFD1 DB ERR – MFD1 FliteCharts database error exists.	The MFD and/or PFDs detected a failure in the FliteCharts database (optional feature). Ensure that the data card is properly inserted. Replace data card. If problem persists, the system should be serviced.
MFD1 DB ERR – MFD1 obstacle database error exists.	The MFD and/or PFD detected a failure in the obstacle database. Ensure that the data card is properly inserted. Replace data card. If problem persists, the system should be serviced.
PFD1 DB ERR – PFD1 obstacle database error exists.	
PFD2 DB ERR – PFD2 obstacle database error exists.	
MFD1 DB ERR – MFD1 obstacle database missing.	The obstacle database is present on another LRU, but is missing on the specified LRU.
PFD1 DB ERR – PFD1 obstacle database missing.	
PFD2 DB ERR – PFD2 obstacle database missing.	

Message	Comments
MFD1 DB ERR – MFD1 navigation database error exists.	The MFD and/or PFD detected a failure in the navigation database. Attempt to reload the navigation database. If problem persists, the system should be serviced.
PFD1 DB ERR – PFD1 navigation database error exists.	
PFD2 DB ERR – PFD2 navigation database error exists.	
MFD1 DB ERR – MFD1 Safe Taxi database error exists.	The MFD and/or PFD detected a failure in the Safe Taxi database. Ensure that the data card is properly inserted. Replace data card. If problem persists, the system should be serviced.
PFD1 DB ERR – PFD1 Safe Taxi database error exists.	
PFD2 DB ERR – PFD2 Safe Taxi database error exists.	
MFD1 DB ERR – MFD1 terrain database error exists.	The MFD and/or PFD detected a failure in the terrain database. Ensure that the terrain card is properly inserted in display. Replace terrain card. If problem persists, the system should be serviced.
PFD1 DB ERR – PFD1 terrain database error exists.	
PFD2 DB ERR – PFD2 terrain database error exists.	
MFD1 DB ERR – MFD1 terrain database missing.	The terrain database is present on another LRU, but is missing on the specified LRU.
PFD1 DB ERR – PFD1 terrain database missing.	
PFD2 DB ERR – PFD2 terrain database missing.	

NAV DB UPDATED – Active navigation database updated.	System has updated the active navigation database from the standby navigation database.
NAV1 MANIFEST – NAV1 software mismatch.	NAV1 and/or NAV2 software mismatch, communication halted. The system should be serviced.
NAV2 MANIFEST – NAV2 software mismatch.	
NAV1 SERVICE – NAV1 needs service. Return unit for repair.	A failure has been detected in the NAV1 and/or NAV2 receiver. The receiver may still be available. The system should be serviced.
NAV2 SERVICE – NAV2 needs service. Return unit for repair.	
NAV1 RMT XFR – NAV1 remote transfer key is stuck.	The remote NAV1 and/or NAV2 transfer switch is stuck in the enabled (or "pressed") state. Press the transfer switch again to cycle its operation. If the problem persists, the system should be serviced.
NAV2 RMT XFR – NAV2 remote transfer key is stuck.	

Message	Comments
NON WGS84 WPT – Do not use GPS navigation to [xxxx].	The position of the selected waypoint [xxxx] is not calculated based on the WGS84 map reference datum and may be positioned in error as displayed. Do not use GPS to navigate to the selected non-WGS84 waypoint.
NON-MAG UNITS – Non-magnetic NAV ANGLE display units are active.	Navigation angle is not set to MAGNETIC at power-up.
PFD1 KEYSTK – PFD1 [key name] Key is stuck.	A key is stuck on the PFD and/or MFD bezel. Attempt to free the stuck key by pressing it several times. The system should be serviced if the problem persists.
PFD2 KEYSTK – PFD2 [key name] Key is stuck.	
MFD1 KEYSTK – MFD [key name] Key is stuck.	
PFD1 COOLING – PFD1 has poor cooling. Reducing power usage.	The PFD and/or MFD is overheating and is reducing power consumption by dimming the display. If problem persists, the system should be serviced.
PFD2 COOLING – PFD2 has poor cooling. Reducing power usage.	
MFD1 COOLING – MFD1 has poor cooling. Reducing power usage.	
PFD1 CONFIG – PFD1 config error. Config service req'd.	The PFD configuration settings do not match backup configuration memory. The system should be serviced.
PFD2 CONFIG – PFD2 config error. Config service req'd.	
PFD1 SERVICE – PFD1 needs service. Return unit for repair.	The PFD and/or MFD self-test has detected a problem. The system should be serviced.
PFD2 SERVICE – PFD2 needs service. Return unit for repair.	
MFD1 SERVICE – MFD1 needs service. Return unit for repair.	
PFD1 VOLTAGE – PFD1 has low voltage. Reducing power usage	The PFD1 voltage is low. The system should be serviced.
PFD2 VOLTAGE – PFD2 has low voltage. Reducing power usage	The PFD2 voltage is low. The system should be serviced.
MFD1 VOLTAGE – MFD1 has low voltage. Reducing power usage	The MFD voltage is low. The system should be serviced.

[PFD1, PFD2, or MFD1] CARD 1 REM – Card 1 was removed. Reinsert card.	The SD card was removed from the top card slot of the specified PFD or MFD. The SD card needs to be reinserted.
[PFD1, PFD2, or MFD1] CARD 2 REM – Card 2 was removed. Reinsert card.	The SD card was removed from the bottom card slot of the specified PFD or MFD. The SD card needs to be reinserted.
[PFD1, PFD2, or MFD1] CARD 1 ERR – Card 1 is invalid.	The SD card in the top card slot of the specified PFD or MFD contains invalid data.

Message	Comments
[PFD1, PFD2, or MFD1] CARD 2 ERR – Card 2 is invalid.	The SD card in the bottom card slot of the specified PFD or MFD contains invalid data.
PTK FAIL – Parallel track unavailable: bad geometry.	Bad parallel track geometry.
PTK FAIL – Parallel track unavailable: invalid leg type.	Invalid leg type for parallel offset.
PTK FAIL – Parallel track unavailable: past IAF.	IAF waypoint for parallel offset has been passed.
SCHEDULER [#] – <message>.	Message criteria entered by the user.
SLCT FREQ – Select appropriate frequency for approach.	The system notifies the pilot to load the approach frequency for the appropriate NAV receiver. Select the correct frequency for the approach.
SLCT NAV – Select NAV on CDI for approach.	The system notifies the pilot to set the CDI to the correct NAV receiver. Set the CDI to the correct NAV receiver.
STEEP TURN – Steep turn ahead.	A steep turn is 15 seconds ahead. Prepare to turn.
STRMSCP FAIL – Stormscope has failed.	Stormscope has failed. The system should be serviced.
SVS – SVS DISABLED:Out of available terrain region.	Synthetic Vision is disabled because the aircraft is not within the boundaries of the installed database.
SVS – SVS DISABLED:Terrain DB resolution too low.	Synthetic Vision is disabled because a terrain database of sufficient resolution (9 arc-second or better) is not currently installed.
SW MISMATCH – GDU software version mismatch. Xtalk is off.	The MFD and PFDs have different software versions installed. The system should be serviced.
TERRAIN DSP – [PFD1, PFD2 or MFD1] Terrain awareness display unavailable.	One of the terrain, airport terrain, or obstacle databases required for TAWS in the specified PFD or MFD is missing or invalid.
TIMER EXPIRD – Timer has expired.	The system notifies the pilot that the timer has expired.
TRAFFIC FAIL – Traffic device has failed.	The G900X is no longer receiving data from the traffic system. The traffic device should be serviced.
TRUE APR – True north approach. Change HDG reference to TRUE.	Displayed after passing the first waypoint of a true north approach when the nav angle is set to 'AUTO'.
UNABLE V WPT – Can't reach current vertical waypoint.	The current vertical waypoint can not be reached within the maximum flight path angle and vertical speed constraints. The system automatically transitions to the next vertical waypoint.
VNV – Unavailable. Unsupported leg type in flight plan.	The lateral flight plan contains a procedure turn, vector, or other unsupported leg type prior to the active vertical waypoint. This prevents vertical guidance to the active vertical waypoint.

Message	Comments
VNV – Unavailable. Excessive track angle error.	The current track angle error exceeds the limit, causing the vertical deviation to go invalid.
VNV – Unavailable. Excessive crosstrack error.	The current crosstrack exceeds the limit, causing vertical deviation to go invalid.
VNV – Unavailable. Parallel course selected.	A parallel course has been selected, causing the vertical deviation to go invalid.
WPT ARRIVAL – Arriving at waypoint -[xxxx]	Arriving at waypoint [xxxx], where [xxxx] is the waypoint name.
WX ALERT – Possible severe weather ahead.	The GWX 68 indicates severe weather within ±10 degrees of the aircraft heading at a range of 80 to 320 nm.

XPDR1 ADS-B FAIL – XPDR1 is unable to transmit ADS-B messages.	ADS-B is inoperative. The transponder may not be receiving a valid GPS position. Other transponder functions may be available. Service when possible.
XPDR2 ADS-B FAIL – XPDR2 is unable to transmit ADS-B messages.	
XPDR1 CONFIG – XPDR1 config error. Config service req'd.	The transponder configuration settings do not match those of backup configuration memory. The system should be serviced.
XPDR2 CONFIG – XPDR2 config error. Config service req'd.	The transponder configuration settings do not match those of backup configuration memory. The system should be serviced.
XPDR1 FAIL – XPDR1 is inoperative.	There is no communication with the #1 transponder.
XPDR2 FAIL – XPDR2 is inoperative.	There is no communication with the #2 transponder.
XPDR1 SRVC – XPDR1 needs service. Return unit for repair.	The #1 transponder should be serviced when possible.
XPDR2 SRVC – XPDR2 needs service. Return unit for repair.	The #2 transponder should be serviced when possible.
XTALK ERROR – A flight display crosstalk error has occurred.	The MFD and PFDs are not communicating with each other. The system should be serviced.

AURAL ALERTS

The following aural alerts are announced by the system using a voice of male or female gender (see the AUX - System Setup Page to change the audio alert voice). If an optional terrain system is installed, voice alerts are also generated (refer to the appropriate terrain alerts section).

Voice Alert	Alert Trigger
"Airspeed"	Airspeed has exceeded V_{NE}.
"Minimums, Minimums"	The aircraft has descended below the preset minimum descent altitude or decision altitude.
"Vertical track"	The aircraft is one minute from Top of Descent. Issued only when vertical navigation is enabled.
"Timer Expired"	Countdown timer on the PFD has reached zero.
"Traffic"	Played when a Traffic Advisory (TA) is issued with the TIS system or the optional GTS 800/820 TAS system. See the Hazard Avoidance section for additional details on GTS 800/820 voice alerts.
"TIS Not Available"	The aircraft is outside the Traffic Information Service (TIS) coverage area.
"TAS System Test Passed"	Played when the optional GTS 800/820 traffic system passes a pilot-initiated self test.
"TAS System Test Fail"	Played when the optional GTS 800/820 traffic system fails a pilot-initiated self test.
"One o'clock" through "Twelve o'clock" or "No Bearing"	Intruder bearing (GTS 820 only)
"High", "Low", "Same Altitude" (if within 200 feet of own altitude), or "Altitude not available"	Intruder relative altitude (GTS 820 only)
"Less than one mile", "One Mile" through "Ten Miles", or "More than ten miles"	Intruder distance (GTS 820 only)

Changing the audio alert voice:

1) Use the **FMS** Knob to select the AUX - System Setup Page.

2) Press the **FMS** Knob momentarily to activate the flashing cursor.

3) Turn the large **FMS** Knob to highlight the voice in the Audio Alert Box.

4) Turn the small **FMS** Knob to display and highlight the desired voice and press the **ENT** Key.



Figure A-5 System Setup Page, Alert Voice Settings

ADS-B STATUS PAGE MESSAGES

ADS-B Status Page Item	Status Message	Description
Traffic Application Status: AIRBORNE (AIRB), SURFACE (SURF), AIRBORNE ALERTS (CSA)	ON	Traffic application is currently on. Required input data is available, and it meets performance requirements.
	AVAILABLE TO RUN	Traffic application is not currently active, but application is ready to run when condition(s) determine the application should be active. Required input data is available, and it meets performance requirements.
	NOT AVAILABLE	Traffic application is not available. Required input data is available, but it does not meet performance requirements.
	FAULT	Traffic application is not available. Required input data is not available or the application has failed.
	NOT CONFIGURED	Traffic application is not available, because it has not been configured. If this annunciation persists, the system should be serviced.
	----------	Traffic application status is invalid or unknown.
TIS-B/ADS-R Coverage	AVAILABLE	The system is receiving the ADS-R coverage from an FAA ground station.
	NOT AVAILABLE	The system is not receiving the ADS-R coverage from an FAA ground station.
	----------	ADS-R coverage is invalid or unknown.
GPS Status: GPS Source	External #1	The GDL 88 is using the #1 GPS receiver for the GPS position source.
	External #2	The GDL 88 is using the #2 GPS receiver for the GPS position source.
	---------	The GPS source is invalid or unknown.
Ground Uplink Status: Last uplink	Number of minutes, or '------'	Displays the number of minutes since the last uplink from a ground station occurred. If no uplink has been received, or the status is invalid, dashes appear instead of a number of minutes.

AFCS ALERTS

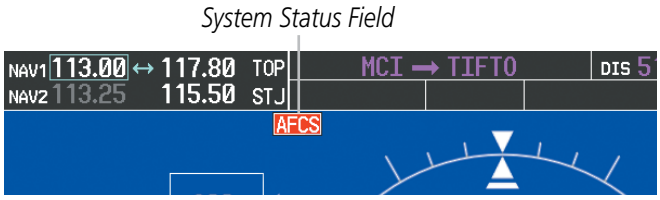


Figure A-6 AFCS System Status Field

The following alert annunciations appear in the AFCS System Status field on the PFD.

Condition	Annunciation	Description
Pitch Failure	PTCH	Pitch axis control failure. AP is inoperative.
Roll Failure	ROLL	Roll axis control failure. AP is inoperative.
Yaw Damper Failure	YAW	YD control failure; AP is inoperative.
Pitch Trim Failure (or stuck MEPT Switch)	PTRM	If AP engaged, take control of the aircraft and disengage AP. If AP disengaged, move MEPT switches separately to unstick.
System Failure	AFCS	AP and MEPT are unavailable. FD may still be available.
Elevator Mistrim Down	↓ELE	Pitch servo providing sustained force in the indicated direction. May indicate a failure of the pitch trim servo or trim system.
Elevator Mistrim Up	↑ELE	
Aileron Mistrim Right	AIL→	Roll servo providing sustained force in the indicated direction.
Aileron Mistrim Left	←AIL	
Rudder Mistrim Right	RUD→	Yaw servo providing sustained force in the indicated direction. Aircraft rudder retrim after substantial pitch and power changes required.
Rudder Mistrim Left	←RUD	
Preflight Test	PFT	Performing preflight system test; aural alert sounds at completion.
	PFT	Preflight system test failed; aural alert sounds at failure.

NOTE: *Do not press the* ***AP/YD DISC TRIM INTRPT*** *switch during servo power-up and preflight system tests as this may cause the preflight system test to fail or never to start (if servos fail their power-up tests). Power must be cycled to the servos to remedy the situation.*

TERRAIN-SVS ALERTS

Alert Type	PFD/MFD* Alert Annunciation	MFD Pop-Up Alert (except Terrain-SVS Page	Aural Message
Reduced Required Terrain Clearance Warning (RTC)	TERRAIN	WARNING TERRAIN	"Warning; Terrain, Terrain"
Imminent Terrain Impact Warning (ITI)	TERRAIN	WARNING TERRAIN	"Warning; Terrain, Terrain"
Reduced Required Obstacle Clearance Warning (ROC)	TERRAIN	WARNING OBSTACLE	"Warning; Obstacle, Obstacle"
Imminent Obstacle Impact Warning (IOI)	TERRAIN	WARNING OBSTACLE	"Warning; Obstacle, Obstacle"
Reduced Required Terrain Clearance Caution (RTC)	TERRAIN	CAUTION-TERRAIN	"Caution; Terrain, Terrain"
Imminent Terrain Impact Caution (ITI)	TERRAIN	TERRAIN AHEAD	"Caution; Terrain, Terrain"
Reduced Required Obstacle Clearance Caution (ROC)	TERRAIN	CAUTION-OBSTACLE	"Caution; Obstacle, Obstacle"
Imminent Obstacle Impact Caution (IOI)	TERRAIN	OBSTACLE AHEAD	"Caution; Obstacle, Obstacle"

* *Annunciation is shown on the Terrain-SVS Page and the Navigation Map Page when Terrain is enabled.*

TERRAIN-SVS SYSTEM STATUS ANNUNCIATIONS

Alert Type	PFD/MFD* Alert Annunciation	TAWS-B Page Center Banner Annunciation	Aural Message
System Test in progress	TER TEST	TERRAIN TEST	None
System Test pass	None	None	"Terrain System Test OK"
Terrain Alerting Inhibited	TER INH	None	None
No GPS position	TER N/A	NO GPS POSITION	"Terrain System Not Available" †
Excessively degraded GPS signal; or Out of database coverage area	TER N/A	None	"Terrain System Not Available" †
Terrain System Test Fail; Terrain or Obstacle database unavailable or invalid; Invalid software configuration; or System audio fault	TER FAIL	TERRAIN FAIL	"Terrain System Failure"
MFD Terrain or Obstacle database unavailable or invalid, Terrain-SVS operating with PFD Terrain or Obstacle databases	None	TERRAIN DATABASE FAILURE	None

* *Annunciation is shown on the Terrain-SVS Page and the Navigation Map Page when Terrain is enabled.*

† *"Terrain System Available" (in-flight only) when sufficient GPS signal received, or terrain database coverage re-entered.*

TAWS-B ALERTS

Annunciations appear on the PFD and the MFD. Pop-up alerts appear only on the MFD.

Alert Type	PFD/MFD* Alert Annunciation	MFD Pop-Up Alert (except TAWS-B Page)	Aural Message
Excessive Descent Rate Warning (EDR)	PULL UP	PULL-UP	"Pull Up"
Reduced Required Terrain Clearance Warning (RTC)	PULL UP	TERRAIN-PULL-UP	"Terrain, Terrain; Pull Up, Pull Up"
Imminent Terrain Impact Warning (ITI)	PULL UP	TERRAIN AHEAD-PULL-UP	"Terrain Ahead, Pull Up; Terrain Ahead, Pull Up"
Reduced Required Obstacle Clearance Warning (ROC)	PULL UP	OBSTACLE AHEAD-PULL-UP	"Obstacle Ahead, Pull Up; Obstacle Ahead, Pull Up"
Imminent Obstacle Impact Warning (IOI)	PULL UP	OBSTACLE-PULL-UP	"Obstacle, Obstacle; Pull Up, Pull Up"
Reduced Required Terrain Clearance Caution (RTC)	TERRAIN	CAUTION-TERRAIN	"Caution, Terrain; Caution, Terrain"
Imminent Terrain Impact Caution (ITI)	TERRAIN	TERRAIN AHEAD	"Terrain Ahead; Terrain Ahead"
Reduced Required Obstacle Clearance Caution (ROC)	TERRAIN	CAUTION-OBSTACLE	"Caution, Obstacle; Caution, Obstacle"
Imminent Obstacle Impact Caution (IOI)	TERRAIN	OBSTACLE AHEAD	"Obstacle Ahead; Obstacle Ahead"
Premature Descent Alert Caution (PDA)	TERRAIN	TOO LOW-TERRAIN	"Too Low, Terrain"
Altitude Callout "500"	None	None	"Five-Hundred"
Excessive Descent Rate Caution (EDR)	TERRAIN	SINK RATE	"Sink Rate"
Negative Climb Rate Caution (NCR)	TERRAIN	DON'T SINK	"Don't Sink"

* *Annunciation is shown on the TAWS-B Page and the Navigation Map Page when Terrain is enabled.*

TAWS-B SYSTEM STATUS ANNUNCIATIONS

Alert Type	PFD/MFD* Alert Annunciation	TAWS-B Page Center Banner Annunciation	Aural Message
System Test in progress	TAWS TEST	TAWS TEST	None
System Test pass	None	None	"TAWS System Test OK"
TAWS-B FLTA Alerting Inhibited	TAWS INH	None	None
No GPS position	TAWS N/A	NO GPS POSITION	"TAWS Not Available"†
Excessively degraded GPS signal; or Out of database coverage area	TAWS N/A	None	"TAWS Not Available"†
TAWS-B System Test Fail; Terrain or Obstacle database unavailable or invalid; Invalid software configuration; or System audio fault	TAWS FAIL	TAWS FAIL	"TAWS System Failure"
MFD Terrain or Obstacle database unavailable or invalid, TAWS-B operating with PFD Terrain or Obstacle databases	None	TERRAIN DATABASE FAILURE	None

** Annunciation is shown on the TAWS-B Page and the Navigation Map Page when Terrain is enabled.*

† *"TAWS Available" (in-flight only) when sufficient GPS signal received, or terrain database coverage re-entered.*

TRAFFIC SYSTEM STATUS ALERTS

Traffic Mode	Traffic Mode Annunciation (Traffic Map Page)	Traffic Display Status Icon (Other Maps)
TAS Operating	OPERATING	
TAS Failed*	FAIL	

Traffic Map Page Annunciation	Description
NO DATA	Data is not being received from the TAS unit
DATA FAILED	Data is being received from the TAS unit, but the unit is self-reporting a failure
FAILED	Incorrect data format received from the TAS unit

Traffic Status Banner Annunciation	Description
TA OFF SCALE	A Traffic Advisory is outside the selected display range Annunciation is removed when traffic comes within the selected display range
TA X.X ± XX ↕	System cannot determine bearing of Traffic Advisory Annunciation indicates distance in nm, altitude separation in hundreds of feet, and altitude trend arrow (climbing/descending)
TRFC FAIL	TAS unit has failed (unit is self-reporting a failure or sending incorrectly formatted data)
NO TRFC DATA	Data is not being received from the TAS unit

Mode	Traffic Mode Annunciation (Traffic Maps)	Traffic Map Center Banner Annunciation	Traffic Display Status Icon (Navigation Maps)
ADS-B System Test Initiated	ADS-B: TEST	TEST MODE	
ADS-B Operating in Airborne Mode	ADS-B: AIRB	ADS-B: AIRB	
ADS-B Operating in Surface Mode	ADS-B: SURF	ADS-B: SURF	
ABD-B Operating without own aircraft directional information	ADS-B: NO TRK/HDG	none	
ABD-B Traffic Off	ADS-B: OFF	ADS-B TRFC OFF	
ADS-B Traffic Not Available	ADS-B: N/A	ADS-B TRFC N/A	
ADS-B Failed*	ADS-B: FAIL	ADS-B TRFC FAIL	

Traffic Map Page Center Annunciation	Description
NO DATA	Data is not being received from the traffic unit
DATA FAILED	Data is being received from the traffic unit, but the unit is self-reporting a failure
ADS-B TRFC FAIL	Incorrect data format received from the traffic unit

Mode	Traffic Mode Annunciation (Traffic Map Page)	Traffic Display Enabled Icon (Other Maps)
TIS Operating	OPERATING	
TIS Standby	STANDBY (also shown in white in center of page)	
TIS Failed*	FAIL	

Traffic Status Banner Annunciation	Description
TA OFF SCALE	A Traffic Advisory is outside the selected display range Annunciation is removed when traffic comes within the selected display range
TA X.X ± XX ↕	System cannot determine bearing of Traffic Advisory Annunciation indicates distance in nm, altitude separation in hundreds of feet, and altitude trend arrow (climbing/descending)
AGE MM:SS	Appears if traffic data is not refreshed within 6 seconds If after another 6 seconds data is not received, traffic is removed from the display The quality of displayed traffic information is reduced as the age increases
TRFC COAST	The displayed data is not current (6 to 12 seconds since last message) The quality of displayed traffic information is reduced when this message is displayed
TRFC RMVD	Traffic is removed because it is too old for coasting (12 to 60 seconds since last message) Traffic may exist within the selected display range, but it is not displayed
TRFC FAIL	Traffic data has failed
NO TRFC DATA	Traffic data has not been detected
TRFC UNAVAIL	The traffic service is unavailable or out of range

FLIGHT PLAN IMPORT/EXPORT MESSAGES

In some circumstances, some messages may appear in conjunction with others.

Flight Plan Import/Export Results	Description
'Flight plan successfully imported.'	A flight plan file stored on the SD card was successfully imported as a stored flight plan.
'File contained user waypoints only. User waypoints imported successfully. No stored flight plan data was modified.'	The file stored on the SD card did not contain a flight plan, only user waypoints. These waypoints have been saved to the system user waypoints. No flight plans stored in the system have been modified.
'No flight plan files found to import.'	The SD card contains no flight plan data.
'Flight plan import failed.'	Flight plan data was not successfully imported from the SD card.
'Flight plan partially imported.'	Some flight plan waypoints were successfully imported from the SD card, however others had errors and were not imported. A partial stored flight plan now exists in the system.
'File contained user waypoints only.'	The file stored on the SD card did not contain a flight plan, only user waypoints. One or more of these waypoints did not import successfully.
'Too many points. Flight plan truncated.'	The flight plan on the SD card contains more waypoints than the system can support. The flight plan was imported with as many waypoints as possible.
'Some waypoints not loaded. Waypoints locked.'	The flight plan on the SD card contains one or more waypoints that the system cannot find in the navigation database. The flight plan has been imported, but must be edited within the system before it can be activated for use.
'User waypoint database full. Not all loaded.'	The flight plan file on the SD card contains user waypoints. The quantity of stored user waypoints has exceeded system capacity, therefore not all the user waypoints on the SD card have been imported. Any flight plan user waypoints that were not imported are locked in the flight plan. The flight plan must be edited within the system before it can be activated for use.
'One or more user waypoints renamed.'	One or more imported user waypoints were renamed when imported due to naming conflicts with waypoints already existing in the system.
'Flight plan successfully exported.'	The stored flight plan was successfully exported to the SD card.
'Flight plan export failed.'	The stored flight plan was not successfully exported to the SD card. The SD card may not have sufficient available memory or the card may have been removed prematurely.

PILOT PROFILE IMPORT/EXPORT MESSAGES

Pilot Profile Import/Export Results	Description
'No pilot profile plan files found to import.'	Displayed if the SD card does not have one or more valid pilot profile filenames.
'Overwrite existing profile?'	Displayed if the profile name matches the name of existing profile.
'Profile name invalid. Enter a different profile name.'	Displayed if the profile name is invalid.
'All available pilot profiles in use. Delete a profile before importing another.'	Displayed if the maximum number for pilot profiles has been reached.
'Pilot profile import failed.'	Displayed if the importing operation fails for any other reason.
'Pilot profile import succeeded.'	Displayed if the importing operation succeeds.
'Overwrite existing file?'	Displayed if the filename matches the name of an existing file on the SD card.
'Pilot profile export failed.'	Displayed if the export operation fails.
'Pilot profile export succeeded.'	Displayed if the export operation succeeds.

DATABASE MANAGEMENT

CAUTION: *Never disconnect power to the system when loading a database. Power interuption during the database loading process could result in maintenance being required to reboot the system.*

The system uses Secure Digital (SD) cards to load and store various types of data. For basic flight operations, SD cards are required for database storage as well as Jeppesen navigation and ChartView database updates. Not all SD cards are compatible with the G900X. Use only SD cards supplied by Garmin or the aircraft manufacturer.

CAUTION: *When downloading updates to the Jeppesen Navigation Database, copy the data to an SD card other than a Garmin Supplemental Data Card. Otherwise, data corruption can occur.*

NOTE: *When loading database updates, the 'DB Mismatch' message will be displayed until database synchronization is complete, followed by turning system power off, then on. Synchronization can be monitored on the AUX-SYSTEM STATUS Page.*

NOTE: *Loading a database in the system prior to its effective date will result in the expiration date on the power-up screen and the effective date on the AUX-System Status Page being displayed in yellow.*

NOTE: *Garmin requests the flight crew report any observed discrepancies related to database information. These discrepancies could come in the form of an incorrect procedure; incorrectly identified terrain, obstacles and fixes; or any other displayed item used for navigation or communication in the air or on the ground. Go to FlyGarmin.com and select "Aviation Data Error Report.*

JEPPESEN DATABASES

The Jeppesen navigation database is updated on a 28-day cycle. The ChartView database is updated on a 14-day cycle. If the ChartView database is not updated within 70 days of the expiration date, ChartView will no longer function. Both of these databases are provided directly from Jeppesen.

NOTE: *The Jeppesen aviation navigation database is now referred to as the 'navigation database'. Previously this database had been referred to as the 'aviation database'.*

The ChartView database should be copied to the Garmin supplied Supplemental Data Card which will reside in the bottom card slot on the MFD. The navigation database must be installed from the Jeppesen or user supplied SD data card. Contact Jeppesen (www.jeppesen.com) for subscription and update information.

NOTE: *After the navigation database is installed, the card may be removed.*

Updating the active Jeppesen navigation database (not using the Dual Navigation Database or Automatic Database Synchronization Features):

1) With the system OFF, insert the SD card containing the navigation database update into the top card slot of the display (PFD or MFD) to be updated (label of SD card facing left).
2) Turn the system ON. A prompt similar to the following is displayed in the upper left corner of the display:

```
DO YOU WANT TO UPDATE THE STANDBY NAVIGATION DATABASE ON THE BOTTOM CARD?
THE STANDBY DATABASE WILL BE ACTIVATED UPON THE FIRST ON-GROUND POWER CYCLE ON OR
AFTER 00:00 SYSTEM TIME ON THE EFFECTIVE DATE.
            FROM            TO
REGION:     WORLDWIDE       WORLDWIDE
CYCLE:       1504            1505
EFFECTIVE:  09-APR-2015     07-MAY-2015
EXPIRES:    07-MAY-2015     04-JUN-2015

NO WILL BE ASSUMED IN 21 SECONDS.
```

Figure B-1: Standby Navigation Database Prompt

3) Press the **NO** Softkey to proceed to the active database update.
4) A prompt similar to the following is displayed, press the **YES** Softkey to update the active navigation database.

```
DO YOU WANT TO UPDATE THE ACTIVE NAVIGATION DATABASE?
SELECTING YES WILL OVERWRITE THE ACTIVE NAVIGATION DATABASE.
            FROM            TO
REGION:     WORLDWIDE       WORLDWIDE
CYCLE:       1504            1505
EFFECTIVE:  09-APR-2015     07-MAY-2015
EXPIRES:    07-MAY-2015     04-JUN-2015

NO WILL BE ASSUMED IN 8 SECONDS.
UPDATING THE ACTIVE NAVIGATION DATABASE, PLEASE WAIT.
.
UPDATED 1 FILES SUCCESSFULLY!
PRESS ANY KEY TO CONTINUE.
CONTINUING IN 8 SECONDS.
```

Figure B-2 Database Update Confirmation

5) After the update completes, the display starts in normal mode. Do not remove power while the display is starting.
6) Turn the system OFF and remove the SD card from the top card slot.
7) Repeat steps 1 through 6 for the other displays (PFD1, PFD2 or MFD). Remove the SD card when finished.
8) Apply power to the system and press the **ENT** Key to acknowledge the startup screen.
9) Turn the large **FMS** Knob to select the AUX Page group on the MFD.
10) Turn the small **FMS** Knob to select the System Status Page.
11) Press the Display Database Selection Softkey to show active navigation database information for each display (**MFD1 DB**, **PFD1 DB, PFD2 DB**). Verify the correct active navigation database cycle information is shown for each display.

DUAL NAVIGATION DATABASE FEATURE

The dual navigation database feature allows each display to store an upcoming navigation database on the bottom SD card so that the system can automatically load it to replace the active database when the new database becomes effective (the next cycle becomes available seven days prior to its effective date).

If a navigation database loader card is inserted into the top SD card slot of a display, and an SD card is in the bottom slot, the system will prompt the user (upon on-ground power up) as to whether the database should

be stored on the bottom SD card as the standby database. If the user responds affirmatively, the system will copy the navigation database from the top SD card to the bottom SD card. As long as the bottom SD card remains in the card slot, this standby navigation database will be available for the system to use as the active database as soon as it becomes effective.

The system checks the active and standby databases upon (on-ground only) power-up. If the standby database is current and the active database is out of date, the display will upload the standby database into the active internal database location. Uploading the standby database to the active location takes approximately 45-55 seconds. The pilot is alerted that the update is complete by a system alert message, 'NAV DB UPDATED'.

Loading a standby navigation database:

1) With the system OFF, insert the SD card containing the new navigation database version into the top card slot of the MFD.
2) Verify that an SD card is inserted in the bottom slot of each PFD and the MFD.
3) Turn the system ON. A prompt similar to the following is displayed.

```
DO YOU WANT TO UPDATE THE STANDBY NAVIGATION DATABASE ON THE BOTTOM CARD?
THE STANDBY DATABASE WILL BE ACTIVATED UPON THE FIRST ON-GROUND POWER CYCLE ON OR
AFTER 00:00 SYSTEM TIME ON THE EFFECTIVE DATE.
            FROM            TO
REGION:     WORLDWIDE       WORLDWIDE
CYCLE:      1504            1505
EFFECTIVE:  09-APR-2015     07-MAY-2015
EXPIRES:    07-MAY-2015     04-JUN-2015

NO WILL BE ASSUMED IN 21 SECONDS.
```

Figure B-3 Standby Navigation Database Prompt

4) Press the **YES** Softkey. The navigation database is copied to the SD card in the bottom card slot of the MFD.
5) After the navigation database files are copied to the bottom SD card, the display will appear as shown in Figure B-4.

```
INITIALIZING SYSTEM

DO YOU WANT TO UPDATE THE STANDBY NAVIGATION DATABASE ON THE BOTTOM CARD?
THE STANDBY DATABASE WILL BE ACTIVATED UPON THE FIRST ON-GROUND POWER CYCLE ON OR
AFTER 00:00 SYSTEM TIME ON THE EFFECTIVE DATE.
            FROM            TO
REGION:     WORLDWIDE       WORLDWIDE
CYCLE:      1509            1512
EFFECTIVE:  26-AUG-2015     18-NOV-2015
EXPIRES:    23-SEP-2015     16-DEC-2015

NO WILL BE ASSUMED IN 18 SECONDS.
UPDATING STANDBY NAVIGATION DATABASE, PLEASE WAIT.
.
UPDATED STANDBY NAVIGATION DATABASE SUCCESSFULLY.
PRESS ANY KEY TO CONTINUE.
CONTINUING IN 9 SECONDS.
```

Figure B-4 Standby Navigation Database Update Complete

6) As instructed on the display, press any key to continue. The display will now appear as shown in Figure B-5.

```
DATABASE NAVIGATION WILL BE VERIFIED BEFORE USE.
DATABASE STANDBY NAV WILL BE VERIFIED BEFORE USE.
PRESS ANY KEY TO CONTINUE.
CONTINUING IN 6 SECONDS.
```

Figure B-5 Navigation Database Verification Prompt

7) Press any key to continue. The display will now appear as shown in Figure B-6.

```
.
DO YOU WANT TO UPDATE THE ACTIVE NAVIGATION DATABASE?
SELECTING YES WILL OVERWRITE THE ACTIVE NAVIGATION DATABASE.
            FROM            TO
REGION:     WORLDWIDE       WORLDWIDE
CYCLE:      1504            1505
EFFECTIVE:  09-APR-2015     07-MAY-2015
EXPIRES:    07-MAY-2015     04-JUN-2015

NO WILL BE ASSUMED IN 8 SECONDS.
```

Figure B-6 Active Navigation Database Prompt

8) Press the **NO** Softkey. The display now starts in normal mode. Since the database effective date is not yet valid, it should not be loaded as the active database. The display now starts in normal mode. Do not remove power while the display is starting.

9) Press the **ENT** Key to acknowledge the startup screen.

10) Turn the large **FMS** Knob to select the AUX Page group on the MFD.

11) Turn the small **FMS** Knob to select the System Status Page.

12) The new database is copied to the SD card in the bottom card slot of each PFD. Progress can be monitored in the SYNC STATUS field. When copying is finished, 'Complete' is displayed.

13) Turn system power OFF.

14) Remove the SD card from the top card slot of the MFD.

15) Turn system power ON.

16) Press the **ENT** Key to acknowledge the startup screen.

17) Turn the large **FMS** Knob to select the AUX Page group on the MFD.

18) Turn the small **FMS** Knob to select the System Status Page.

19) Press the Display Database Selection Softkey to show standby navigation database information for each display (**MFD1 DB**, **PFD1 DB, PFD2 DB**). Verify the correct standby navigation database cycle information is shown for each display.

NOTE: *The system compares the active databases on each PFD and the MFD, and displays a system alert message 'DB Mismatch' if they are not identical. Similarly, if the standby databases on each PFD and the MFD are not identical, the system will display a 'DB Mismatch' alert for the standby navigation databases.*

GARMIN DATABASES

The following databases are stored on Supplemental Data Cards provided by Garmin:

- Expanded basemap
- Terrain
- SafeTaxi
- Obstacle
- FliteCharts
- Airport Directory

After subscribing to the desired database product, these database products will be downloaded and ultimately stored on three Supplemental Data Cards. Each Supplemental Data Card resides in the bottom card of each display as shown in Figure B-7. These cards must not be removed except to update the databases stored on each card.

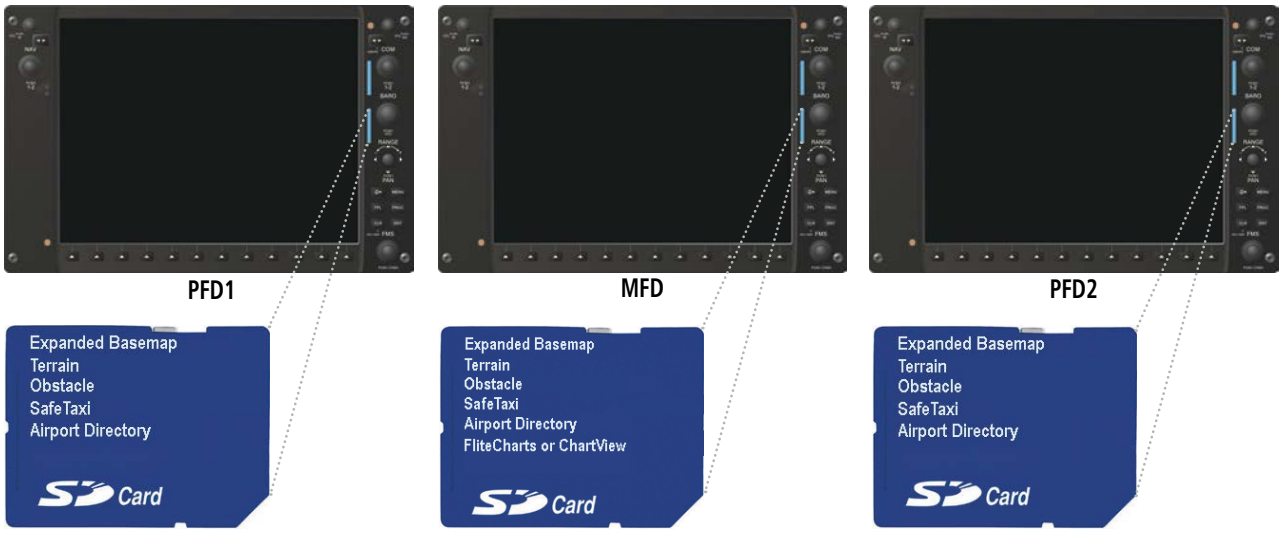


Figure B-7 Correct Database Locations

Since these databases are not stored internally in the displays, a Supplemental Data Card containing identical database versions must be kept in each display unit.

The basemap database contains data for the topography and land features, such as rivers, lakes, and towns. It is updated only periodically, with no set schedule. There is no expiration date.

The terrain database contains the terrain mapping data. This database is updated periodically and has no expiration date.

The obstacle database contains data for obstacles, such as towers, that pose a potential hazard to aircraft. Obstacles 200 feet and higher are included in the obstacle database. It is very important to note that not all obstacles are necessarily charted and therefore may not be contained in the obstacle database. This database is updated on a 56-day cycle.

NOTE: *The data contained in the terrain and obstacle databases comes from government agencies. Garmin accurately processes and cross-validates the data, but cannot guarantee the accuracy and completeness of the data.*

The AOPA or AC-U-KWIK Airport Directory provides data on airports and heliports throughout the U.S. or worldwide, respectively. The AOPA Directory offers detailed information for over 5,300 U. S. airports, along with the names and phone numbers of thousands of FBOs. These databases are updated every 56 days. The AC-U-KWIK Directory offers detailed information for more than 8,000 airports with runways longer than 3,000 feet worldwide.

The SafeTaxi database contains detailed airport diagrams for selected airports. These diagrams aid in following ground control instructions by accurately displaying the aircraft position on the map in relation to taxiways, ramps, runways, terminals, and services. This database is updated on a 56-day cycle.

The FliteCharts database contains procedure charts for the United States only. This database is updated on a 28-day cycle. If not updated within 180 days of the expiration date, FliteCharts will no longer function.

AUTOMATIC DATABASE SYNCHRONIZATION FEATURE

The automatic database synchronization feature automatically transfers the database from a single SD database card to the SD cards on each PFD and the MFD to ensure that all databases are synchronized throughout the system. After power-up, the system compares all copies of each applicable database. If similar databases do not match, the most recent valid database is automatically copied to each card in the system that does not already contain that database.

The following databases are checked and synchronized: Basemap, Safetaxi, Obstacle, Airport Directory (AOPA), and Terrain. This feature applies only to databases that are stored on the SD card that resides in the bottom slot of each display. This feature does not apply to the navigation database which is stored internally in each display, or to the charts databases (FliteCharts and ChartView) which are only required to be present on the MFD. The typical procedure would be to download new databases to the MFD card, then synchronize the data to the PFD(s).

NOTE: The 9-arc second terrain database may take as long as 100 minutes to synchronize using this method. Therefore the user may want to transfer the data using a PC, or connect the system to a ground power source while performing the database synchronization.

The synchronization progress may be monitored on the AUX-System Status Page in the Sync Status section of the Database Window (Figure B-8). This section shows the synchronization status of each applicable database, including the percent complete, time remaining, and to which displays the databases are being copied. When the synchronization is complete, the status is listed as 'Complete', followed by the displays to which the databases were copied. This sub-section is only present when a sync is occurring or has occurred on the current power-up.

An indication of 'Complete' still requires a power cycle before the synchronized databases will be used by the system.

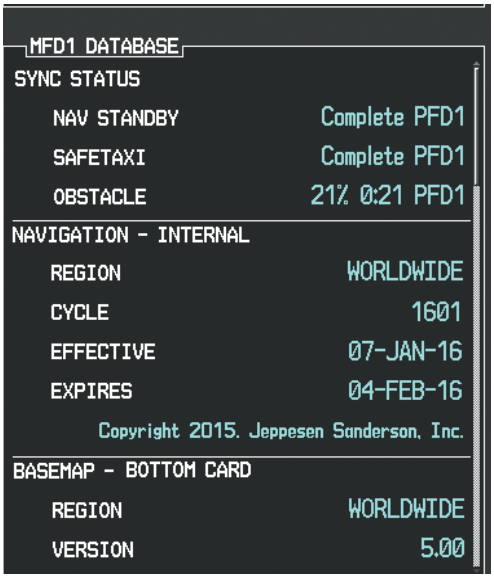
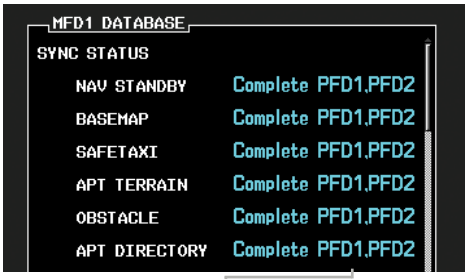


Figure B-8 AUX-System Status Page, Database Window

The Display Database Softkey (Figure B-11) is used to place the cursor in the Database Window. Upon first press of the Display Database Softkey, the softkey will change to a selected state (black text on gray background) and the cursor will appear in the Database Window. At this point the user can scroll through all databases in the Database Window to view status information. If the Display Database Softkey is pressed repeatedly, the softkey will cycle through PFD1, PFD2, and MFD. Database status information in the Database Window will reflect the database of the selected PFD or MFD. After a successful sync and restart, verify that the proper databases are now in use on the AUX–System Status Page (Figure B-8).

If an error occurs during the synchronization, an error message will be displayed, followed by the affected display in the Sync Status section of the Database Window (Figure B-9). If a synchronization completes on one display, but an error occurs on another, the error message will be displayed with the affected diaplay listed after it. When an error message (Table B-1) is displayed, the problem must be corrected before the synchronization can be completed. A power cycle is required to restart synchronization when 'Card Full' or 'Err' is shown.



Database Synchronization Error Message

Figure B-9 Synchronization Error Message

Error Message	Description
Canceled	Database synchronization has been canceled by removing the bottom SD card in display being updated
Card Full	SD card does not contain sufficient memory
Err	Displayed for all other errors that may cause the synchronization process to be halted
Timeout	System timed-out prior to the database transfer completing

Table B-1 Database Synchronization Error Messages

UPDATING GARMIN DATABASES

The Garmin database updates can be obtained by following the instructions detailed in the 'Aviation Databases' section of the Garmin website (fly.garmin.com). Once the updated files have been downloaded from the website, a PC equipped with an appropriate SD card reader is used to unpack and program the new databases onto an existing Supplemental Data Card. Equipment required to perform the update is as follows:

- Windows-compatible PC computer (Windows 2000, Windows XP, Vista, or Windows 7))
- SD Card Reader: SanDisk SDDR-93, SanDisk SDDR-99, Verbatim #96504, or equivalent
- Updated database obtained from the Garmin website
- Existing Supplemental Database SD Cards (010-00330-42, or -43) from both PFDs and MFD

In some cases it may be necessary to obtain an unlock code from Garmin in order to make the database product functional. It may also be necessary to have the system configured by a Garmin authorized service facility in order to use some database features.

After the data has been copied to the appropriate data card, perform the following steps:

1) With system power OFF, remove the MFD database card from the bottom card slot of the MFD.
2) Update the Garmin databases on the MFD card.
3) Insert the MFD database card into the bottom card slot of the MFD.
4) Apply power to the system, check that the databases are initialized and displayed on the power-up screen (Figure B-10). When updating the terrain and FliteCharts databases, a 'Verifying' message may be seen. If this message is present, wait for the system to finish loading before proceeding to step 5.

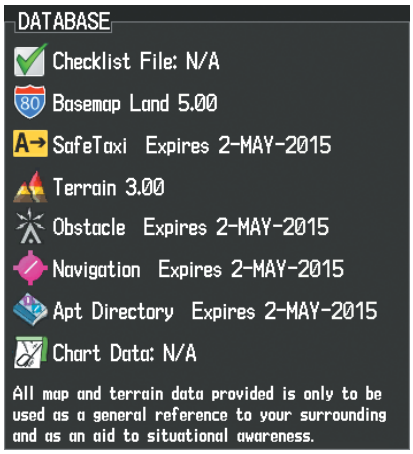


Figure B-10 Database Information on the Power-up Screen

5) Acknowledge the Power-up Page agreement by pressing the **ENT** Key or the right most softkey.
6) Turn the large **FMS** Knob to select the AUX Page group on the MFD.
7) Turn the small **FMS** Knob to select the System Status Page.
8) Monitor the Sync Status in the Database Window. Wait for all databases to complete synching, indicated by 'Complete' being displayed as seen in Figure B-9.
9) Remove and reapply power to the system.
10) Turn the large **FMS** Knob to select the AUX Page group on the MFD.
11) Turn the small **FMS** Knob to select the System Status Page.
12) Press the Display Database Selection Softkey to show database information for each display (**MFD1 DB**, **PFD1 DB, PFD2 DB**). Verify the correct database cycle information is shown for each database for each display.



Unselected *MFD1 DB Selected* *PFD1 DB Selected*

Figure B-11 Display Database Softkey

MAGNETIC FIELD VARIATION DATABASE UPDATE

A copy of the current magnetic field variation database (MV DB) is included with the navigation database. At startup, the system compares this version of the MV DB with that presently being used by each AHRS (GRS1 and GRS2). If the system determines the MV DB needs to be updated, a prompt is displayed on the Navigation Map Page, as shown in Figure B-12. Note, in the following example, GRS1 is the first AHRS to indicate an update is available. In actuality, this is dependent on which AHRS is the first to report status to the system. GRS2 may be displayed before GRS1. The order is not important, only that both AHRS be updated.

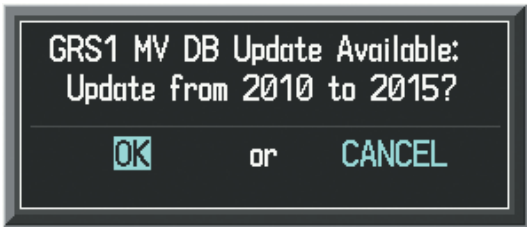


Figure B-12 GRS1 Magnetic Field Variation Database Update Prompt

Loading the magnetic field variation database update:

1) With 'OK' highlighted, as seen in Figure B-12, press the **ENT** Key on the MFD. A progress monitor is displayed as shown in Figure B-13.

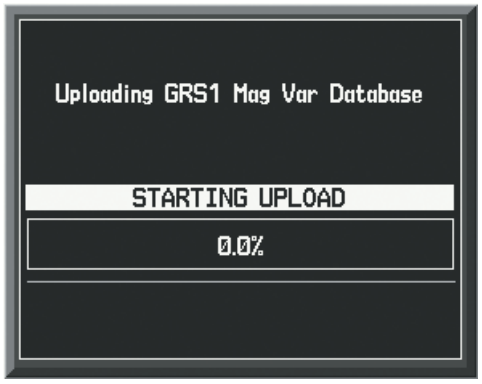


Figure B-13 Uploading Database to GRS1

2) When the upload is complete, the prompt for the next GRS upload is displayed, as seen in Figure B-14.

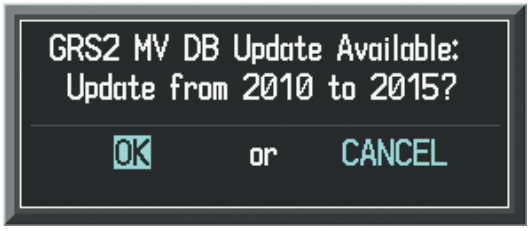


Figure B-14 GRS2 Magnetic Field Variation Database Update Prompt

3) With 'OK' highlighted, press the **ENT** Key on the MFD. A progress monitor is displayed as shown in Figure B-15. When the upload is complete, the system is ready for use.

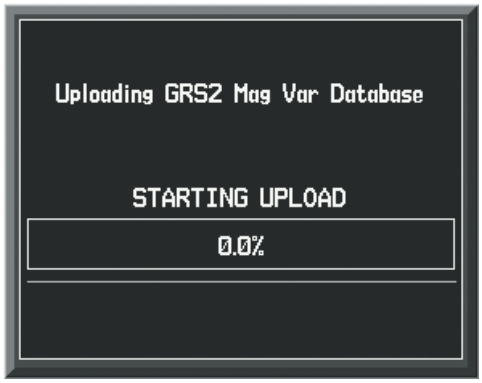


Figure B-15 Uploading Database to GRS2

GARMIN AVIATION GLOSSARY

ACARS	Airborne Communications Addressing and Reporting System
ACC	Accuracy
ACT, ACTV	Active, Activate, Altitude Compensated Tilt
ADC	Air Data Computer
ADF	Automatic Direction Finder
ADI	Attitude Direction Indicator
ADIZ	Air Defense Identification Zone
ADS-B	Automatic Dependent Surveillance-Broadcast
AF	Arc to Fix Leg
AFCS	Automatic Flight Control System
AFM	Airplane Flight Manual
AFMS	Airplane Flight Manual Supplement
AFRM	Airframe
AGL	Above Ground Level
AHRS	Attitude and Heading Reference System
AIM	Aeronautical Information Manual
AIRMET	Airman's Meteorological Information
AIRREP	Air Reports
ALRT	Alert
ALT	Altitude
ALT, ALTN	Alternator
ALTS	Selected Altitude Capture Mode
ALTV	VNAV Altitude Capture Mode
AMPS	Amperes
ANNUNC	Annunciation
ANT	Antenna
AOA	Angle of Attack
AOG	Aircraft On Ground
AOPA	Aircraft Owners and Pilots Association
AP	Autopilot
AP DISC	Autopilot Disconnect
APPR, APR	Approach
APT	Airport, Aerodrome
APTSIGNS	Airport Signs
ARINC	Aeronautical Radio Incorporated
ARSPC	Airspace
ARTCC	Air Route Traffic Control Center
ARV	Arrival
AS	Airspeed
ASB	Aviation Support Branch
ASOS	Automated Surface Observing System
ATC	Air Traffic Control
ATCRBS	ATC Radar Beacon System
ATIS	Automatic Terminal Information Service
ATK	Along Track
AUTOSEQ	Automatic Sequence
AUX	Auxiliary
AVG	Average
AWOS	Automated Weather Observing System
B	Both Runways
B ALT	Barometric Altitude
BARO	Barometer, Barometric
BATT	Battery
BC	Backcourse
Bearing	The compass direction from the present position to a destination waypoint.
BFO	Beat Frequency Oscillator
BKSP	Backspace
BRG	Bearing
°C	Degrees Celsius
C	Center Runway
CA	Course to Altitude Leg
CAL	Calibrated
CALC	Calculator
Calibrated Airspeed	Indicated airspeed corrected for installation and instrument errors.
CAS	Crew Alerting System
CD	Course to DME Distance Leg
CDI	Course Deviation Indicator
CDU	Control Display Unit
CF	Course to Fix Leg
CH, CHNL	Channel
CHT	Cylinder Head Temperature
CHKLIST	Checklist

CI	Course to Intercept Leg
CLD	Cloud
CLR	Clear
CM	Centimeter
CN	Canada
CNS	Communication, Navigation, & Surveillance
CO	Carbon Monoxide
COM	Communication Radio
CONFIG	Configuration
COOL	Coolant
COPLT	Copilot
Course	The line between two points to be followed by the aircraft.
Course to Steer	The recommended direction to steer in order to reduce course error or stay on course. Provides the most efficient heading to get back to the desired course and proceed along the flight plan.
CPDLC	Controller Pilot Datalink Communications
CPL	Couple
CR	Course to Radial Leg
CRG	Cockpit Reference Guide
CRNT	Current
Crosstrack Error	The distance the aircraft is off a desired course in either direction, left or right.
CRS	Course, Course to Steer
CRSR	Cursor
CSC	Current Speed Control
CTA	Control Area
CTR	Center
CTRL	Control
Cumulative, CUM	The total of all legs in a flight plan.
CVDR	Cockpit Voice Data Recorder
CVR	Cockpit Voice Recorder
CVRG	Coverage
CWS	Control Wheel Steering
CYL	Cylinder
D ALT	Density Altitude
DB, DBASE	Database
dBZ	Decibels 'Z' (Radar Return)
DCLTR, DECLTR	Declutter
DEC FUEL	Decrease Fuel
DEG	Degree
DEIC, DEICE	De-icing
DEP	Departure
Desired Track	The desired course between the active "from" and "to" waypoints.
DEST	Destination
DEV	Deviation
DF	Direct to Fix Leg
DFLT	Default
DG	Directional Gyro
DGRD	Degrade
DH	Decision Height
Dilution of Precision	A measure of GPS satellite geometry quality on a scale of one to ten (lower numbers equal better geometry, where higher numbers equal poorer geometry).
DIR	Direction
DIS	Distance
Distance	The 'great circle' distance from the present position to a destination waypoint.
DL LTNG	Datalink Lightning
DME	Distance Measuring Equipment
DN	Down
DOP	Dilution of Precision
DP	Departure Procedure
DPRT	Departure
DR	Dead Reckoning
DSBL	Disabled
DTK	Desired Track
E	Empty, East
EAS	Engine and Airframe Systems
ECU	Engine Control Unit
Efficiency	A measure of fuel consumption, expressed in distance per unit of fuel.
EGNOS	European Geostationary Navigation Overlay Service
EGT	Exhaust Gas Temperature
EICAS	Engine Indication and Crew Alerting System

EIS	Engine Indication System
ELEV	Elevation, Elevator
EMER, EMERG, EMERGCY	Emergency
EMI	Electromagnetic Interference
END, ENDUR	Endurance
Endurance	Flight endurance, or total possible flight time based on available fuel on board.
ENG	Engine
ENGD	Engaged
ENR	Enroute; ETE to Final Destination
Enroute Safe Altitude	The recommended minimum altitude within ten miles left or right of the desired course on an active flight plan or direct-to.
ENT	Enter
EPE	Estimated Position Error
EPU	Estimated Position Uncertainty
ERR	Error
ESA	Enroute Safe Altitude
ESP	Electronic Stability and Protection
Estimated Position Error	A measure of horizontal GPS position error derived by satellite geometry conditions and other factors.
Estimated Time of Arrival	The estimated time at which the aircraft should reach the destination waypoint, based upon current speed and track.
Estimated Time Enroute	The estimated time it takes to reach the destination waypoint from the present position, based upon current groundspeed.
ETA	Estimated Time of Arrival
ETE	Estimated Time Enroute
EXPIRD	Expired
°F	Degrees Fahrenheit
FA	Course From Fix to Altitude Leg
FAA	Federal Aviation Administration
FADEC	Full Authority Digital Engine Control
FAF	Final Approach Fix
FAIL	Failure
FC	Course From Fix to Distance Leg
FCC	Federal Communication Commission
FCST	Forecast
FD	Flight Director, Course From Fix to DME Distance Leg
FDE	Fault Detection and Exclusion
FF, FFLOW	Fuel Flow
FIS-B	Flight Information Services-Broadcast
FISDL	Flight Information Service Data Link
FL	Flight Level
FLC	Flight Level Change
FM	Course From Fix to Manual Termination Leg
FMS	Flight Management System
FOB	Fuel On Board
FOD	Fuel Over Destination
FPA	Flight Path Angle
FPL	Flight Plan
FPM	Feet Per Minute, Flight Path Marker
FREQ	Frequency
FRMT	Format
FRZ	Freezing
FSS	Flight Service Station
FT	foot/feet
Fuel Flow	The fuel flow rate, expressed in units of fuel per hour.
Fuel On Board	The total amount of usable fuel on board the aircraft.
FWD	Forward
G/S	Glideslope
GA	Go-Around
GAL, GL	Gallon(s)
GBOX	Gearbox
GCU	Garmin Control Unit
GCS	Ground Clutter Suppression
GDC	Garmin Air Data Computer
GDL	Garmin Satellite Data Link
GDR	Garmin Data Radio
GDU	Garmin Display Unit
GEA	Garmin Engine/Airframe Unit
GEO	Geographic
GFC	Garmin Flight Control

GIA	Garmin Integrated Avionics Unit
GLS	Global Navigation Satellite Landing System
GMA	Garmin Audio Panel System
GMC	Garmin Mode Controller
GMT	Greenwich Mean Time
GMU	Garmin Magnetometer Unit
GND	Ground
GPH	Gallons per Hour
GPN	Garmin Part Number
GPS	Global Positioning System
GPWS	Ground Proximity Warning System
Grid MORA	Grid Minimum Off-Route Altitude; One degree latitude by one degree longitude in size and clears the highest elevation reference point in the grid by 1,000 feet for all areas of the grid or 2,000 feet for mountainous
Groundspeed	The velocity that the aircraft is travelling relative to a ground position.
Ground Track	See Track
GRS	Garmin Reference System
GS	Ground Speed, Glideslope
GSA	Garmin Servo Adapter
GSD	Garmin Data Concentrator
GSL	Geodetic Sea Level
GSR	Garmin Satellite Radio
GTC	Garmin Touchscreen Controller
GTS	Garmin Traffic System
GTX	Garmin Transponder
GWX	Garmin Weather Radar
HA	Hold Terminating at Altitude Leg
HDG	Heading
HDOP	Horizontal Dilution of Precision
Heading	The direction an aircraft is pointed, based upon indications from a magnetic compass or a properly set directional gyro.
HF	High Frequency, Hold Terminating at Fix Leg
HFOM	Horizontal Figure of Merit
Hg	Mercury
HI	High
HI SENS	High Sensitivity
HM	Hold with Manual Termination Leg
Horizontal Figure of Merit	A measure of the uncertainty in the aircraft's horizontal position.
hPa	Hectopascal
HPL	Horizontal Protection Level
HR	Hour
HRZN HDG	Horizon Heading
HSDB	High-Speed Data Bus
HSI	Horizontal Situation Indicator
HT	heat
HUL	Horizontal Uncertainty Level
Hz	Hertz (cycles per second)
I	Inner Marker
IAF	Initial Approach Fix
IAS	Indicated Air Speed
IAT	Indicated Air Temperature
IAU	Integrated Avionics Unit
ICAO	International Civil Aviation Organization
ICS	Intercom System
ID	Identification/Morse Code Identifier
IDENT, IDNT	Identification
IF	Initial Fix
IFR	Instrument Flight Rules
IG	Imperial Gallon
ILS	Instrument Landing System
IMC	Instrument Meteorological Conditions
IN	Inch
INACTV	Inactive
INC FUEL	Increase Fuel
IND	Indicator, Indicated
Indicated	Information provided by properly calibrated and set instrumentation on the aircraft panel.
INFO	Information
IN Hg	Inches of Mercury
INT	Intersection(s)
INTEG	Integrity (RAIM unavailable)
IrDA, IRDA	Infrared Data Association

ISA	International Standard Atmosphere; ISA Relative Temperature
ITT	Interstage Turbine Temperature, Inter-Turbine Temperature
KEYSTK	Key Stuck
KG	Kilogram
kHz	Kilohertz
KM	Kilometer
KT	Knot
L	Left, Left Runway
LAT	Latitude
LBL	Label
LB	Pound
LCD	Liquid Crystal Display
LCL	Local
LDA	Landing Distance Available
LDG	ETA at Final Destination
LED	Light Emitting Diode
Left Over Fuel On Board	The amount of fuel remaining on board after the completion of one or more legs of a flight plan or direct-to.
Left Over Fuel Reserve	The amount of flight time remaining, based on the amount of fuel on board after the completion of one or more legs of a flight plan or direct-to, and a known consumption rate.
Leg	The portion of a flight plan between two waypoints.
LGND	Legend
LIFR	Low Instrument Flight Rules
LNAV	Lateral Navigation
LO	Low
LOC	Localizer
LOI	Loss of Integrity (GPS)
LON	Longitude
LPV	Localizer Performance with Vertical Guidance
LRU	Line Replaceable Unit
LT	Left
LTNG	Lightning
LVL	Level
M	Meter, Middle Marker
M_{MO} (V_{MO})	Maximum Speed
Mach Number	Mach number is the ratio of the true airspeed to the speed of sound.
MAG	Magnetic
MAG VAR	Magnetic Variation
MAHP	Missed Approach Hold Point
MAN IN	Manifold Pressure (inches Hg)
MAN SQ	Manual Squelch
MAP	Missed Approach Point
MASQ	Master Avionics Squelch
MAX	Maximum
MAXSPD	Maximum Speed (overspeed)
MDA	Barometric Minimum Descent Altitude
MEPT	Manual Electric Pitch Trim
MET	Manual Electric Trim
METAR	Aviation Routine Weather Report
MFD	Multi Function Display
MFW	Multi Function Window
MGRS	Military Grid Reference System
MHz	Megahertz
MIC	Microphone
MIN	Minimum
Minimum Safe Altitude	Uses Grid MORAs to determine a safe altitude within ten miles of the aircraft present position.
MKR	Marker Beacon
MOA	Military Operations Area
MON	Monitor
MOV	Movement
MORA	Minimum Off-Route Altitude
MPEL	Maximum Permissible Exposure Level
MPM	Meters per Minute
MSA	Minimum Safe Altitude
MSAS	Multi-functional Satellite Augmentation System
MSG	Message
MSL	Mean Sea Level
MT, M	Meter
mV	Millivolt(s)

MVFR	Marginal Visual Flight Rules
N	North
NAV	Navigation
NAVAID	Navigation Aid
NDB	Non-Directional Beacon
NEXRAD	Next Generation Radar
NM	Nautical Mile(s)
NoPT	No Procedure Turn Required (procedure shall not be executed without ATC clearance)
NOTAM	Notice To Airman
NRST	Nearest
O	Outer Marker
OAT	Outside Air Temperature
OBS	Omni Bearing Selector
OFST	Offset
OXY	Oxygen
P ALT	Pressure Altitude
PA	Passenger Address, Proximity Advisory
PASS	Passenger(s)
PC	Personal Computer
PFD	Primary Flight Display
PI	Procedure Turn to Course Intercept Leg
PIREP	Pilot Report
PIT, PTCH	Pitch
POH	Pilot's Operating Handbook
POHS	Pilot's Operating Handbook Supplement
POS, POSN	Position
PPH	Pounds per Hour
PPM	Parts per Million
P. POS	Present Position
PRES, PRESS	Pressure
PROC	Procedure(s), Procedure Turn
PROP	Propeller
PROX	Proximity
PSI	Pounds per Square Inch
PT	Procedure Turn
PTK	Parallel Track
PTT	Push-to-Talk
PWR	Power
QTY	Quantity
R	Right, Right Runway
RA	Resolution Advisory, Radio Altimeter
RAD	Radial
RA, RAD ALT	Radio Altimeter
RAIM	Receiver Autonomous Integrity Monitoring
RAM	Random Access Memory
RAT	Ram Air Temperature
RCVR	Receiver
REF	Reference
REM	Remaining (fuel remaining), Reminder
REQ	Required
RES	Reserve (fuel reserve entered by pilot)
REV	Reverse, Revision, Revise
RF	Radio Frequency, Constant Radius Turn to Fix Leg
RMI	Radio Magnetic Indicator
RMT	Remote
RNAV	Area Navigation
RNG	Range
RNP	Required Navigation Performance
RNWY, RWY	Runway
ROL	Roll
ROM	Read Only Memory
RPM	Revolutions Per Minute
RST FUEL	Reset Fuel
RSV	Reserve (fuel reserve entered by pilot)
RT	Right
RVRSNRY	Reversionary
RX	Receive
S	South
SA	Selective Availability
SAT	Static Air Temperature
SBAS	Satellite-Based Augmentation System
SCIT	Storm Cell Identification and Tracking
SD	Secure Digital

SEC	Second(s)
SEL, SLCT	Select
SELCAL	Selective Calling
SENS	Sense
SFC	Surface
SIAP	Standard Instrument Approach Procedures
SID	Standard Instrument Departure
SIG/AIR	SIGMET/AIRMET
SIGMET	Significant Meteorological Information
SIM	Simulator
SLD	Supercooled Large Droplet
SLP/SKD	Slip/Skid
SMBL	Symbol
SMS	Short Message System
SPC	Space
SPD	Speed
SPI	Special Position Identification
SPKR	Speaker
SQ	Squelch
SRVC, SVC	Service
SSID	Wi-Fi Service Set Identifier
STAB	Stabilization
STAL	Stall
STAR	Standard Terminal Arrival Route
STATS	Statistics
STBY	Standby
STD	Standard
STRMSCP	Stormscope
SUA	Special Use Airspace
SUSP	Suspend
SVT, SYN VIS	Synthetic Vision Technology
SW	Software
SYNC	Synchronize
SYN TERR	Synthetic Terrain
SYN VIS	Synthetic Vision
SYS	System
T	True
TA	Traffic Advisory
TACAN	Tactical Air Navigation System
TAF	Terminal Aerodrome Forecast
TAS	True Airspeed, Traffic Advisory System
TAT	Total Air Temperature
TAWS	Terrain Awareness and Warning System
TCA	Terminal Control Area
TCAS	Traffic Alert Collision Avoidance System
TEL	Telephone
TEMP	Temperature
TERM	Terminal
TF	Track Between Two Fixes Leg
TFR	Temporary Flight Restriction
TGT	Target
T HDG	True Heading
TIS	Traffic Information Service
TIT	Turbine Inlet Temperature
TKE	Track Angle Error
TMA	Terminal Maneuvering Area
TMR/REF	Timer/Reference
TOC	Top of Climb
TOD	Top of Descent
TOGA, TO/GA	Take-Off, Go-Around
TOLD	Takeoff and Landing Data
TOPO	Topographic
TORA	Takeoff Run Available
TOT	Total
Track	Direction of aircraft movement relative to a ground position; also 'Ground Track'.
Track Angle Error	The angle difference between the desired track and the current track.
TRK	Track
TRSA	Terminal Radar Service Area
TRUNC	Truncated
TTL	Total
TURB	Turbulence
TURN	Procedure Turn
TX	Transmit
UNAVAIL	Unavailable
US	United States
USR	User

UTC	Coordinated Universal Time
UTM/UPS	Universal Transverse Mercator/ Universal Polar Stereographic Grid
V	Volts
V, Vspeed	Velocity (airspeed)
V_1	Takeoff Decision Speed
V_2	Takeoff Safety Speed
V_{APP}	Approach Climb Speed
V_{LE}	Maximum Landing Gear Extended Speed
V_{LNDx}	Approach Speed (Flaps at x°)
V_{LO}	Maximum Landing Gear Operating Speed
V_{MC}	Minimum Control Speed
V_{MO} (M_{MO})	Maximum Speed
V_{NE}	Never-Exceed Speed
V_R	Takeoff Rotate Speed
V_{REF}	Landing Approach Speed
V_T	Takeoff Flap Retraction Speed
V_X	Best Angle of Climb Speed
V_Y	Best Rate of Climb Speed
V_{YSE}	Best Single-Engine Rate of Climb Speed
V DEV	Vertical Deviation
VA	Heading Vector to Altitude Leg
VAC	Volts Alternating Current
VAPP	VOR Approach
VAR	Variation
VD	Heading Vector to DME Distance Leg
VDC	Volts Direct Current
VERT	Vertical
Vertical Figure of Merit	A measure of the uncertainty in the aircraft's vertical position.
Vertical Speed Required	The vertical speed necessary to descend/ climb from a current position and altitude to a defined target position and altitude, based upon current groundspeed.
VFOM	Vertical Figure of Merit
VFR	Visual Flight Rules
VHF	Very High Frequency
VI	Heading Vector to Intercept Leg
VLOC	VOR/Localizer Receiver
VM	Heading Vector to Manual Termination Leg
VMC	Visual Meteorological Conditions
VNAV, VNV	Vertical Navigation
VOL	Volume
VOR	VHF Omnidirectional Range
VORTAC	VHF Omnidirectional Range Station and Tactical Air Navigation
VPATH, VPTH	Vertical Path
VPL	Vertical Protection Level
VPROF	VNAV Profile, Vertical Profile
VR	Heading Vector to Radial Leg
VS	Vertical Speed
VSD	Vertical Situation Display
VSI	Vertical Speed Indicator
VSR, VS REQ	Vertical Speed Required
VTF	Vector to Final
W	Watt(s), West
WAAS	Wide Area Augmentation System
WARN	Warning
WATCH	Weather Attenuated Color Highlight
WGS-84	World Geodetic System - 1984
WPT	Waypoint(s)
WT	Weight
WW	World Wide
WX	Weather
XFER, XFR	Transfer
XM LTNG	SiriusXM Lightning
XPDR	Transponder
XTALK	Cross-Talk
XTK	Cross-Track
YD	Yaw Damper

FREQUENTLY ASKED QUESTIONS

If a particular aspect of G900X operational capability is not addressed by these commonly asked questions or in the index, contact Garmin (see the copyright page or back cover for contact information) or a Garmin-authorized dealer. Garmin is dedicated to supporting its products and customers.

What is SBAS?

The Satellite Based Augmentation System (SBAS) uses a system of ground stations to correct any GPS signal errors. These ground stations correct for errors caused by ionospheric disturbances, timing, and satellite orbit errors. It also provides vital integrity information regarding the health of each GPS satellite. The signal correction is then broadcast through geostationary satellites. This correction information can then be received by any SBAS-enabled GPS receiver.

SBAS is designed to provide the additional accuracy, availability, and integrity necessary to enable users to rely on GPS for all phases of flight.

There are several SBAS systems serving different parts of the world. The Wide Area Augmentation System (WAAS) is currently available in the United States, including Alaska and Hawaii. The European Geostationary Navigation Overlay Service (EGNOS) offers coverage of Europe, parts of the middle east and northern Africa. The Multi-functional Satellite Augmentation System (MSAS) covers mainly Japan.

How does SBAS affect approach operations?

Both LNAV/VNAV and LPV approaches use the accuracy of SBAS to include vertical (glide path) guidance capability. The additional accuracy and vertical guidance capability allows improved instrument approaches to an expanded number of airports throughout the U.S.

The implementation of LPV approaches further improves precision approach capabilities. LPV approaches are designed to make full use of the improved GPS signal from the SBAS. This approach combines the LNAV/VNAV vertical accuracy with lateral guidance similar to the typical Instrument Landing System (ILS). LPV approaches allow lower approach minimums.

What is RAIM and how does it affect approach operations?

RAIM is an acronym for Receiver Autonomous Integrity Monitoring. RAIM is a GPS receiver function that performs the following functions:

- Monitors and verifies integrity and geometry of tracked GPS satellites
- Notifies the pilot when satellite conditions do not provide the necessary coverage to support a certain phase of flight
- Predicts satellite coverage of a destination area to determine whether the number of available satellites is sufficient to satisfy requirements

NOTE: *If RAIM is not predicted to be available for the final approach course, the approach does not become active, as indicated by the "RAIM not available from FAF to MAP" message and the LOI annunciation flagging on the HSI.*

For RAIM to work correctly, the GPS receiver must track at least five satellites. A minimum of six satellites is required to allow RAIM to eliminate a single corrupt satellite from the navigation solution.

RAIM ensures that satellite geometry allows for a navigation solution calculation within a specified protection limit (2.0 nm for oceanic and en route, 1.0 nm for terminal, and 0.3 nm for non-precision approaches). The G900X System monitors RAIM and issues an alert message when RAIM is not available (see Appendix A). Without RAIM, GPS position accuracy cannot be monitored. If RAIM is not available when crossing the FAF, the pilot must fly the missed approach procedure.

What is GSL altitude?

GSL (Geodetic Sea Level) altitude is the height above Mean Sea Level (MSL), as calculated geometrically, generally using a global positioning system (GPS) as the primary data source. The calculated result may or may not include a barometric component, but the primary source is geometric.

Why are there not any approaches available for a flight plan?

Approaches are available for the final destination airport in a flight plan or as a direct-to (keep in mind that some VOR/VORTAC identifiers are similar to airport identifiers). If a destination airport does not have a published approach, the G900X indicates "NONE" for the available procedures.

What happens when an approach is selected? Can a flight plan with an approach, a departure, or an arrival be stored?

When an approach, departure, or arrival is loaded into the active flight plan, a set of approach, departure, or arrival waypoints is inserted into the flight plan, along with a header line showing the title of the selected instrument procedure. The original en route portion of the flight plan remains active, unless the instrument procedure is activated. This may be done either when the procedure is loaded or at a later time.

Flight plans can also be stored with an approach, a departure, or an arrival. Note that the active flight plan is erased when the system is turned off. Also, the active flight plan is overwritten when another flight plan is activated. When storing flight plans with an approach, a departure, or an arrival, the G900X uses the waypoint information from the current database to define the waypoints. If the database is changed or updated, the G900X System automatically updates the information, provided the procedure has not been modified. Should an approach, departure, or arrival procedure no longer be available, the flight plan becomes locked until the procedure is deleted from the flight plan.

Can "slant Golf" ("/G") be filed using the G900X?

"/G" may be filed for a flight plan. The G900X system meets the requirements of TSO-C145a Class 3 and ETSO C145 Class 3 installations. GPS approaches are not to be flown with an expired database. See the approved Pilot's Operating Handbook (POH) as well as the Aeronautical Information Manual (AIM) for more information.

What does the OBS Softkey do?

The **OBS** Softkey is used to select manual sequencing of waypoints. Activating OBS mode sets the current active-to waypoint as the primary navigation reference and prevents the system from sequencing to the next waypoint in a flight plan. When OBS mode is cancelled, automatic waypoint sequencing is continued, and the G900X automatically activates the next waypoint in the flight plan once the aircraft has crossed the present active waypoint.

Normal (OBS not activated)	OBS
• Automatic sequencing of waypoints	• Manual sequencing - 'holds' on selected waypoint
• Manual course change on HSI not possible	• Manually select course to waypoint from HSI
• Always navigates 'TO' the active waypoint	• Indicates 'TO' or 'FROM' waypoint
• Must be in this mode for final approach course	• Cannot be set for final approach course or published holding patterns

When OBS mode is active, the G900X allows the pilot to set a desired course to/from a waypoint using the **CRS/BARO** Knob and HSI (much like a VOR).

The most common application for using the **OBS** Softkey is the missed approach. The G900X suspends automatic waypoint sequencing (indicated by a 'SUSP' annunciation placed on the HSI) when the missed approach point (MAP) is crossed. This prevents the G900X from automatically sequencing to the missed approach holding point (MAHP). During this time, the **OBS** Softkey designation changes to **SUSP**. Pressing the **SUSP** Softkey reactivates automatic waypoint sequencing. The **OBS** Softkey then resumes its normal functionality.

Why might the G900X not automatically sequence to the next waypoint?

The G900X only sequences flight plan waypoints when automatic sequencing is enabled (i.e., no 'OBS' or 'SUSP' annunciation on the HSI). For automatic sequencing to occur, the aircraft must also cross the *bisector* of the turn being navigated. The bisector is a line passing through the waypoint common to two flight plan legs at an equal angle from each leg.

How can a waypoint be skipped in an approach, a departure, or an arrival?

The G900X allows the pilot to manually select any approach, departure, or arrival leg as the active leg of the flight plan. This procedure is performed on the MFD from the Active Flight Plan Page by highlighting the desired waypoint and pressing the **ACT LEG** Softkey then the **ENT** Key to approve the selection. The GPS then provides navigation along the selected flight plan leg.

When does turn anticipation begin?

The G900X smooths adjacent leg transitions based on a normal 15° bank angle (with the ability to roll up to 30°) and provides three pilot cues for turn anticipation:

- A waypoint alert ('Next DTK ###° in # seconds' or 'Next HDG ###° in # seconds') appears on the PFD 10 seconds before the turn point and flashes as it counts down to zero.
- A flashing turn advisory ('Turn [right/left] to ###° in # seconds') appears on the PFD 10 seconds before the turn and flashes as it counts down to zero. 'Turn [right/left] to ###° now' or 'Next [DTK/HDG] to ###° now' is displayed when the pilot is to begin the turn and the HSI (GPS mode) automatically sequences to the next DTK or HDG value.
- The To/From indicator on the HSI flips momentarily to indicate that the midpoint of the turn has been crossed.

When does the CDI scale change?

Once a departure is activated, the G900X Course Deviation Indicator (CDI) full scale deflection is set to 0.3 nm. The CDI scale changes to 1.0 nm (terminal mode) then ramps up to 2.0 nm (enroute mode) at 30 nm from the departure airport. When 31 nm from the destination, the CDI scale smoothly transition from 2.0 nm back to 1.0 nm (terminal mode). At 2.0 nm before the FAF during an active approach, the CDI scale transitions down further based on the type of approach activated (LNAV, LNAV/VNAV, LPV). When a missed approach is activated, the CDI is set to 0.3 nm. See the Flight Instruments Section for more details on CDI scaling.

Why does the HSI not respond like a VOR when OBS mode is active?

Unlike a VOR, the CDI scale used on GPS equipment is based on the crosstrack distance to the desired course, not on the angular relationship to the destination. Therefore, the CDI deflection on the GPS is constant regardless of the distance to the destination and does not become less sensitive when further away from the destination.

What is the correct missed approach procedure? How is the missed approach holding point selected?

To comply with TSO specifications, the G900X does not automatically sequence past the MAP. The first waypoint in the missed approach procedure becomes the active waypoint when the **SUSP** Softkey is selected *after* crossing the MAP. All published missed approach procedures must be followed, as indicated on the approach plate.

To execute the missed approach procedure prior to the MAP (not recommended), select the Active Flight Plan Page and use the **ACT LEG** Softkey to activate the missed approach portion of the procedure.

After a missed approach, how can the same approach be re-selected? How can a new approach be activated?

NOTE: *Do not attempt to reactivate the current approach prior to crossing the missed approach point (MAP). If an attempt to do so is made, an alert message "Are you sure you want to discontinue the current approach?" appears. The G900X directs the pilot back to the transition waypoint and does not take into consideration any missed approach procedures, if the current approach is reactivated.*

After flying the missed approach procedure, the pilot may reactivate the same approach for another attempt by pressing the **PROC** Key. Once the clearance is given for another attempt, activate the approach by highlighting 'ACTIVATE APPROACH' using the large **FMS** Knob and pressing the **ENT** Key. The G900X provides navigation along the desired course to the waypoint and rejoins the approach in sequence from that point.

To activate a new approach for the same airport, select the new procedure by pressing the **PROC** Key. Choose 'SELECT APPROACH', select the desired approach from the list shown, and press the **ENT** Key. Select the desired transition, then activate the approach using the **ENT** Key.

To activate a new approach to a different airport, press the **Direct-to** Key and select the desired airport using the **FMS** Knobs. Press the **ENT** Key to accept the selected airport, then follow the steps in the preceding paragraph to select an approach for the new airport.

GENERAL TIS INFORMATION

NOTE: *Aircraft without an operating transponder are invisible to TIS.*

NOTE: *TIS is not intended to be used as a collision avoidance system and does not relieve the pilot of the responsibility to "see and avoid" other aircraft. TIS should not be used for avoidance maneuvers during instrument meterorlogical conditions (IMC) or when there is no visual contact with the intruder aircraft.*

The Traffic Information Service (TIS) provides traffic advisory information to non-TAS/TCAS-equipped aircraft. TIS is a ground-based service providing the relative locations of all ATCRBS Mode-A and Mode-C transponder equipped aircraft within a specified service volume. The TIS ground sensor uses real-time track reports to generate traffic notification. The G900X System displays TIS traffic information on the Traffic Map Page of the MFD. TIS information may also be displayed for overlay on the MFD Navigation Map Page, as well as on the PFD Inset Map. Surveillance data includes all transponder-equipped aircraft within the coverage volume. The G900X System displays up to eight traffic targets within a 7.5-nm radius, from 3,000 feet below, to 3,500 feet above the requesting aircraft.

The main difference between the Traffic Information System (TIS) and Traffic Advisory (TAS) or Traffic Collision Avoidance Systems (TCAS) is the source of surveillance data. TAS/TCAS uses an airborne interrogator with a half-second update rate, while TIS utilizes the terminal Mode-S ground interrogator and accompanying data link to provide a five-second update rate. TIS and TAS/TCAS have similar ranges.

TIS relies on surveillance of the Mode-S radar system, which is a "secondary surveillance" radar system similar to that used by ATCRBS. Many limitations are inherent in secondary radar surveillance. Information provided by TIS is neither better nor more accurate than the information used by ATC. TIS is intended only to assist in visual acquisition of other aircraft in visual meteorological conditions (VMC). While TIS is a useful aid for visual traffic avoidance, system limitations must be considered to ensure proper use. No recommended avoidance maneuvers are given, nor authorized, as a direct result of a TIS intruder display or TIS advisory.

- TIS operation may be intermittent during turns or other maneuvering.
- TIS is dependent on two-way, line-of-sight communications between the aircraft and the Mode-S radar antenna. Whenever the structure of the aircraft comes between the transponder antenna and the ground-based radar antenna, the signal may be temporarily interrupted.

NOTE: *Refer to the TIS Limitations section of the Aeronautical Information Manual (AIM) for a more comprehensive explanation of limitations and anomalies associated with TIS.*

NOTE: *TIS is unavailable at low altitudes in many areas of the United States. This is often the case in mountainous regions.*

***WARNING:** Garmin is not responsible for Mode S geographical coverage. Operation of the ground stations is the responsibility of the FAA. Refer to the AIM for a Terminal Mode S radar site map.*

TIS information is collected during a single radar sweep. Collected information is then sent through the Mode S uplink on the next radar sweep. Because of this, the surveillance information is approximately five seconds old. TIS ground station tracking software uses prediction algorithms to compensate for this delay. These algorithms use track history data to calculate expected intruder positions consistent with the time of display. Occasionally, aircraft maneuvering may cause variations in this calculation and create slight errors on the Traffic Map Page which affect relative bearing information and the target track vector and may delay display of the intruder information. However, intruder distance and altitude typically remain relatively accurate and may be used to assist in spotting traffic. The following errors are common examples:

- When the client or intruder aircraft maneuvers excessively or abruptly, the tracking algorithm may report incorrect horizontal position until the maneuvering aircraft stabilizes.
- When a rapidly closing intruder is on a course that intercepts the client aircraft course at a shallow angle (either overtaking or head-on) and either aircraft abruptly changes course within 0.25 nm, TIS may display the intruder aircraft on the incorrect side of the client aircraft.

These are rare occurrences and are typically resolved within a few radar sweeps once the client/intruder aircraft course stabilizes.

Pilots using TIS can provide valuable assistance in the correction of malfunctions by reporting observations of undesirable performance. Reports should identify the time of observation, location, type and identity of the aircraft, and describe the condition observed. Reports should also include the type of transponder and transponder software version. Since TIS performance is monitored by maintenance personnel, not ATC, malfunctions should be reported in the following ways:

- By telephone to the nearest Flight Service Station (FSS) facility
- By FAA Form 8000-7, Safety Improvement Report (postage-paid card can be obtained at FAA FSSs, General Aviation District Offices, Flight Standards District Offices, and General Aviation Fixed Base Operators)

MAP SYMBOLS

AIRPORTS

Item	Symbol
Unknown Airport	
Non-towered, Non-serviced Airport	
Towered, Non-serviced Airport	
Non-towered, Serviced Airport	
Towered, Serviced Airport	
Restricted (Private) Airport	
Heliport	

NAVAIDS

Item	Symbol
Intersection	
LOM (compass locator at outer marker)	
NDB (non-directional radio beacon)	
VOR	
VOR/DME	
VOR/ILS	
VORTAC	
VRP	
TACAN	

BASEMAP

Item	Symbol
Interstate Highway	
State Highway	
US Highway	
National Highway	
City	
State/Province Border	
International Border	
Road	
Railroad	
Latitude/Longitude	

AIRSPACE BOUNDARIES

Item	Symbol
ICAO Control Area Class B Airspace	
Mode C Tower Area	
Warning Area — Prohibited Area Alert Area — Restricted Area Caution Area — Training Area Danger Area — Unknown Area	
Class C Terminal Radar Service Area Mode C Area	
Military Operations Area (MOA)	

HAZARD AVOIDANCE FEATURES

This table identifies the symbols displayed in the lower right corner of PFD or MFD maps to indicate which hazard avoidance features are activated for display.

Feature	Symbol
TAWS display enabled	
Traffic display enabled	
Stormscope display enabled	
NEXRAD display enabled	
NEXRAD Composite (FIS-B only)	
Cloud Top display enabled	
Echo Top display enabled	
XM Lightning display enabled	
Cell Movement display enabled	
SIGMETs/AIRMETs display enabled	
METARs display enabled	
City Forecast display enabled	
Surface Analysis display enabled	
Freezing Levels display enabled	
Winds Aloft display enabled	
County Warnings display enabled	
Cyclone Warnings display enabled	
Icing Potential (CIP and SLD) (ICNG)	
Pilot Weather Report (PIREPs)	
Air Report (AIREPs)	
Turbulence (TURB)	
Loss of hazard avoidance feature, (a white X is shown over the symbol to indicate not available; e.g., traffic)	

MISCELLANEOUS

Item	Symbol
ARTCC Frequency or FSS Frequency	
Map Pointer (when panning)	
Elevation Pointer (on Topography Scale when panning)	
Measuring Pointer	
Wind Vector	
Overzoom Indicator	
User Waypoint	
Vertical Navigation Along Track Waypoint	
Parallel Track Waypoint	
Unanchored Flight Path Waypoint	
Top of Descent (TOD)	
Bottom of Descent (BOD)	
Navigating using Dead Reckoning	

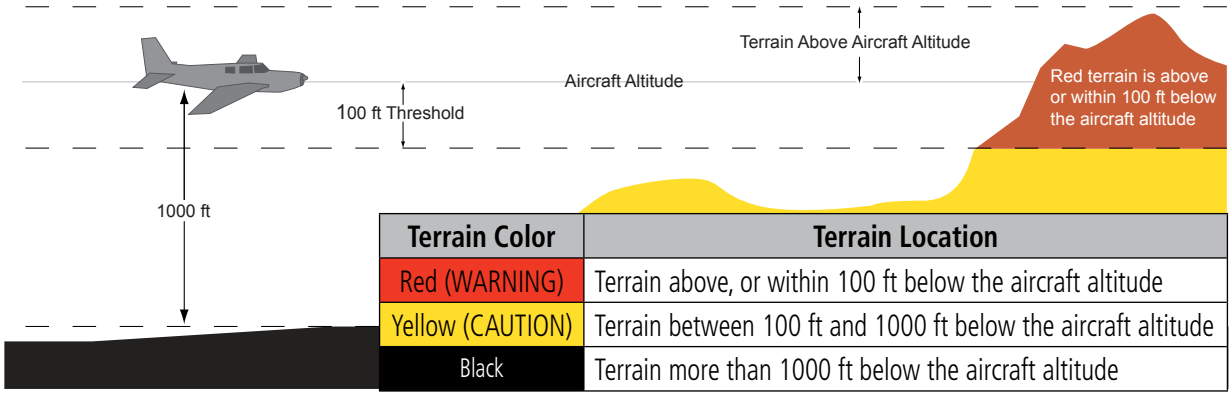
TRAFFIC (TAWS-B)

Item	Symbol
Non-threat Traffic (hollow diamond)	
Proximity Advisory (TAS only)	
Traffic Advisory, Out of Range	
Traffic Advisory	
Traffic Advisory (TA) arrow with ADS-B directional information. Points in the direction of the intruder aircraft track (GTS 820 only).	
Proximity Advisory (PA) arrow with ADS-B directional information. Points in the direction of the aircraft track (GTS 820 only).	
Non-threat traffic arrow with ADS-B directional information. Points in the direction of the intruder aircraft track (GTS 820 only).	
PA or Non-threat traffic arrow with ADS-B directional information, but positional accuracy is degraded. Points in the direction of the aircraft track (GTS 820 only).	

TRAFFIC (ADS-B WITH GDL 88)

Description	
Traffic Advisory with directional information. Points in the direction of the intruder aircraft track.	
Traffic Advisory without directional information.	
Traffic Advisory out of the selected display range. Displayed at outer range ring at proper bearing.	
Proximity Advisory with directional information. Points in the direction of the aircraft track.	
Proximity Advisory without directional information.	
Non-threat traffic with directional information. Points in the direction of the intruder aircraft track.	
Non-threat traffic without directional information.	
Traffic located on the ground with directional information. Points in the direction of the aircraft track. Ground traffic is only displayed when ADS-B is in Surface (SURF) Mode or own aircraft is on the ground.	
Ground traffic without directional information. Ground traffic is only displayed when ADS-B is in Surface (SURF) Mode or own aircraft is on the ground.	
Non-aircraft ground traffic. Ground traffic is only displayed when ADS-B is in Surface (SURF) Mode or own aircraft is on the ground.	

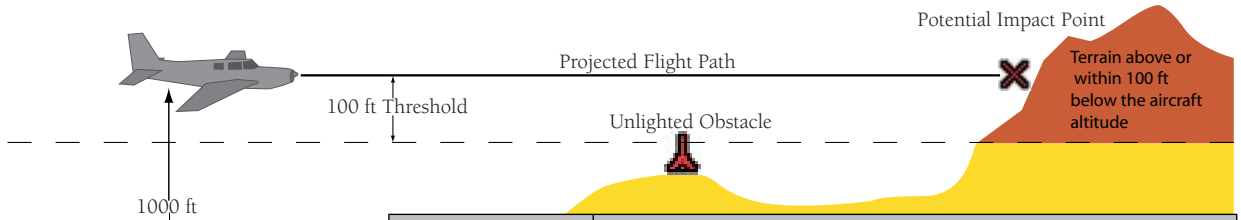
TERRAIN AVOIDANCE COLORS AND SYMBOLS



Terrain Color	Terrain Location
Red (WARNING)	Terrain above, or within 100 ft below the aircraft altitude
Yellow (CAUTION)	Terrain between 100 ft and 1000 ft below the aircraft altitude
Black	Terrain more than 1000 ft below the aircraft altitude

On the Terrain Proxmity Page only, a gray shade of purple indicates no terrain data is

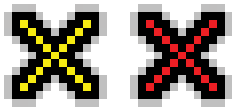
Terrain Proximity Color Chart



Terrain Color	Terrain Location
Red (WARNING)	Terrain above, or within 100 ft below the aircraft altitude
Yellow (CAUTION)	Terrain between 100 ft and 1000 ft below the aircraft altitude
Black	Terrain more than 1000 ft below the aircraft altitude

On the Terrain-SVS Page only, a gray shade of purple indicates no terrain data is available.

Terrain-SVS & TAWS Color Chart



Terrain-SVS & TAWS Potential Impact Points

	Unlighted Obstacle		Lighted Obstacle		Obstacle Color	Obstacle Location
Height	< 1000 ft AGL	> 1000 ft AGL	< 1000 ft AGL	> 1000 ft AGL		
Obstacle Symbol					Red (WARNING)	Obstacle within 100 ft of or above aircraft altitude
					Yellow (CAUTION)	Obstacle within 1000 ft of aircraft altitude
					Gray	Obstacle more than 1000 ft below aircraft altitude

Obstacle Symbols and Colors

A

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