G1000H

**Integrated Flight Deck
Pilot's Guide**

GARMIN®

AgustaWestland AW119Kx

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

⚠ **WARNING:** *Do not use outdated database information. Databases used in the 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 Pilots using any outdated database do so entirely at their own risk.*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:** *Traffic information shown on system displays is provided as an aid in visually acquiring traffic. Pilots must maneuver the aircraft based only upon ATC guidance or positive visual acquisition of conflicting traffic.*

⚠ **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.*

⚠ **WARNING:** *The Garmin G1000H, as installed in the AgustaWestland AW119Kx helicopter, 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 system. 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: For safety reasons, system operational procedures must be learned on the ground.

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 system utilize GPS as a precision electronic NAVigation AID (NAVAID). Therefore, as with all NAVAIDs, information presented by the system 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 G1000H Pilot's Guide documentation and the AgustaWestland AW119Kx Rotorcraft Flight Manual. Thoroughly practice basic operation prior to actual use. During flight operations, carefully compare indications from the system 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 system 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 system 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.

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 system 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: *All visual depictions contained within this document, including screen images of the panel and displays, are subject to change and may not reflect the most current system and 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: *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: *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: *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.*

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.*

Record of Revisions				
Part Number	**Revision**	**Date**	**Page Range**	**Description**
190-01514-00	1TP	October 2012	All	Experimental release
190-01514-00	2TP	March 2013	All	Experimental release
190-01514-00	A	March 2013	All	Production release

SECTION 1 SYSTEM OVERVIEW

1.1 SYSTEM DESCRIPTION

This section provides an overview of the G1000H Integrated Flight Deck as installed in the AgustaWestland AW119Kx. The G1000H system is an integrated flight control system that presents flight instrumentation, position, navigation, communication, and identification information to the pilot through large-format displays. The system consists of the following Line Replaceable Units (LRUs):

- **GDU 1040H** Primary Flight Display (PFD) and Multi Function Display (MFD)
- **GIA 63H** Integrated Avionics Unit
- **GDC 74H** Air Data Computer (ADC)
- **GEA 71H** Engine/Airframe Unit
- **GSC 46** Signal Conditioner
- **GRS 77H** Attitude and Heading Reference System (AHRS)
- **GMU 44** Magnetometer

- **GTX 33H** Mode S Transponder with extended squitter
- **GDL 69AH** Satellite Data Link Receiver (optional)
- **GTS 800** Traffic Avoidance System (optional)
- **GA 58** Directional Antenna (optional)
- **GTP 59** Outside Air Temperature (OAT) Probe
- **GA 36** GPS/WAAS and **GA 37** GPS/WAAS/XM Antennas

A top-level G1000H system block diagram is shown in Figure 1-1 (it does not include the GA 36, GA 37 and GA 58.

1.2 LINE REPLACEABLE UNITS (LRU)

• **GDU 1040H** (2) – One unit is configured as a PFD, the other as an MFD, each featuring a 10.4-inch LCD with 1024 x 768 resolution. The unit installed on the right/pilot side is designated as the PFD, and the one installed on the left/copilot side is designated as the MFD. These units communicate with each other and with the on-side GIA 63H Integrated Avionics Unit through a High-Speed Data Bus (HSDB) connection.

• **GIA 63H** (2) – Functions as the main communication hub, linking all LRUs with the on-side PFD. Each GIA 63H contains a GPS SBAS receiver, VHF COM/NAV/GS receivers, a flight director (FD) and system integration microprocessors. Each GIA 63W is paired with a respective GDU 1040H via HSDB connection. The GIA 63Hs are not paired together and do not communicate with each other directly.
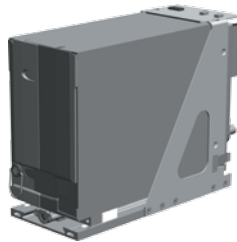
• **GDC 74H** (1) – Processes data from the pitot/static system as well as the OAT probe. This unit provides pressure altitude, airspeed, vertical speed and OAT information to the G1000H system, and it communicates with the each GIA 63H, GDU 1040H and GRS 77H, using an ARINC 429 digital interface (it also interfaces directly with the GTP 59).
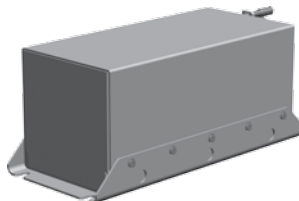
• **GEA 71H** (2) – Receives and processes signals from the engine and airframe sensors. This unit communicates with both GIA 63Hs using an RS-485 digital interface.
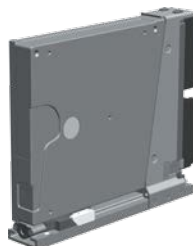
- **GSC 46** (2) – The GSC 46 is a signal conditioner which converts engine and rotor analog speed information to a digital format for use by the GEA 71H.

- **GRS 77H** (1) – Provides aircraft attitude and heading information via ARINC 429 to both GDU 1040H units and the both GIA 63H units. The GRS 77H contains advanced sensors (including accelerometers and rate sensors) and interfaces with the GMU 44 to obtain magnetic field information, with the GDC 74H to obtain air data, and with both GIA 63Hs to obtain GPS information. AHRS modes of operation are discussed later in this document.
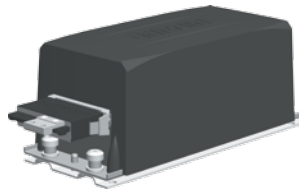
- **GMU 44** (1) – Measures local magnetic field. Data is sent to the GRS 77H for processing to determine aircraft magnetic heading. This unit receives power directly from the GRS 77H and communicates with the GRS 77H, using an RS-485 digital interface.

- **GTX 33H/ES** (1) – The GTX 33H/ES is a solid-state, Mode-S transponder that provides Modes A, C and S operation. The unit is controlled through the PFD and communicates with both GIA 63Hs through an RS-232 digital interface. Extended Squitter (ES) provides ADS-B output.

- **GDL 69AH** (1) – A satellite radio receiver that provides real-time weather information to the G1000H MFD. The GDL 69AH communicates with the MFD via HSDB connection. A subscription to the XM Satellite Radio service is required to enable the GDL 69AH capability.
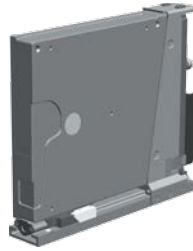
- **GTP 59** (1) – Provides Outside Air Temperature (OAT) data to the GDC 74H.

- **GTS 800** (1) – The GTS 800 Traffic Advisory System (TAS) uses active interrogations of Mode S and Mode C transponders to provide Traffic Advisories to the pilot independent of the air traffic control system.
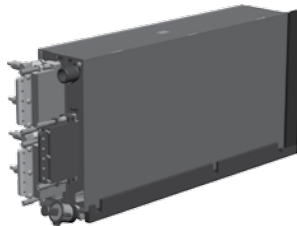
- **GA 58** (1) – The GA 58 is a directional antenna for the Traffic Avoidance System. One bottom-mounted directional antenna is required. The top-mounted monopole antenna offers better threat visibility.
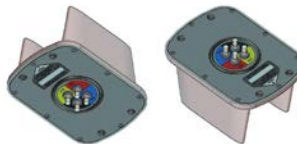
- **GA 36** (1) and **GA 37** (1) – The GA 36 is a through-mount GPS/SBAS antenna. The GA 37 is a through-mount GPS/SBAS antenna with XM/Data Link.

GA 36   GA 37
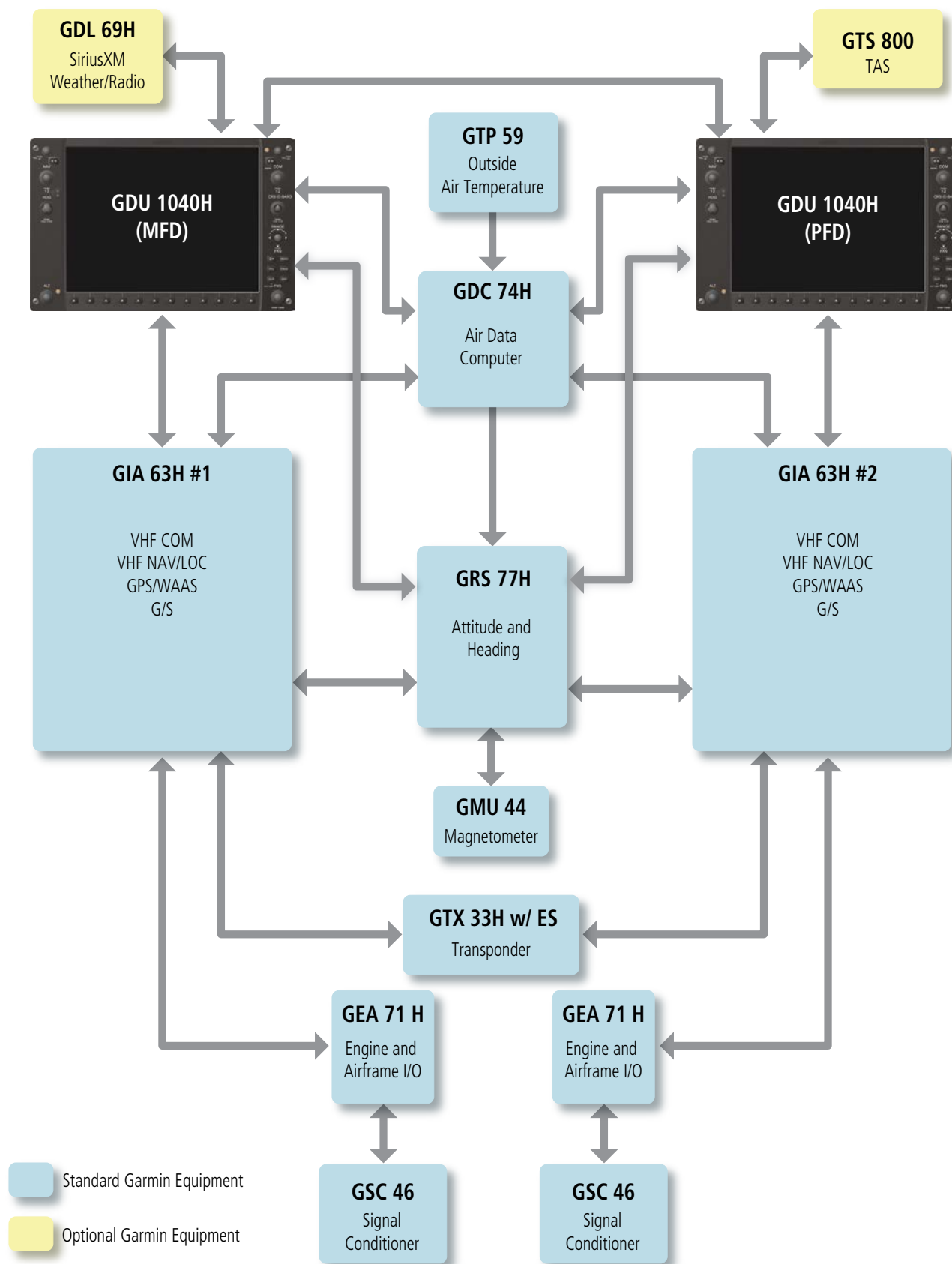
Figure 1-1 G1000H System (LRU Configuration)

1.3 G1000H CONTROLS

The G1000H system controls are located on the PFD and MFD bezels. The controls for the PFD and MFD are discussed within the following pages of this section.

PFD CONTROLS
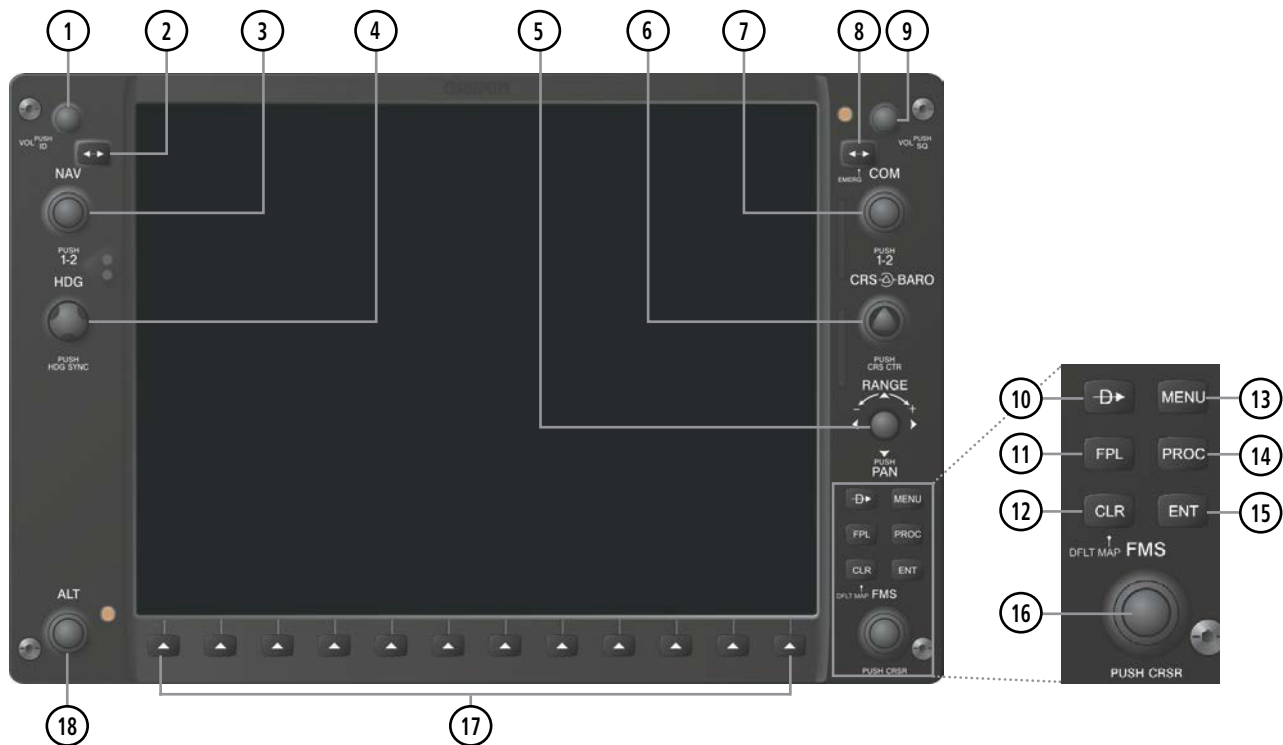
Figure 1-2 PFD/MFD Controls

The following list provides an overview of the controls located on the PFD bezel (see Figure 1-2).

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 light blue 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 light blue tuning box between COM1 and COM2
⑧	**COM Frequency Transfer Key (EMERG)**	Transfers the standby and active COM frequencies
		Press and hold two 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**	Press to turn the selection cursor ON/OFF.
	(Flight Management System Knob)	*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)

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.
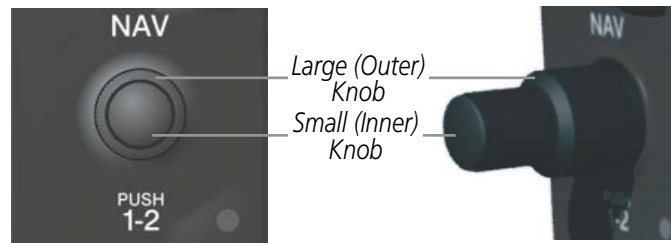
Figure 1-3 Dual Concentric Knob

1.4 SECURE DIGITAL CARDS

> *NOTE: Refer to the Appendices for instructions on updating the aviation database.*

> *NOTE: Ensure that the G1000H system is powered off before inserting the SD card.*

The PFD and MFD data card slots use Secure Digital (SD) cards and are located on the top right portion 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.

Not all SD cards are compatible with the G1000H. Use only SD cards supplied by Garmin or the aircraft manufacturer.

Install an SD card

Insert the SD card in the SD card slot, pushing the card in until the spring latch engages. The front of the card should remain flush with the face of the display bezel.

Remove an SD card

Gently press on the SD card to release the spring latch and eject the card.

Figure 1-4 Display Bezel SD Card Slots

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1.5 SYSTEM POWER-UP

> ✓ **NOTE:** *Refer to the Appendices for AHRS initialization bank angle limitations.*

> ✓ **NOTE:** *See the Appendices for additional information regarding system-specific annunciations and alerts.*

> ✓ **NOTE:** *See the Rotorcraft Flight Manual Supplement (RFMS) for specific procedures concerning avionics power application and emergency power supply operation.*

The G1000H system is integrated with the aircraft electrical system and receives power directly from electrical busses. The G1000H PFD, 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 1-6. All system annunciations should disappear typically within one minute of power-up at normal temperature, but may take as long as 10 minutes at cold temperatures. Upon power-up, key annunciator lights also become momentarily illuminated on the control units and the display bezels.

On the PFD, the AHRS begins to initialize and displays 'AHRS ALIGN: Keep Wings Level'. The AHRS should display valid attitude and heading fields typically within one minute of power-up. The AHRS can align itself both while taxiing 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 information
- Terrain database name and version
- Airport Terrain database name and version

- Obstacle database name and version
- Navigation database name, version, and effective dates
- Airport Directory name, version and effective dates
- FliteCharts/ChartView database information
- Pilot Profile selection

Current database information includes the 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 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.
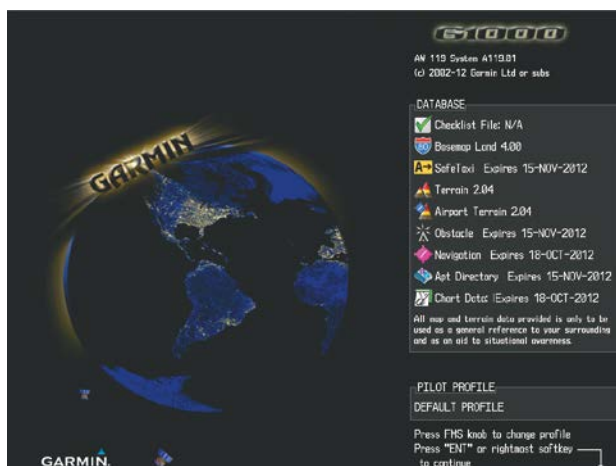
Figure 1-5 MFD Power-up Page

Figure 1-6 PFD Initialization

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1.6 SYSTEM OPERATION

> **NOTE:** *In normal operating mode, backlighting can only be adjusted from the PFD. In reversionary mode, it can be adjusted from the remaining display.*

The displays are connected together via a single Ethernet bus for high-speed communication. Each IAU is connected to a single display, as shown in Figure 1-1. This allows the units to share information, enabling true system integration.. This section discusses normal and reversionary G1000H display operation, as well as the various AHRS modes and G1000H System Annunciations.

NORMAL DISPLAY OPERATION

In normal operating mode, the PFD 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 Engine Indication System and CAS messages are also displayed on the PFD.

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 (EIS; see the EIS Section).

Both displays offer control for COM and NAV frequency selection.

Figure 1-7 Normal Mode

REVERSIONARY DISPLAY OPERATION

> ✅ **NOTE:** *The G1000H System alerts the pilot when backup paths are utilized by the LRUs. Refer to Appendix A for further information regarding system-specific alerts.*

In the event of a display failure, the G1000H System automatically switches to reversionary (backup) mode. In reversionary mode, flight information is presented on the remaining display in the same format as the PFD operating in normal mode. The secondary EIS indications normally presented on the MFD are no longer available in reversionary mode. However, a CAS message is displayed on the remaining display in the event that a secondary EIS indication is out-of-range.

Reversionary display mode can be manually activated by switching TRNG MODE to the 'ON' position on the overhead switch panel.

If a display fails, the appropriate IAU Ethernet interface to the display 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.

Figure 1-8 Reversionary Mode

AHRS OPERATION

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

> ✓ **NOTE:** *Aggressive maneuvering while the AHRS is not operating normally can degrade AHRS accuracy.*

In addition to using internal sensors, the GRS 77H AHRS uses GPS information, magnetic field data and air data to assist in attitude/heading calculations. In normal mode, the AHRS relies upon GPS and magnetic field measurements. In Heading Preset Mode, the magnetometer data is replaced by a heading value set by the pilot. If either of these external measurements is unavailable or invalid, the AHRS uses air data information for attitude determination. Four AHRS modes of operation are available (see Figure 1-9) 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.
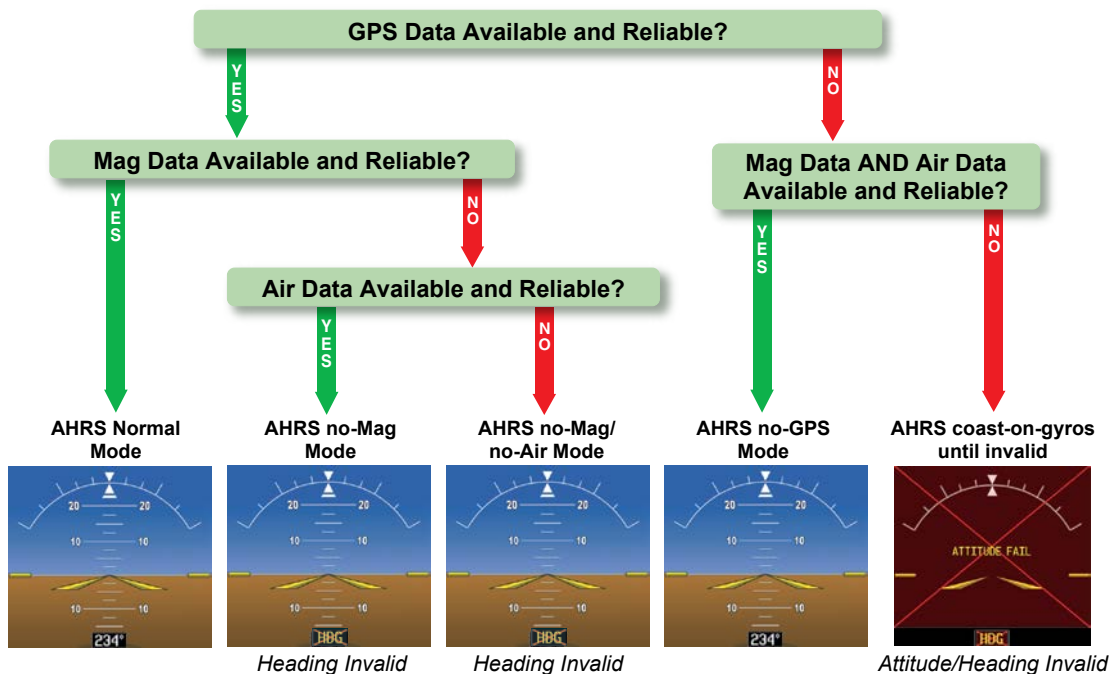
Figure 1-9 AHRS Operation

GPS INPUT FAILURE

The G1000H 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 valid.

AIR DATA INPUT FAILURE

A failure of the air data input has no effect on AHRS output while AHRS is operating in normal mode. 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).

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").

G1000H SYSTEM ANNUNCIATIONS

> **NOTE:** *For a detailed description of all annunciations and alerts, refer to Appendix A. Refer to the Rotorcraft Flight Manual Supplement (RFMS) for additional information regarding pilot responses to these annunciations.*

When an LRU or an LRU function fails, a large red "X" is typically displayed on windows associated with the failed data (Figure 1-10 displays all possible flags and responsible LRUs). Upon G1000H power-up, certain windows remain invalid as equipment begins to initialize. If any window remains flagged, the G1000H system should be serviced by a Garmin-authorized repair facility.
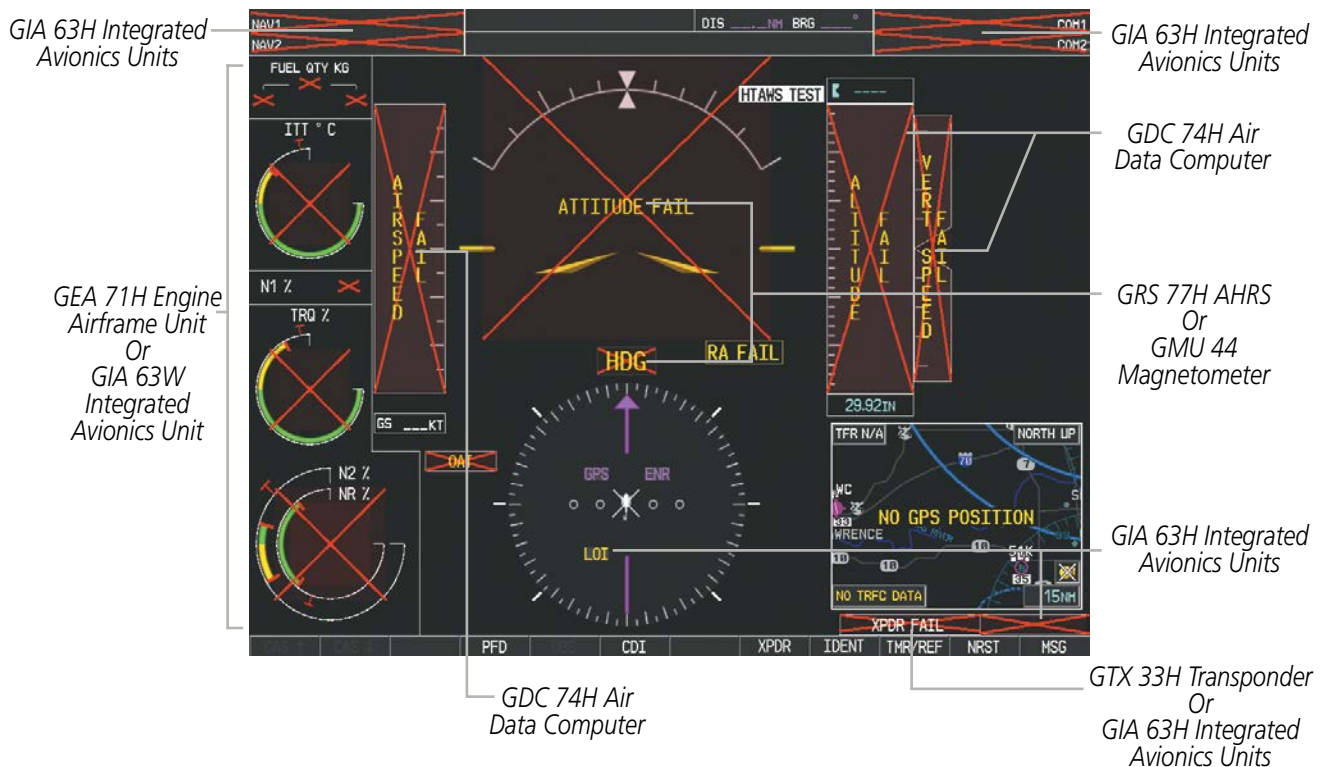
Figure 1-10 G1000H System Failure Annunciations

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 selected, 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.

Figure 1-11 Softkeys (Second-Level PFD Configuration)

PFD SOFTKEYS

The **CDI**, **IDENT**, **TMR/REF**, and **NRST** 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 selected to return to the previous level.

Level 1	Level 2	Level 3	Description
CAS ↑			Scroll up (Displayed only when a sufficient number of items are displayed in the Crew Alerting System Display to warrant scrolling)
CAS ↓			Scroll down (Displayed only when a sufficient number of items are displayed in the Crew Alerting System Display to warrant scrolling)
PFD			Displays second-level softkeys for additional PFD configurations
	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 wind data parameters
		OPTN 1	Wind direction arrow and speed
		OPTN 2	Wind direction arrow with headwind and crosswind components
		OPTN 3	Wind direction arrow with direction and speed

Level 1	Level 2	Level 3	Description
		OFF	Information not displayed
	BRG1		Cycles the Bearing 1 Information Window through NAV1, GPS/ waypoint identifier and GPS-derived distance information, and ADF/frequency
	HSI FRMT		Provides access to the HSI formatting softkeys
		360 HSI	Displays the HSI in a 360 degree view
		ARC HSI	Displays the HSI as an arc
	BRG2		Cycles the Bearing 2 Information Window through NAV2 or GPS waypoint identifier and GPS-derived distance information, and ADF/ frequency.
	SET HDG		
		HDG SYNC	Synchronizes heading to the selected heading
		HDG -	Slews heading counterclockwise
		HDG +	Slews heading clockwise
		HPM OFF	Manually disables Heading Preset Mode
	ALT UNIT		Displays softkeys for setting the altimeter and BARO settings to metric units
		METERS	When enabled, displays altimeter in meters
		IN	Press to display the BARO setting as inches of mercury
		HPA	Press to display the BARO setting as hectopacals
	STD BARO		Sets barometric pressure to 29.92 in Hg (1013 hPa if METRIC softkey is selected)
OBS			Selects OBS mode on the CDI when navigating by GPS (only available with active leg)
CDI			Cycles through GPS, VOR1, and VOR2 navigation modes on the CDI
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)
	GND		Allows manual selection of ground mode in certain conditions
	VFR		Automatically enters the VFR code (1200 in the U.S.A. only)
	CODE		Displays transponder code selection softkeys 0-7

Level 1	Level 2	Level 3	Description
		0 — 7	Use numbers to enter code
	IDENT		Activates the Special Position Identification (SPI) pulse for 18 seconds, identifying the transponder return on the ATC screen
	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 Timer/References Window
NRST			Displays Nearest Airports Window
MSG			Displays the Messages Window
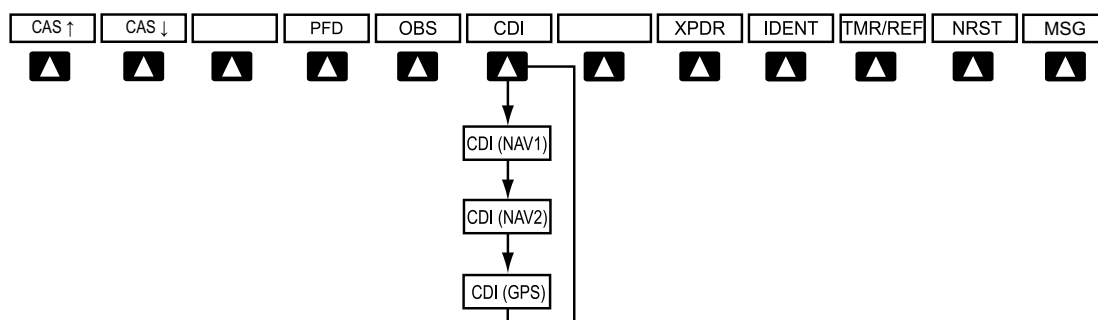
Figure 1-12 Top Level PFD Softkeys

CAS ↑	CAS ↓		PFD	OBS	CDI		XPDR	IDENT	TMR/REF	NRST	MSG

SYN VIS	DFLTS	WIND		BRG1	HSI FRMT	BRG2	SET HDG	ALT UNIT	STD BARO	BACK	MSG

BRG1 (NAV1)
BRG1 (GPS)
BRG1 (OFF)

BRG2 (NAV1)
BRG2 (GPS)
BRG2 (OFF)

Press the **BACK** Softkey to return to the top-level softkeys

				HDG SYNC	HDG -	HDG +	HPM OFF			BACK	MSG

				METERS		IN	HPA		BACK	MSG

				360 HSI	ARC HSI				BACK	MSG

		OPTN 1	OPTN 2	OPTN 3	OFF				BACK	MSG

PATHWAY	SYN TERR	HRZN HDG	APTSIGNS						BACK	MSG

Figure 1-13 PFD Configuration Softkeys

CAS ↑	CAS ↓		PFD	OBS	CDI		XPDR	IDENT	TMR/REF	NRST	MSG

		STBY	ON	ALT	GND	VFR	CODE	IDENT		BACK	MSG

Press the **BACK** Softkey to return to the top-level softkeys.

0	1	2	3	4	5	6	7	IDENT	BKSP	BACK	MSG

Press the **BACK** Softkey to return to the previous level softkeys.
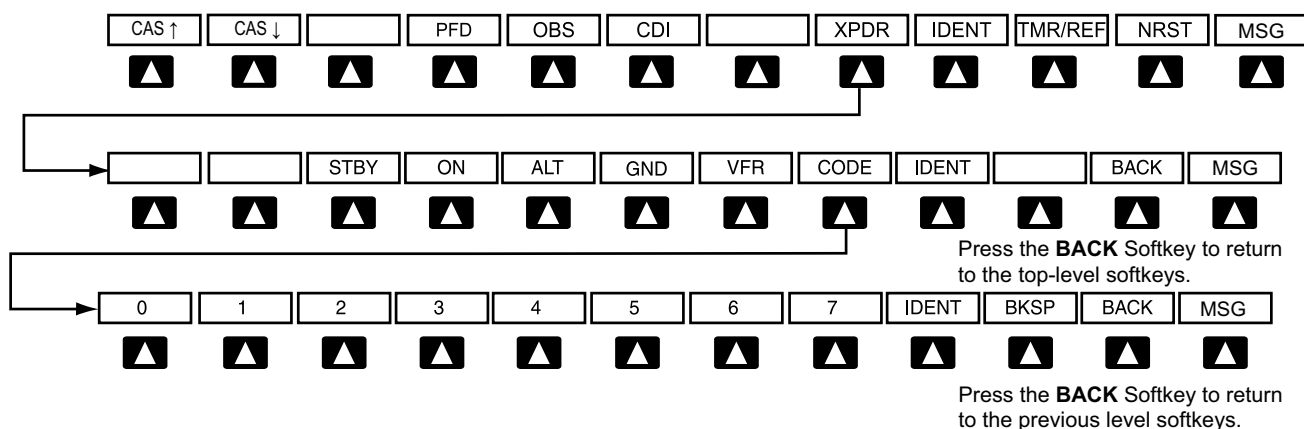
Figure 1-14 XPDR (Transponder) Softkeys

MFD SOFTKEYS

Level 1	Level 2	Level 3	Description
ENGINE			Displays the EIS-Engine Page
MAP			Enables second-level Navigation Map softkeys
	TRAFFIC		Displays traffic information on Navigation Map
	TOPO		Displays topographical data (e.g., coastlines, terrain, rivers, lakes) and elevation scale on Navigation Map
	AIRWAYS		Displays airways on the map; cycles through the following: AIRWAYS: No airways are displayed AIRWY ON: All airways are displayed AIRWY LO: Only low altitude airways are displayed AIRWY HI: Only high altitude airways are displayed
	STRMSCP		Displays Stormscope information on Navigation Map (optional feature)
	NEXRAD		Displays NEXRAD weather and coverage information on Navigation Map (optional feature)
	XM LTNG		Displays XM lightning information on Navigation Map (optional feature)
	METAR		Displays METAR flags on airport symbols shown on the Navigation Map
	LEGEND		Displays the legend for the selected weather products. Available only when NEXRAD, XM LTNG, and/or METAR softkeys are selected.
	BACK		Returns to top-level softkeys
DCLTR			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 the active flight plan
SHW CHRT			When available, displays optional airport and terminal procedure charts
CHKLIST			When available, displays optional checklists

GARMIN
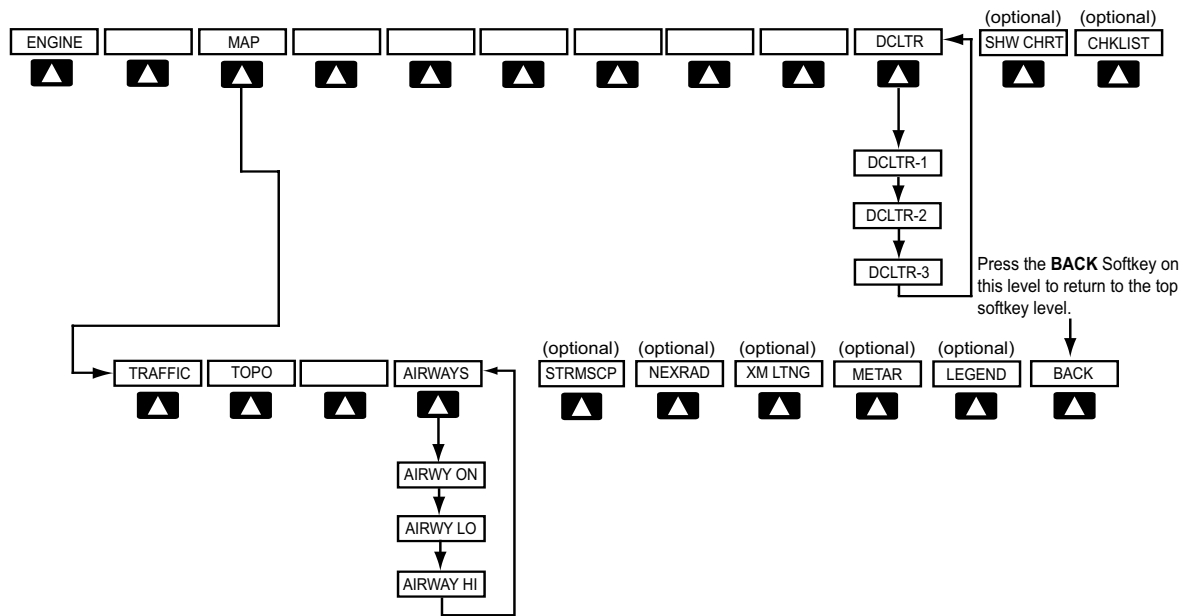
Figure 1-15 MFD Softkeys

GPS RECEIVER OPERATION

Each GIA 63H 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.

These GPS sensor annunciations are most often seen after system power-up when one GPS receiver has acquired satellites before the other, or in SBAS capable systems, 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 1.7 for information on navigating MFD page groups).

2) Use the small **FMS** Knob to select GPS Status Page.

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:

a) 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.
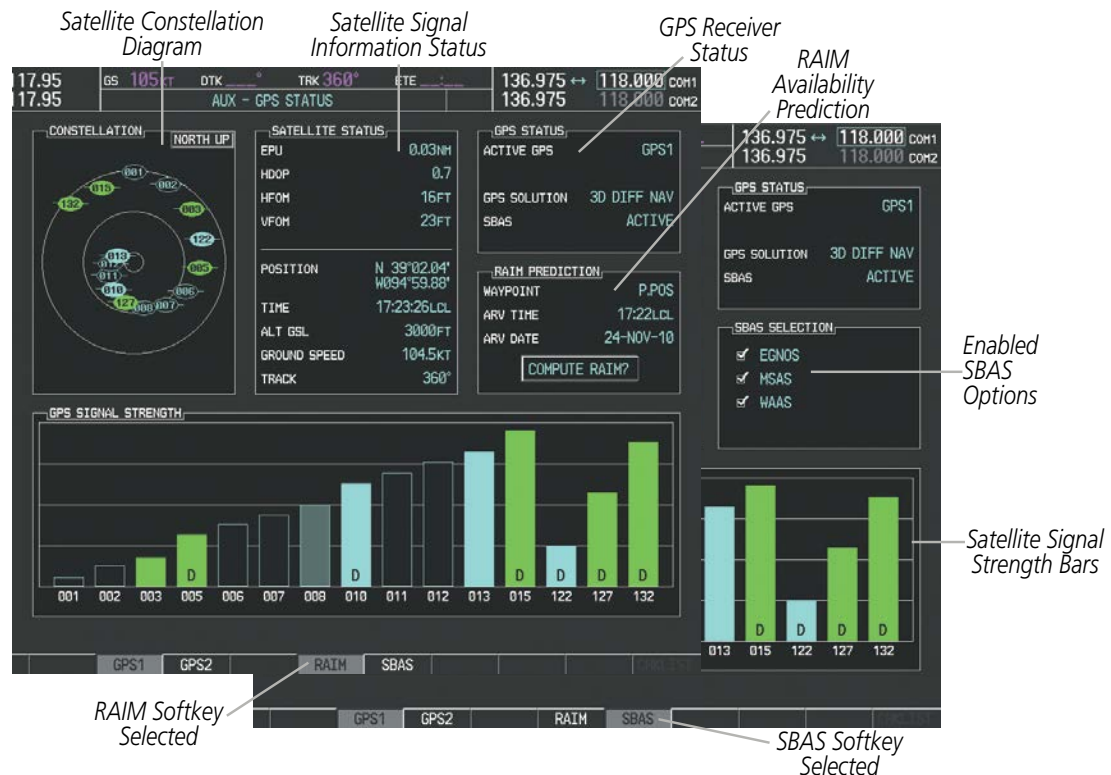
Figure 1-16 GPS Status Page (RAIM or SBAS Selected)

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, GSL (Geodetic Sea Level) 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 navigational 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 G1000H 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

1) Select the GPS Status Page.

2) If necessary, press 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 G1000H.

   Or:

   a) Use the large **FMS** Knob to scroll to the Most Recent Waypoints List.

   b) Use the small FMS Knob to highlight the desired waypoint in the list and press the **ENT** Key. The G1000H automatically fills in the identifier, facility, and city fields with the information for the selected waypoint.

    c) Press the **ENT** Key to accept the waypoint entry.

    Or:

    a) To use the present position, press the **MENU** Key.

    b) With 'Set WPT to Present Position' highlighted, press the **ENT** Key.

    c) 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

- SBAS Selection (**SBAS** Softkey is pressed)(WAAS, EGNOS, or MSAS capable systems only)

    In certain situations, such as when the aircraft is outside or on the fringe of the WAAS, EGNOS, or MSAS coverage area, it may be desirable to disable the reception of the applicable SBAS signal (although it is not recommended). When disabled, the SBAS field in the GPS Status box indicates DISABLED. There may be a small delay for the GPS Status box to be updated upon WAAS, EGNOS, and MSAS enabling/disabling.

    Disabling WAAS, EGNOS or MSAS

    1) Select the GPS Status Page.

    2) If necessary, select the **SBAS** Softkey.

    3) Press the **FMS** Knob, and turn the large FMS Knob to highlight the desired SBAS system.

    4) Press the **ENT** Key to uncheck the box.

    5) 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 WAAS) 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
- Light blue 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 is being 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).

1.7 ACCESSING G1000H FUNCTIONALITY

MENUS

The G1000H has a **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 1.3. Softkey selection does not display menus or submenus.

Navigating the Page Menu Window:

1) Press the **MENU** Key to display the Page Menu Window.

2) Turn the **FMS** Knob to scroll through a list of available options (a scroll bar appears to the right of the window when the option list is longer than the window).

3) Press the **ENT** Key to select the desired option.

4) The **CLR** Key may be pressed to remove the menu and cancel the operation. Pressing the **FMS** Knob also removes the displayed menu.
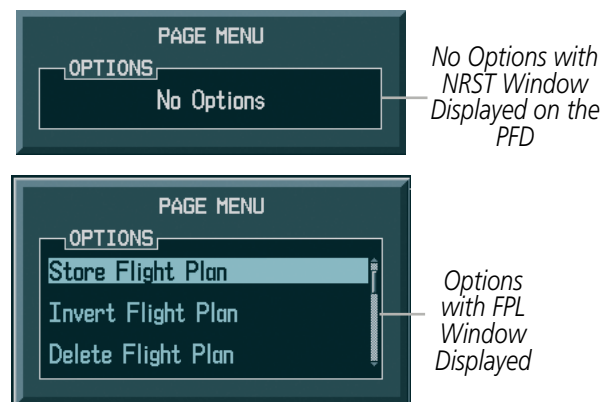
Figure 1-17 Page Menu Examples

MFD PAGE GROUPS

> **NOTE:** Refer to the Flight Management, Hazard Avoidance, and Additional Features sections for details on specific pages.

Information on the MFD is presented on pages which are grouped according to function. The page group and active page title are displayed in the upper center of the screen, below the Navigation Status Box. In the bottom right corner of the screen, the page groups are displayed along the bottom when the **FMS** Knob is turned one click. Available pages in the group are displayed in a list above the page groups. 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.
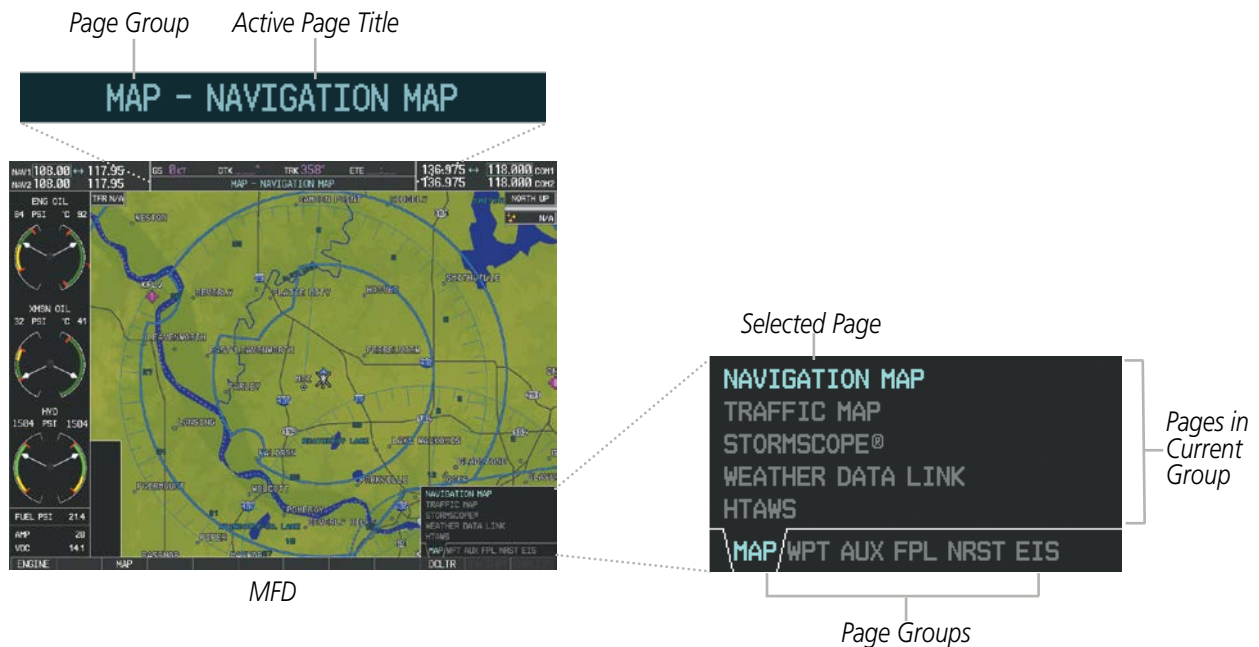
Figure 1-18 Page Title and Page Groups

Selecting a page using the FMS Knob:

1) Turn either **FMS** Knob one click to display the pop-up page selection window.

2) Turn the large **FMS** Knob until the desired page group is selected. For example, the MAP page group is selected in Figure 1-18.

3) Turn the small **FMS** Knob until the desired page is selected.

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 Pages (MAP)

Navigation Map

Traffic Map

Stormscope® (optional)

Weather Data Link (optional)

Terrain Proximity/HTAWS
(HTAWS optional)

Figure 1-19 Map Pages

Waypoint Pages (WPT)

Airport Information pages

- Airport Information
 (**INFO-1** Softkey)

- Airport Directory
 (**INFO-2** Softkey)

- Departure Information
 (**DP** Softkey)

- Arrival Information
 (**STAR** Softkey)

- Approach Information
 (**APR** Softkey)

- Weather Information
 (**WX** Softkey)

Intersection Information

NDB Information

VOR Information

User Waypoint Information
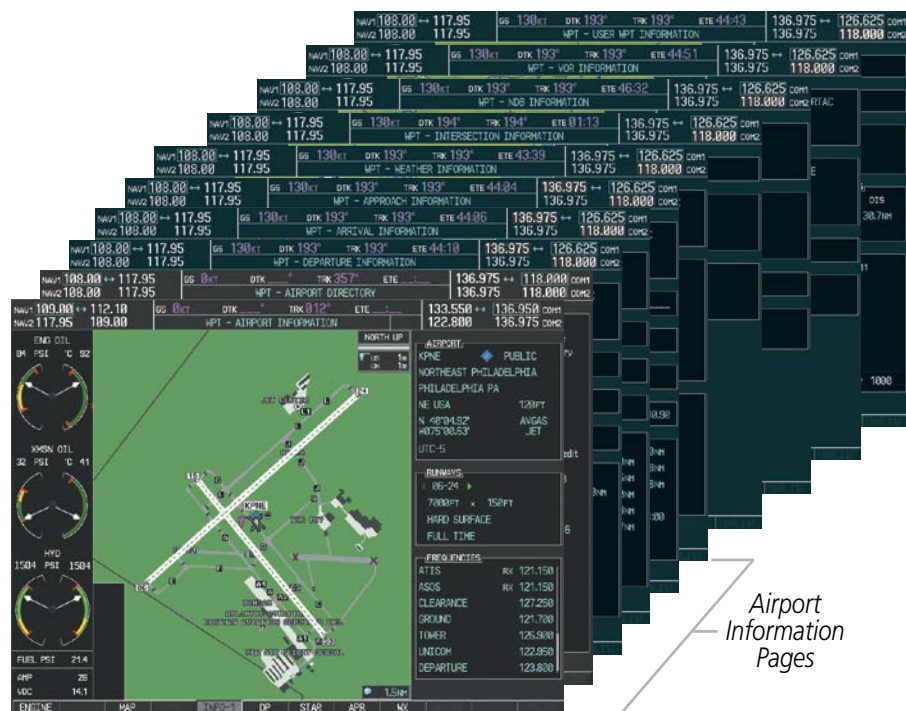
*Airport
Information
Pages*

Figure 1-20 Waypoint Pages

Auxiliary Pages (AUX)

Trip Planning

Utility

GPS Status

System Setup

- System Setup 1
  (**SETUP 1** Softkey)

- System Setup 2
  (**SETUP 2** Softkey)

XM

- XM Information
  (**INFO** Softkey)

System Status

XM Satellite Page

Figure 1-21 Auxiliary Pages

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

Active Flight Plan

- Wide View, Narrow View
  (**VIEW** Softkey)

Flight Plan Catalog

or

Stored Flight Plan (**NEW** Softkey)
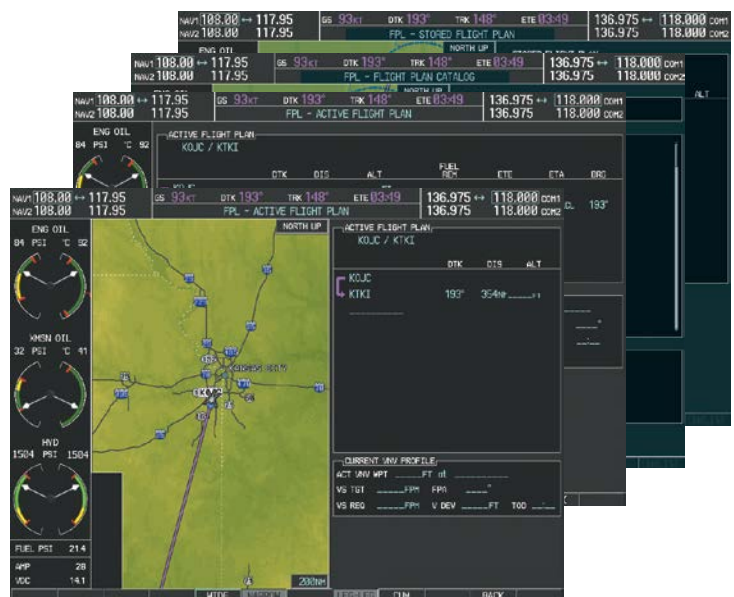
Figure 1-22 Flight Plan Pages

Nearest Pages (NRST)

> Nearest Airports
>
> Nearest Intersections
>
> Nearest NDB
>
> Nearest VOR
>
> Nearest User Waypoints
>
> Nearest Frequencies
>
> Nearest Airspaces
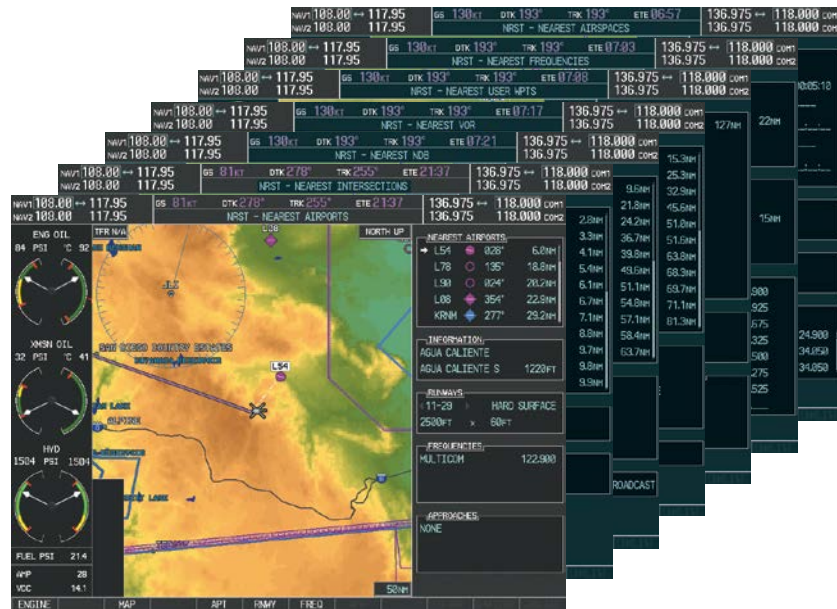
Figure 1-23 Nearest Pages

The Procedure 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. Turning the **FMS** Knob does not scroll through the Procedure pages.

Procedure Pages (PROC)

> Departure Loading
>
> Arrival Loading
>
> Approach Loading

Figure 1-24 Procedure Pages

MFD SYSTEM PAGES

In the Auxiliary (AUX) Page Group, there are two system pages: System Setup and System Status. The System Setup Page allows management of various system parameters, while the System Status Page displays the status of all G1000H system LRUs.

SYSTEM SETUP PAGES

The two System Setup Pages allow management of the following system parameters:

- Pilot Profiles
- Date/time
- Display Units
(see Flight Instruments Section)
- Baro Transition Alert (see Flight Instruments Section)
- Airspace Alerts (see Flight Management Section)
- Arrival Alerts (see Flight Management Section)
- Audio Alerts
- Flight Director

- MFD Data Bar Fields (Navigation Status Box) (see Flight Management Section)
- GPS CDI scaling for GPS navigation source (see Flight Instruments Section)
- COM Configuration (see Com/Nav/Transponder Section)
- Nearest Airports display criteria (see Flight Management Section)

Selecting the System Setup Page:

1) Turn the large **FMS** Knob to select the AUX Page group.

2) Turn the small **FMS** Knob to select System Setup.
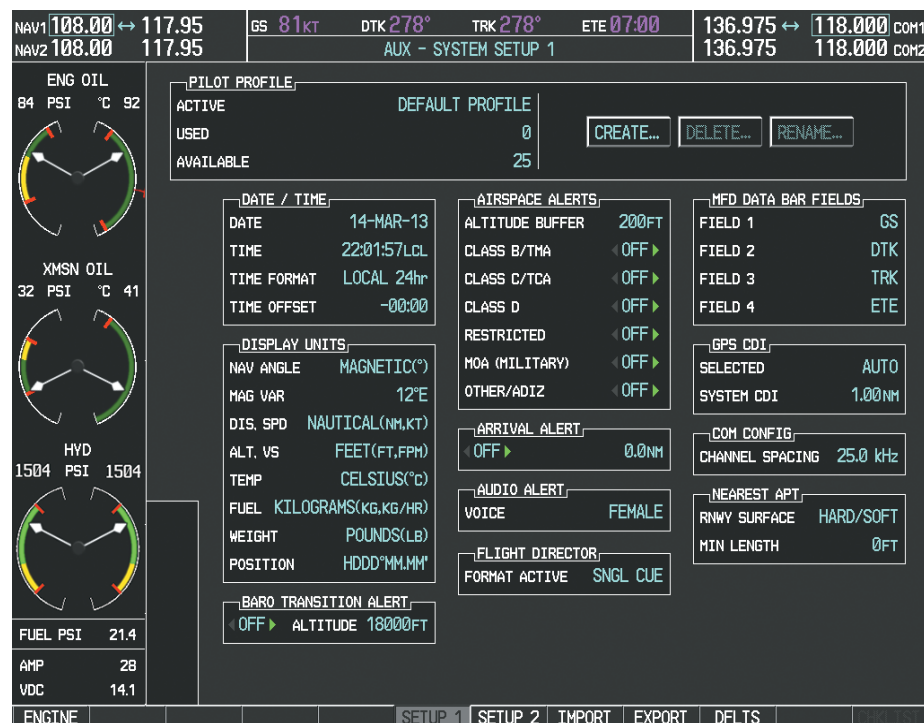
Figure 1-25 System Setup 1 Page

DATE/TIME

The Date/Time Box on the System Setup Page displays the current date and time and allows the pilot to set the time format (local 12-hr, local 24-hr, or UTC) and offset. The time offset is used to define current local time. UTC (also called GMT or Zulu) date and time are calculated directly from the GPS satellites signals and cannot be changed. When using a local time format, designate the offset by adding or subtracting the desired number of hours.

Set the system time format:

1) While on the System Setup Page, press the **FMS** Knob momentarily to activate the flashing cursor.

2) Turn the large **FMS** Knob to highlight the time format field in the Date/Time Box.

3) Turn the small **FMS** Knob to select the desired system time format (local 12hr, local 24hr, UTC) and press the **ENT** Key.

Set the current time offset:

1) While on the System Setup Page, press the **FMS** Knob momentarily to activate the flashing cursor.

2) Turn the large **FMS** Knob to highlight the time offset field in the Date/Time Box.

3) Turn the **FMS** Knobs to enter the time offset and press the **ENT** Key.

DISPLAY UNITS

Units in which various quantities are displayed on the G1000H screens are listed on the System Setup Page. The Navigation Angle reference and the Position units are pilot selectable.

Category	Settings	Affected Quantities	Exceptions
Navigation Angle	Magnetic (North)* True (North) User	Heading Course Bearing Track Desired Track Wind direction (Trip Planning Page)	N/A
Distance and Speed	Nautical* Metric	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, 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)

Category	Settings	Affected Quantities	Exceptions
Temperature	Celsius* Fahrenheit	All temperatures on PFD Total Air Temperature (Trip Planning Page)	Engine Indication System (EIS)
Fuel and Fuel Flow	Gallons* Kilograms Liters Pounds	Fuel parameters (Trip Planning Page)	Engine Indication System (EIS)
Weight	Kilograms Pounds*	Weight Planning Page	N/A
Position	HDDD°MM.MM'* HDDD°MM'SS.S" MGRS UTM/UPS	All positions	N/A

  * *Default setting*

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

To change a Display Units setting:

1) While on the System Setup Page, press the **FMS** Knob momentarily to activate the flashing cursor.

2) Turn the large **FMS** Knob to highlight the desired field in the Display Units Box.

3) Turn the small **FMS** Knob to select from a list of measurement units and press the **ENT** Key when the desired unit is highlighted. Press the **CLR** Key to cancel the action without changing the units.

BARO Transition Alert

See the Flight Instruments section for a discussion on setting the Baro Transition Alert.

Airspace Alerts

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 MFD Navigation Map Page. It simply turns on/off the warning provided when the aircraft is approaching or near an airspace.

Alerts for the following airspaces can be turned on/off in the Airspace Alerts Box:

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

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.

To change the altitude buffer distance setting:

1) While on the System Setup Page, press the **FMS** Knob momentarily to activate the flashing cursor.

2) Turn the large **FMS** Knob to highlight the altitude buffer field in the Airspace Alerts Box.

3) Turn the **FMS** Knobs to enter an altitude buffer value and press the **ENT** Key.

To turn an airspace alert on or off:

1) While on the System Setup Page, press the **FMS** Knob momentarily to activate the flashing cursor.

2) Turn the large **FMS** Knob to highlight the desired field in the Airspace Alerts Box.

3) Turn the small **FMS** Knob clockwise to turn the airspace alert ON or counterclockwise to turn the alert OFF.

ARRIVAL ALERTS

The Arrival Alert Box on the System Setup Page allows arrival alerts to be turned on/off and the alert trigger distance set. An arrival alert can be set to notify the pilot with a message upon reaching a user-specified distance from the final destination (the direct-to waypoint or the last waypoint in a flight plan). Once the set distance (up to 99.9 units) has been reached, an "Arrival at [waypoint]" message is displayed in the PFD Navigation Status Box.

Enabling/disabling an arrival alert:

1) While on the System Setup Page, press the **FMS** Knob momentarily to activate the flashing cursor.

2) Turn the large **FM**S Knob to select the ON/OFF field in the Arrival Alert Box.

3) Turn the small **FMS** Knob clockwise to turn the airspace alert ON or counterclockwise to turn the alert OFF.

4) Press the **FMS** Knob to deactivate the cursor.

Changing the arrival alert trigger distance:

1) While on the System Setup Page, press the **FMS** Knob momentarily to activate the flashing cursor.

2) Turn the large **FMS** Knob to highlight the distance field in the Arrival Alert Box.

3) Use the **FMS** Knob to enter a trigger distance and press the **ENT** Key.

4) Press the **FMS** Knob to deactivate the cursor.

AUDIO ALERTS

The Audio Alert Box on the System Setup Page allows the audio alert voice to be set to male or female.

To change the audio alert voice:

1) While on the System Setup 1 Page, press the **FMS** Knob momentarily to activate the flashing cursor.

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

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

MFD Data Bar Fields

The MFD Data Bar Fields Box on the System Setup 1 Page displays the current configuration of the MFD Navigation Status Box. By default, the Navigation Status Bar is set to display ground speed (GS), distance to next waypoint (DIS), estimated time en route (ETE), and en route safe altitude (ESA).

To change the information shown in an MFD Navigation Status Bar field:

1) While on the System Setup Page, press the **FMS** Knob momentarily to activate the flashing cursor.

2) Turn the large **FMS** Knob to highlight the desired field number in the MFD Data Bar Fields Box.

3) Turn the small **FMS** Knob to display and scroll through the data options list and press the **ENT** Key when the desired data selection is highlighted.

The following data may be selected for display in each of the four fields of the Navigation Status Box.

- Bearing (BRG)
- Distance (DIS)
- Desired Track (DTK)
- En Route Safe Altitude (ESA)
- Estimated Time of Arrival (ETA)
- Estimated Time En Route (ETE)
- Ground Speed (GS)
- Minimum Safe Altitude (MSA)

- True Air Speed (TAS)
- Track Angle Error (TKE)
- Track (TRK)
- Vertical Speed Required (VSR)
- Crosstrack Error (XTK)
- Fuel Over Destination (FOD)
- Endurance (END)

GPS CDI

The GPS CDI Box on the System Setup 1 Page allows the pilot to define the range for the on-screen course deviation indicator (CDI). The range values represent full range deflection for the CDI to either side. The default setting is 'AUTO'. At this setting, leaving the departure airport the CDI range is set to 1.0 nm and gradually ramps up to 2 nm beyond 30 nm from the departure airport. The CDI range is set to 2.0 nautical miles during the en route phase of flight. Within 30 nm of the destination airport, the CDI range gradually ramps down to 1.0 nm (terminal area). During approach operations, the CDI range ramps down even further to 0.3 nm. This transition normally occurs within 2.0 nm of the final approach fix (FAF).

If a lower CDI range setting is selected (i.e., 1.0 or 0.3 nm), the higher range settings are not selected during any phase of flight. For example, if 1.0 nm is selected, the system uses this for en route and terminal phases and ramps down to 0.3 nm during an approach. Note that the Receiver Autonomous Integrity Monitoring (RAIM) protection limits follow the selected CDI range and corresponding flight phases.

The GPS CDI Box on the System Setup 1 Page displays the following:

- Selected CDI range (auto, 2 nm, 1 nm, 0.3 nm)
- Current system CDI range (2 nm, 1 nm, 0.3 nm)

Changing the CDI range:

1) While on the System Setup Page, press the **FMS** Knob momentarily to activate the flashing cursor.

2) Turn the large **FMS** Knob to highlight the SELECTED field in the GPS CDI Box.

3) Turn the small **FMS** Knob to display and scroll through the range list and press the **ENT** Key when the desired selection is highlighted.

4) Press the **FMS** Knob to deactivate the cursor.

COM CONFIGURATION

> **NOTE:** *8.33 kHz VHF communication frequency channel spacing is not approved for use in the United States. Select the 25.0 kHz channel spacing option for use in the United States.*

The COM Configuration Box on the System Setup 1 Page allows the pilot to select 8.33 kHz or 25.0 kHz COM frequency channel spacing.

To change COM channel spacing:

1) While on the System Setup Page, press the **FMS** Knob momentarily to activate the flashing cursor.

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

3) 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 1 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 zero feet (or meters) for runway length and "HARD/SOFT" for runway surface type.

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

1) While on the System Setup Page, press the **FMS** Knob momentarily to activate the flashing cursor.

2) Turn the large **FMS** Knob to highlight the runway surface field in the Nearest Airports Box.

3) Turn the small **FMS** Knob to display and scroll through the runway options (any, hard only, hard/soft, water) and press the **ENT** Key when the desired selection is highlighted.

To select nearest airport minimum runway length matching criteria:

1) While on the System Setup Page, press the **FMS** Knob momentarily to activate the flashing cursor.

2) Turn the large **FMS** Knob to highlight the minimum length field in the Nearest Airport Box.

3) Turn the **FMS** Knobs to enter the minimum runway length (zero to 99,999 feet) 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 G1000H 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.

Figure 1-26 Pilot Profiles (System Setup Page)

Creating a profile:

1) While on the System Setup Page, press the **FMS** Knob momentarily to activate the flashing cursor.

2) Turn the large **FMS** Knob to highlight 'CREATE' in the Pilot Profile Box.

3) Press the **ENT** Key. A 'Create Profile' window is displayed.

4) 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.

5) 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.

6) Press the **ENT** Key.

7) 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.

8) To cancel the process, select 'CANCEL' with the large **FMS** Knob and press the **ENT** Key.

Selecting an active profile:

1) While on the System Setup Page, press the **FMS** Knob momentarily to activate the flashing cursor.

2) Turn the large **FMS** Knob to highlight the active profile field in the Pilot Profile Box.

3) Turn the small **FMS** Knob to display the pilot profile list and highlight the desired profile.

4) Press the **ENT** Key. The G1000H loads and displays the system settings for the selected profile.

Renaming a profile:

1) While on the System Setup Page, press the **FMS** Knob momentarily to activate the flashing cursor.

2) Turn the large **FMS** Knob to highlight 'RENAME' in the Pilot Profile Box.

3) Press the **ENT** Key.

4) In the 'Rename Profile' window, turn the **FMS** Knob to select the profile to rename.

5) Press the **ENT** Key.

6) Use the **FMS** Knob to enter a new profile name up to 16 characters long and press the **ENT** Key.

7) With 'RENAME' highlighted, press the **ENT** Key.

8) To cancel the process, use the large **FMS** Knob to select 'CANCEL' and press the **ENT** Key.

Deleting a profile:

1) While on the System Setup Page, press the **FMS** Knob momentarily to activate the flashing cursor.

2) Turn the large **FMS** Knob to highlight 'DELETE' in the Pilot Profile Box.

3) Press the **ENT** Key.

4) In the 'Delete Profile' window, turn the **FMS** Knob to select the profile to delete.

5) Press the **ENT** Key.

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

7) To cancel the process, use the large **FMS** Knob to select 'CANCEL' and press the **ENT** Key.

SYSTEM STATUS PAGE

The System Status Page displays the status and software version numbers for all detected system LRUs. Pertinent information on all system databases is also displayed. Active LRUs are indicated by green check marks and failed LRUs are indicated by red "X"s. Failed LRUs should be noted and a AgustaWestland service center or Garmin dealer informed.

Display Database Selection Softkey

Figure 1-27 Example System Status Page

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 Display Database Selection Softkey (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 database information. Each press of the Display Database Selection Softkey will change the softkey label (**PFD1 DB,** etc) to indicate the display for which database information is displayed.

The **ANN TEST** Softkey, when pressed, causes an annunciation test tone to be played, the RMP and master warning/ caution PBAs to illuminate, and the instrument fan to activate.

UTILITY PAGE

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, a record of the time of departure, and an hour meter. Trip statistics (odometer, trip odometer, and average trip and maximum groundspeeds) are displayed from the time of the last reset. Refer to the Additional Features section for a discussion on the Scheduler feature.
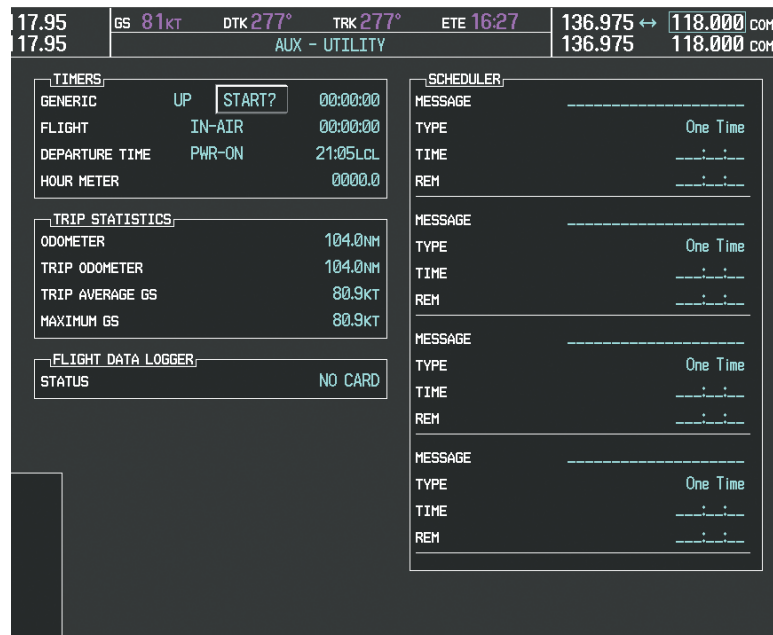
Figure 1-28 Utility Page

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) Press the **TMR/REF** Softkey.

2) Turn the large **FMS** Knob to select the timer field (hh/mm/ss)

3) Use the **FMS** know to enter the desired time and press the **ENT** Key.

4) With the UP/DN field highlighted, turn the small **FMS** Knob to select the timer counting direction.

5) Press the **ENT** Key.

6) With 'START?' highlighted, press the **ENT** Key to start the timer. The field changes to 'STOP?'..

7) To stop the timer, press the **ENT** Key with 'STOP?' highlighted. The field changes to 'RESET?'.

8) To reset the timer, press the **ENT** Key with 'RESET?' highlighted. The field changes back to 'START?' and the digits are reset.

9) To remove the window, press the **CLR** Key or the **TMR/REF** Softkey.
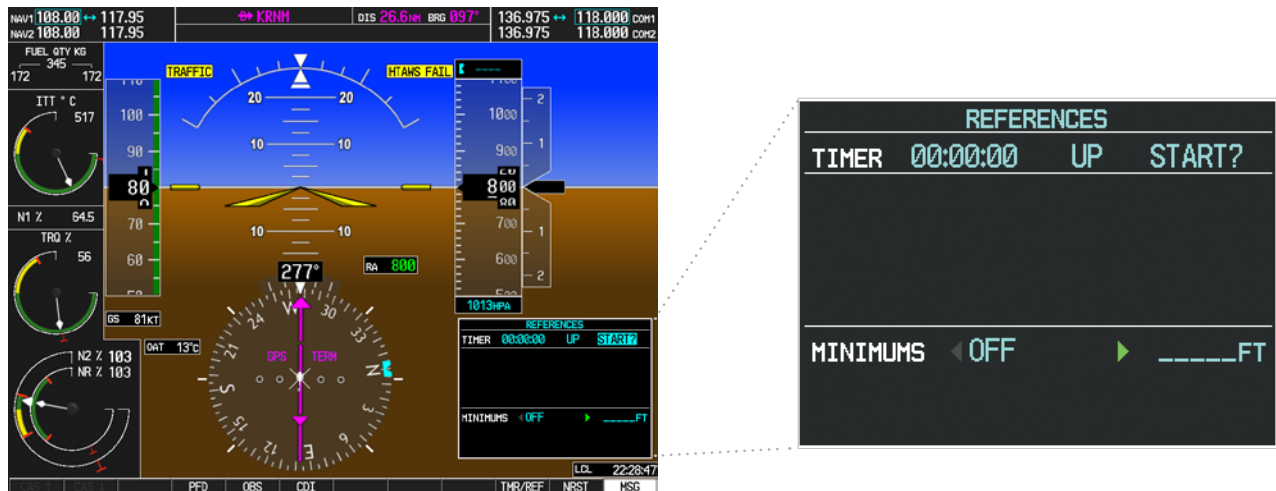
Figure 1-29 Generic Timer (Timer/References Window)

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 G1000H records the time at which departure occurs, depending on whether the pilot prefers the time to be recorded from system power-up or from 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.

1.8 DISPLAY BACKLIGHTING

The G1000H display and control backlighting can be adjusted either automatically or manually.

AUTOMATIC ADJUSTMENT

The existing instrument panel dimmer bus normally controls the PFD and MFD backlighting as well as the PFD and MFD bezels. When the dimmer bus is not used by the G1000H system, photocell technology automatically controls backlighting adjustments. Photocell calibration curves are pre-configured to optimize display appearance through a broad range of cockpit lighting conditions.

MANUAL ADJUSTMENT

> NOTE: The avionics dimming knob may also be used to adjust backlighting. Refer to the POH for details.

> NOTE: In normal mode, backlighting can only be adjusted from the PFD. In reversionary mode, it can also be adjusted from the MFD.

> NOTE: No other window can be displayed on the PFD while the PFD Setup Menu Window is displayed.

Backlighting may also be adjusted manually for all of the displays and the associated bezels.

Adjust display backlighting manually:

1) Press the **MENU** Key on the PFD to display the PFD Setup Menu Window. 'AUTO' becomes highlighted to the right of 'PFD DSPL'.
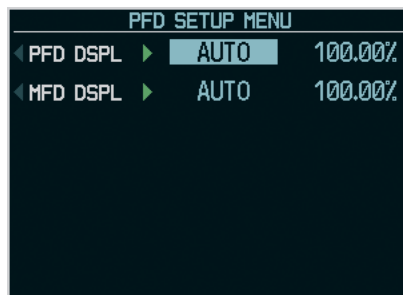
Figure 1-30 Manual Display Backlighting Adjustment

2) Turn the small **FMS** Knob to display the selection box. Turn the **FMS** Knob to select 'MANUAL', then press the **ENT** Key. The intensity value becomes highlighted.

3) Turn the small **FMS** Knob to select the desired backlighting, then press the **ENT** Key.

4) Turn the large **FMS** Knob to highlight 'AUTO' to the right of 'MFD DSPL' and repeat steps 2 and 3.

5) Press the **CLR** or **MENU** Key to remove the PFD Setup Menu Window from the display.

Adjust key backlighting manually:

1) Press the **MENU** Key on the PFD to display the PFD Setup Menu Window. 'AUTO' becomes highlighted to the right of 'PFD DSPL'.

Figure 1-31 Manual Key Lighting Adjustment

2) Turn the large **FMS** Knob to highlight 'PFD DSPL'. Turn the small **FMS** Knob in the direction of the green arrowhead to display 'PFD KEY'.

3) Turn the large **FMS** Knob to highlight 'AUTO' and turn the small **FMS** Knob to display the selection box.

4) Turn the **FMS** Knob to select 'MANUAL', then press the **ENT** Key. The intensity value becomes highlighted.

5) Turn the small **FMS** Knob to select the desired backlighting, then press the **ENT** Key.

6) Turn the large **FMS** Knob to highlight 'MFD DSPL' and turn the small **FMS** Knob in the direction of the green arrowhead to display 'MFD KEY'.

7) Repeat steps 3 to 5.

8) Press the **CLR** or **MENU** Key to remove the PFD Setup Menu Window from the display.

SECTION 2 FLIGHT INSTRUMENTS

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

The Primary Flight Display (PFD) features a large horizon, airspeed, attitude, altitude, vertical speed, and course deviation information. In addition to the flight instruments, engine, 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
  - Indicated airspeed
  - Airspeed awareness ranges
  - Trend vector
  - Ground Speed
- Attitude Indicator with slip/skid indication
- Altimeter, showing
  - Barometric setting
  - Trend vector
  - Reference altitude
- Radar Altimeter (optional)

- Vertical Deviation, Glideslope, and Glidepath Indicators
- Vertical Speed Indicator (VSI)
- Vertical Navigation (VNV) Indications
- Horizontal Situation Indicator, showing
  - Turn Rate Indicator
  - Course Deviation Indicator (CDI)
  - Bearing pointers and information windows
  - Navigation source

- Timer/References Window, showing
  - Generic timer
  - Barometric Minimum Descent Altitude (MDA)
- Transponder Mode, Code, and Ident/Reply
- Outside Air Temperature (OAT)
- Wind data
- Engine data

The PFD also displays various alerts and annunciations.

GARMIN.

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

Figure 2-1 Primary Flight Display (Default)

Figure 2-2 Additional PFD Information

1	Traffic Annunciation		7	Barometric Minimum Descent Altitude
2	Radar Altimeter		8	Flight Plan Window
3	Selected Heading		9	PFD CAS Window
4	Wind Data		10	Selected Course
5	Engine Data		11	Glideslope Indicator
6	Bearing Information Windows		12	Marker Beacon Annunciation

2.1 FLIGHT INSTRUMENTS

AIRSPEED INDICATOR

NOTE: *Refer to the Rotorcraft Flight Manual (RFM) for speed criteria.*

The Airspeed Indicator displays airspeed on a moving tape rolling number gauge. The groundspeed is displayed in knots below the Airspeed Indicator. The numeric labels and major tick marks on the moving tape are marked at intervals of 10 knots. The minor tick marks on the moving tape are indicated at intervals of five knots. Speed indication starts at 20 knots, with 60 knots of airspeed viewable at any time. The indicated airspeed is displayed inside the black pointer. The pointer remains black until reaching never-exceed speed (V_{NE}), at which point it turns red.
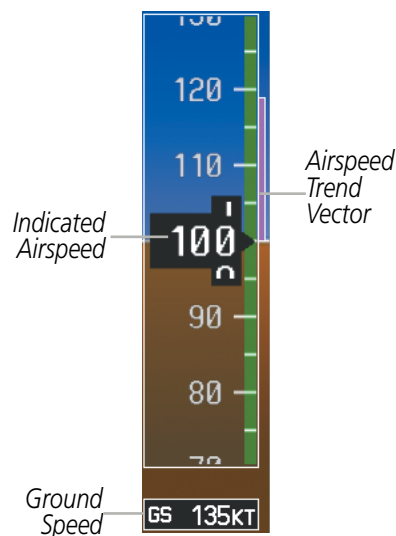
Figure 2-3 Airspeed Indicator
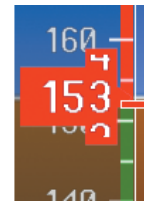
Figure 2-4 Red Pointer at V$_{NE}$

A color-coded (green and red) speed range strip is located on the moving tape. The colors denote normal operating range and never-exceed speed (V_{NE}).

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.

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, 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
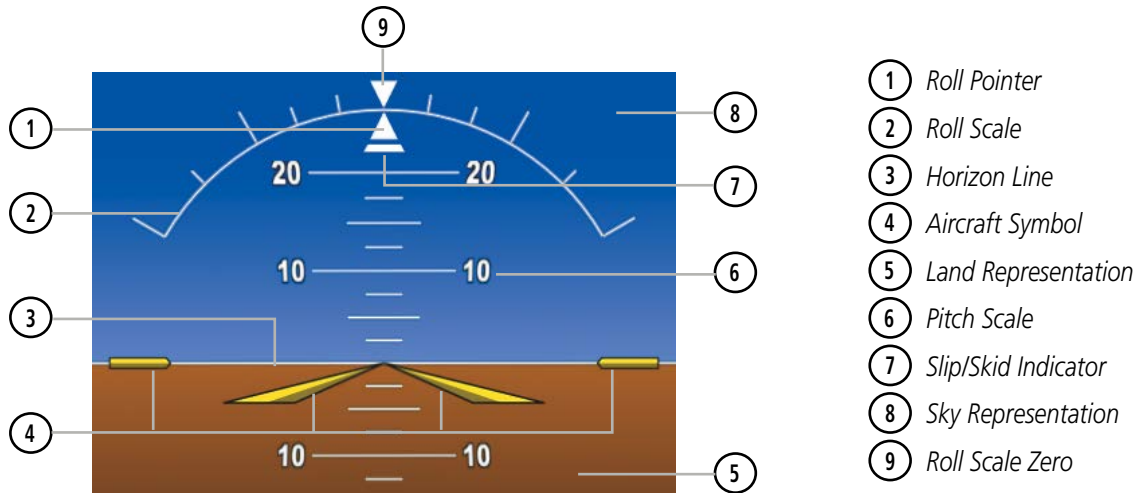
Figure 2-5 Attitude Indicator

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°. When the Synthetic Vision System is activated, the pitch scale is reduced to 10° up and 7.5° down; refer to the Additional Features section.

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 bar moves with the roll pointer and moves laterally away from the pointer to indicate uncoordinated flight. Slip (inside the turn) or skid (outside the turn) is indicated by the location of the bar relative to the pointer.

Figure 2-6 Slip/Skid Indication

ALTIMETER

The Altimeter displays 600 feet of barometric altitude values at a time on a moving tape rolling number gauge. Numeric labels and major tick marks are shown at intervals of 100 feet. Minor tick marks are at intervals of 20 feet. The current 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. When the metric value is selected it 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. The large knob adjusts the Selected Altitude in 1000-ft increments, the small knob in 100-ft increments. If the altimeter is set to display meters, the large knob adjusts the Selected Altitude in 500-meter increments, the small knob in 50-meter increments.

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

Figure 2-7 Altimeter
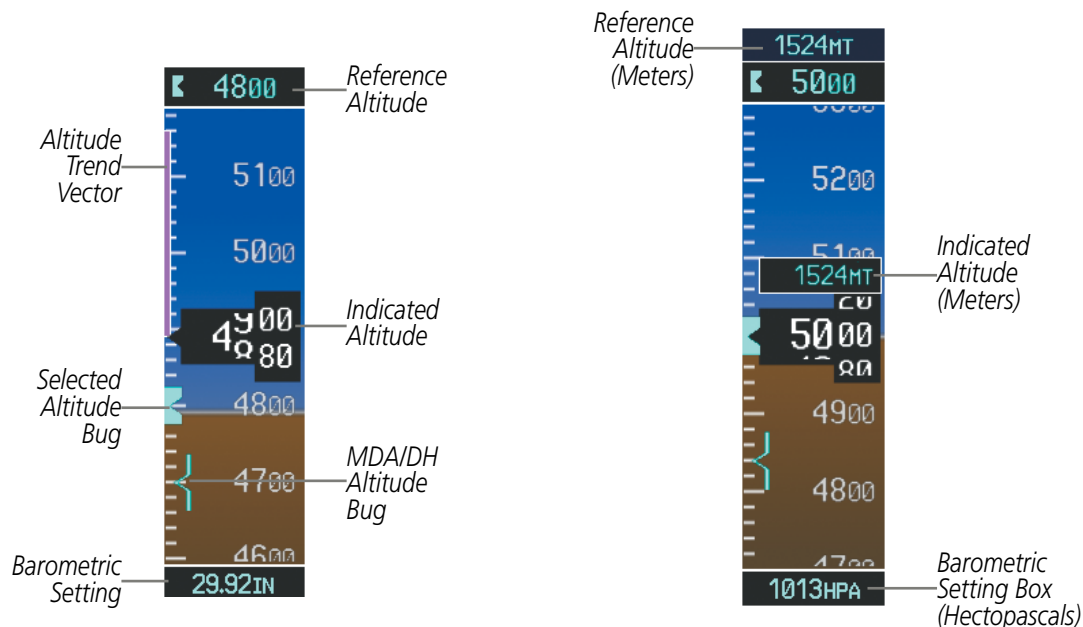
Altitudes can also be displayed in meters (Figure 2-7). Note that the altitude tape does not change scale.

Displaying altitude in meters:

1) Select the **PFD** Softkey to display the second-level softkeys.

2) Select the **ALT UNIT** Softkey.

3) Select the **METERS** Softkey to turn on metric altitude readouts.

4) Select 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:

1)   Select the **PFD** Softkey to display the second-level softkeys.

2)   Select the **STD BARO** Softkey; STD BARO is displayed in barometric setting box.

Figure 2-8 Standard Barometric Altimeter Setting

Changing altimeter barometric pressure setting units:

1)   Select the **PFD** Softkey to display the second-level softkeys.

2)   Select the **ALT UNIT** Softkey.

3)   Select the **IN** Softkey to display the barometric pressure setting in inches of mercury (in Hg).

Or, select the **HPA** Softkey to display the barometric pressure setting in hectopascals (hPa; see Figure 2-7).

4)   Select the **BACK** Softkey to return to the top-level softkeys.

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 flashing light blue barometric pressure setting when crossing the transition altitude.

Setting the Baro Transition Alert:

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 Altitude 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) Turn the small **FMS** Knob to change the altitude and press the **ENT** Key.

6) To cancel the selection, press the **FMS** Knob.

Figure 2-9 Baro Transition Alert
(AUX - System Setup Page)

VERTICAL SPEED INDICATOR (VSI)

The Vertical Speed Indicator (VSI) displays the aircraft vertical speed on a fixed scale with labels at 1000 and 2000 fpm (Figure 2-10). 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 is displayed as the Required Vertical Speed Indication (RVSI) for reaching a VNV Target Altitude once the "TOD [Top of Descent] within 1 minute" alert has been generated. 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.

VERTICAL DEVIATION

✓ **NOTE:** *Refer to the Rotorcraft Flight Manual (RFM) for information regarding the appropriate use of navigation data.*

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

The Vertical Deviation Indicator (VDI) is a magenta chevron indicating the baro-VNV vertical deviation when Vertical Navigation (VNV) is being used (Figure 2-10). 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 2-11) appears to the left of the Altimeter whenever 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. 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/VNV, LPV). When an approach of this type is loaded into the flight plan and GPS is the selected navigation source, the Glidepath Indicator (Figure 2-12) appears as a magenta diamond. 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.

VNV Target Altitude

Vertical Speed Indicator

Vertical Deviation Indicator

Vertical Speed Pointer

Required Vertical Speed Indicator

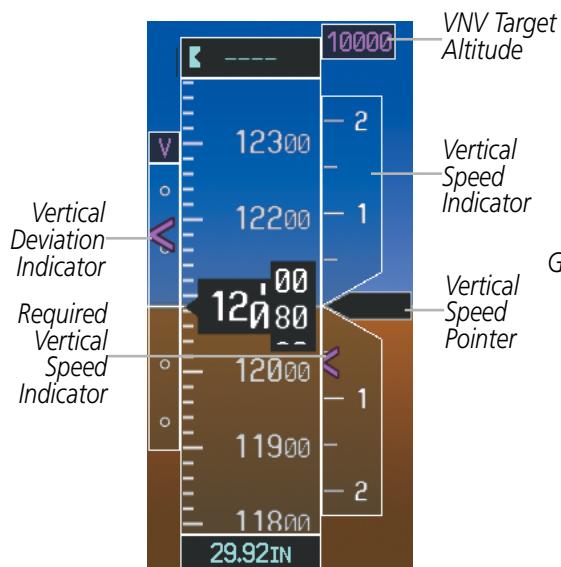*Glideslope Indicator*

Glidepath Indicator

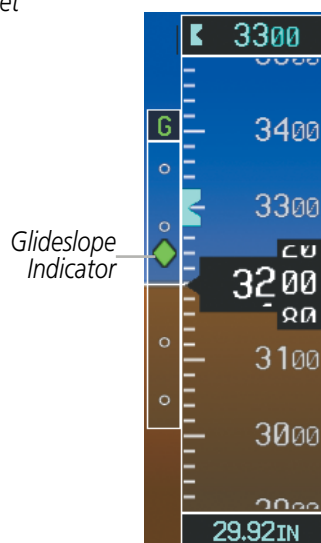**Figure 2-10 Vertical Speed and Deviation Indicators (VSI and VDI)**

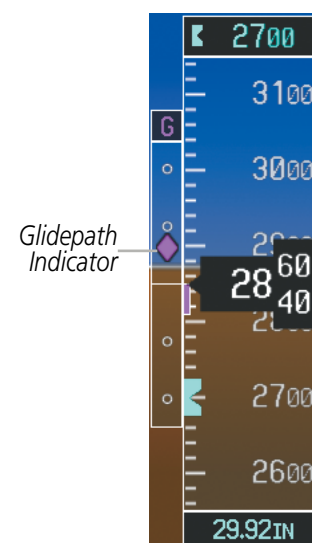**Figure 2-11 Glideslope Indicator**

Figure 2-12 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 with numeric labels every 30°. Major tick marks are at 10° intervals and minor tick marks are 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 connected to a gray dashed line. The HSI also presents turn rate, course deviation, bearing, and navigation source information. The HSI is available in two formats, a 360° compass rose and a 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.

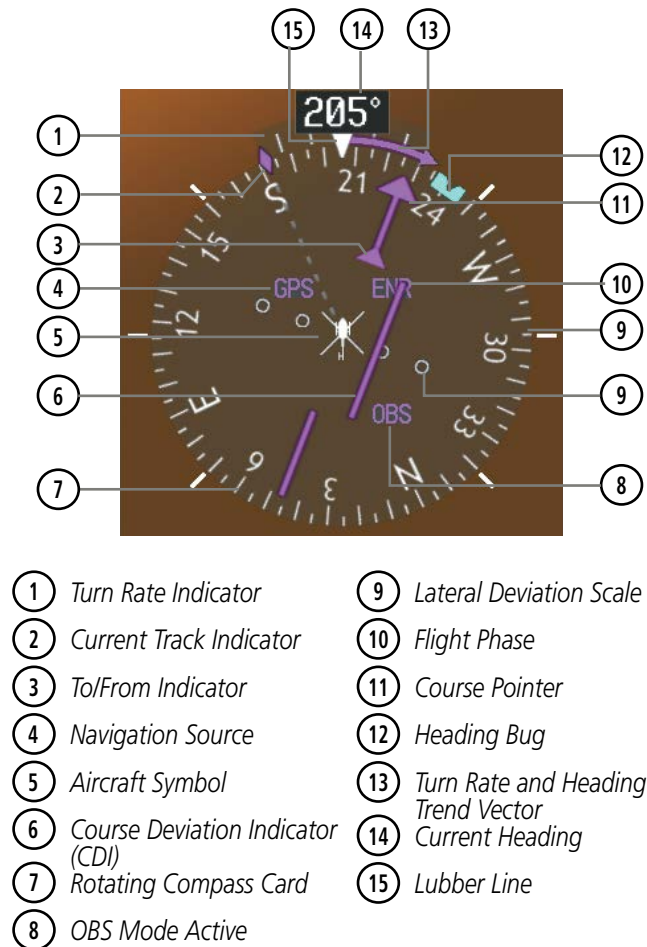|			
1	Turn Rate Indicator	9	Lateral Deviation Scale
2	Current Track Indicator	10	Flight Phase
3	To/From Indicator	11	Course Pointer
4	Navigation Source	12	Heading Bug
5	Aircraft Symbol	13	Turn Rate and Heading Trend Vector
6	Course Deviation Indicator (CDI)	14	Current Heading
7	Rotating Compass Card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

Figure 2-13 Horizontal Situation Indicator (360° HSI)

The Arc HSI is a 140° expanded section of the compass rose. The Arc HSI contains a Course Pointer, combined To/From Indicator and a sliding deviation indicator, 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).
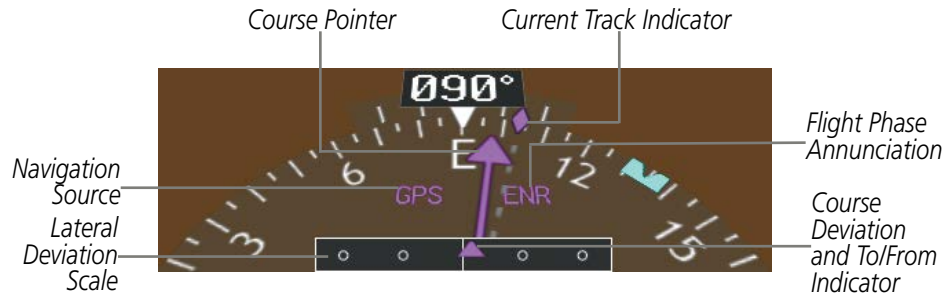

Figure 2-14 Arc HSI

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 Heading Bug is adjusted off the shown portion of the compass rose, the digital reading is 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.

Figure 2-15 Heading and Course Indications

Navigation angles (track, heading, course, bearing) are corrected to the computed magnetic variation (Mag Var) or referenced to true north (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 2-16 Heading and Course Indications (True)

Changing the navigation angle true/magnetic 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 (T)

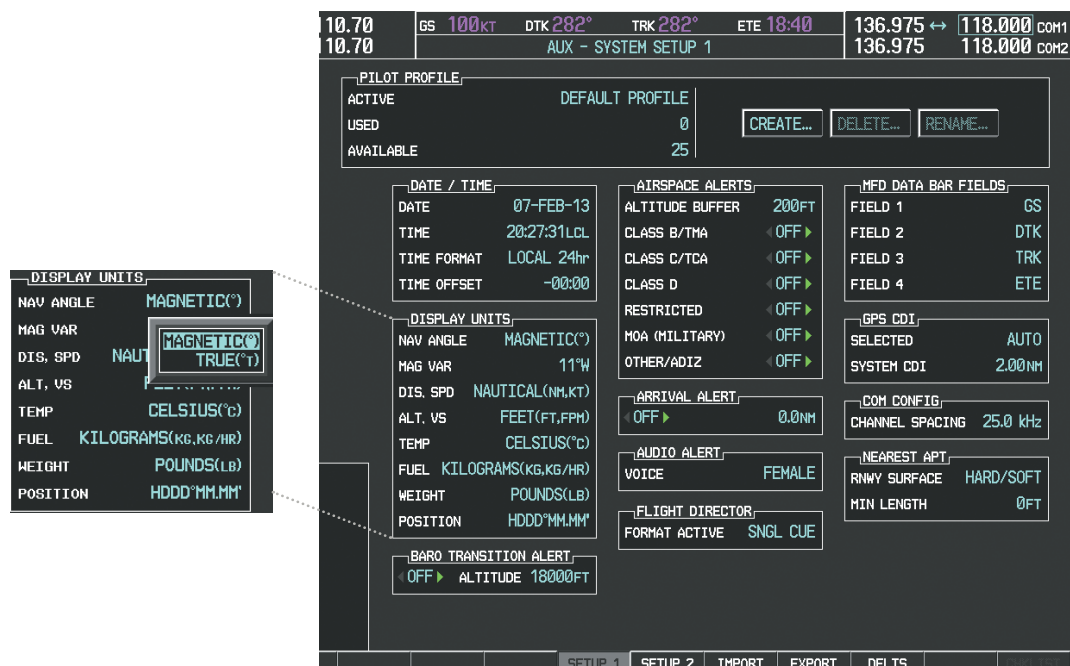   • MAGNETIC - Angles corrected to the computed magnetic variation (Mag Var)

Figure 2-17 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 2-18 Turn Rate Indicator and Trend Vector

BEARING POINTERS AND INFORMATION WINDOWS

Two bearing pointers and associated information can be displayed on the HSI for NAV and GPS sources by pressing the **PFD** Softkey then a **BRG** 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.
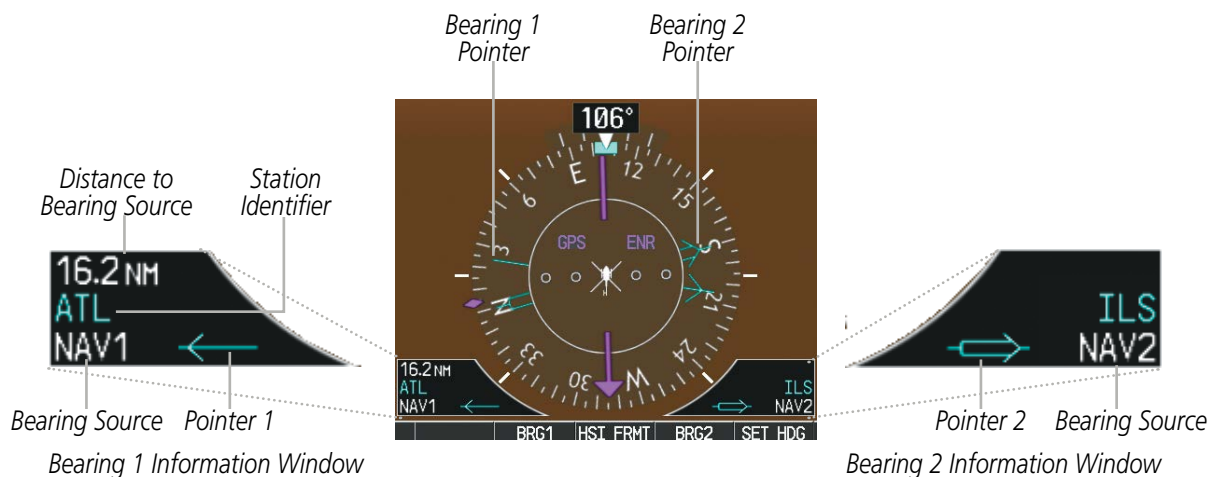

Figure 2-19 HSI with Bearing and Distance Information

When a bearing pointer is displayed, its associated information window is also displayed. The Bearing Information windows (Figure 2-19) are displayed to the lower sides of the HSI and display the following information:

- Bearing source (NAV, GPS)
- Pointer icon (BRG1 = single line, BRG2 = double line)
- Frequency (NAV,)
- 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 in lieu 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 the tuned VOR station or if GPS is the bearing source and an active waypoint is not selected.

Selecting bearing display and changing sources:

1) Select the **PFD** Softkey.

2) Select a **BRG** Softkey to display the desired bearing pointer and information window with a NAV source.

3) Select the **BRG** Softkey again to change the bearing source to GPS.

4) To remove the bearing pointer and information window, select the **BRG** Softkey again.

COURSE DEVIATION INDICATOR (CDI)

> **NOTE:** *During a heading change of greater than 105˚ with respect to the course, 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.
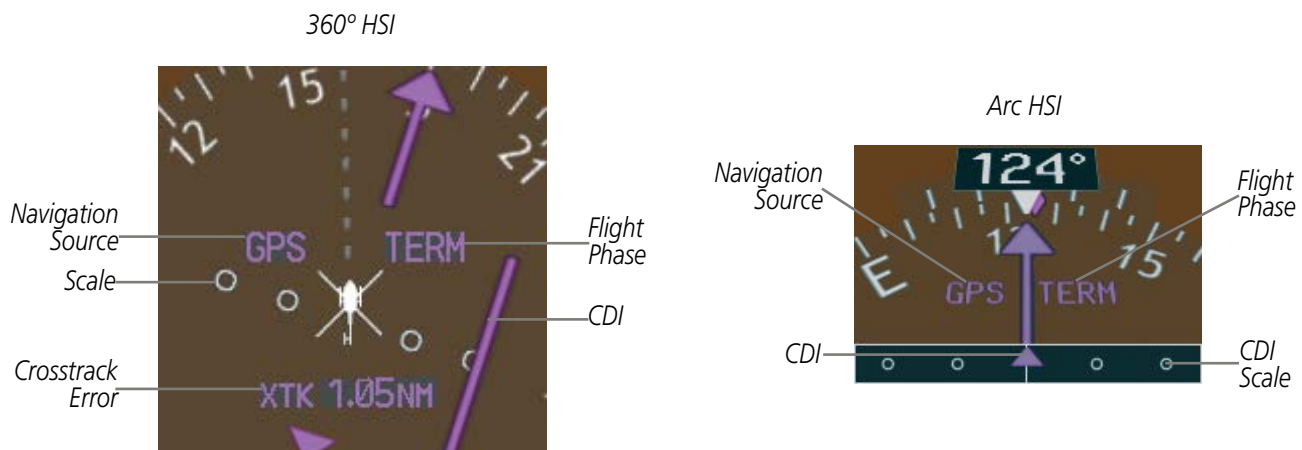

Figure 2-20 Course Deviation Indicator

The CDI can display two sources of navigation, GPS or VOR/LOC. Color indicates the current navigation source, magenta for GPS and green for VOR and LOC. The full scale limits for the CDI are defined by a GPS-derived distance when coupled to GPS. When navigating using a VOR or localizer (LOC), the CDI uses the same angular limits as a mechanical CDI. If the CDI exceeds the maximum deviation on the scale (two dots) while navigating with GPS, the crosstrack error (XTK) is displayed below the white aircraft symbol.
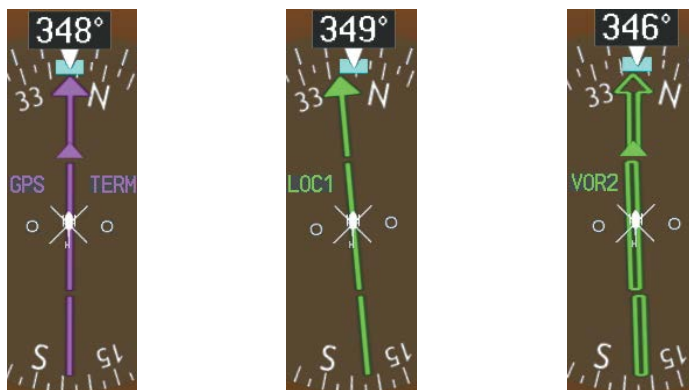
Figure 2-21 Navigation Sources

Changing navigation sources:

1) Select the **CDI** Softkey to change from GPS to VOR1 or LOC1. This causes the NAV1 standby frequency in the upper left corner of the PFD to turn light blue.

2) Select the **CDI** Softkey again to change from VOR1 or LOC1 to VOR2 or LOC2. This causes the NAV2 standby frequency in the upper left corner of the PFD to turn light blue.

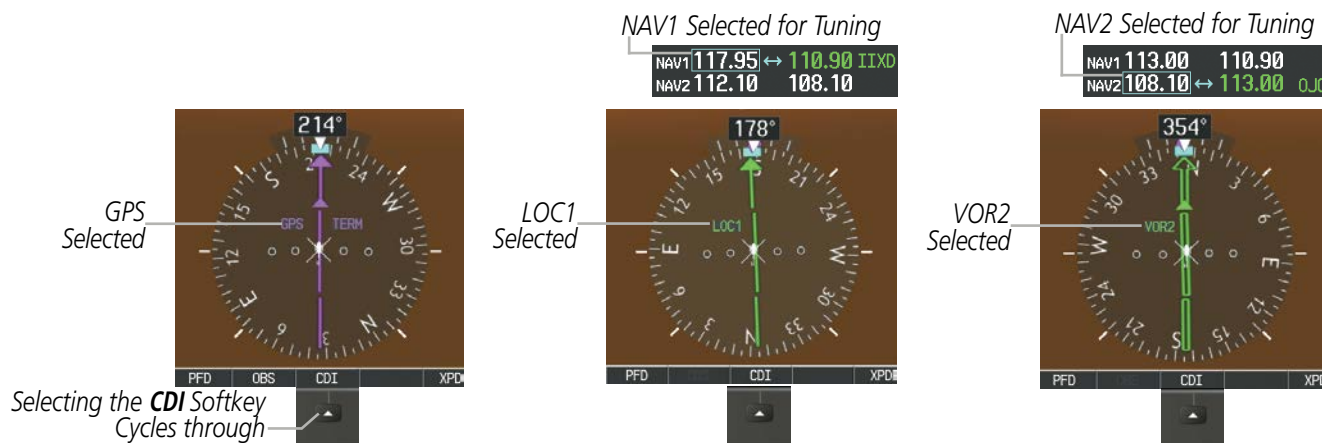3) Select the **CDI** Softkey a third time to return to GPS.

Figure 2-22 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 waypoint, 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) also causes the CDI to switch to LOC navigation source. GPS steering guidance is not provided after this switch.

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 'Selected' 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 2-23 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 2-24, Table 2-1).
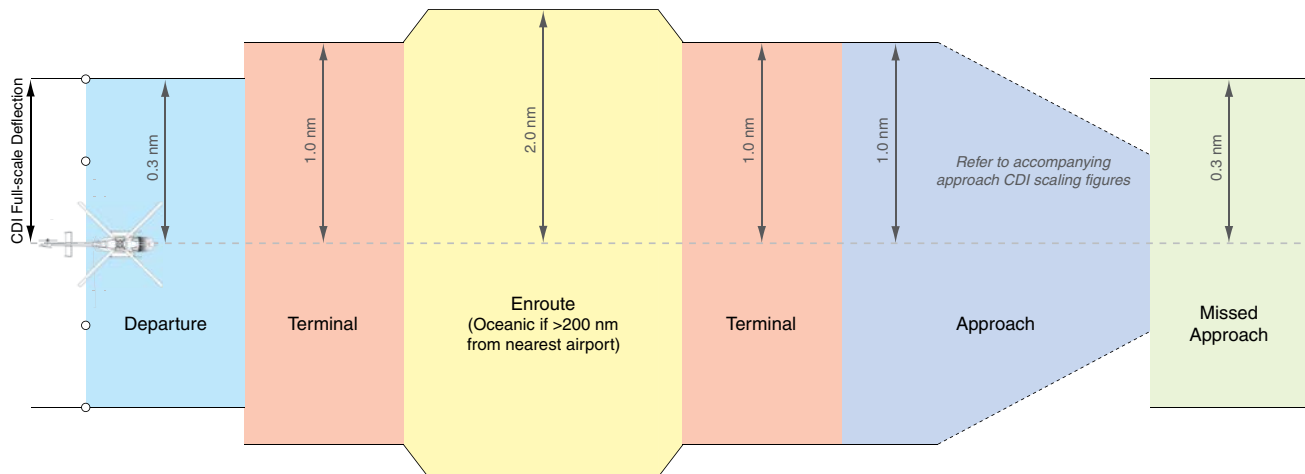
Figure 2-24 Automatic CDI Scaling

- Once a departure procedure is activated, 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 does 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 2-25 and 2-26). 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.
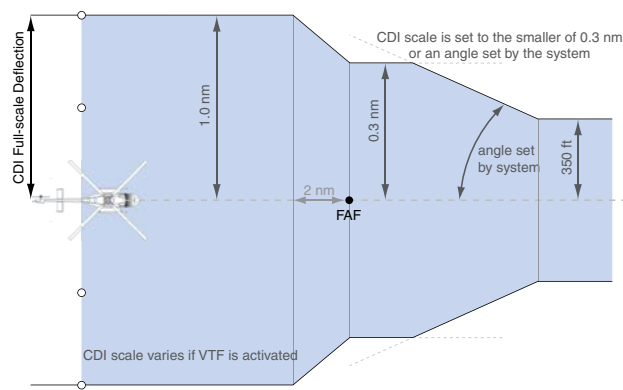
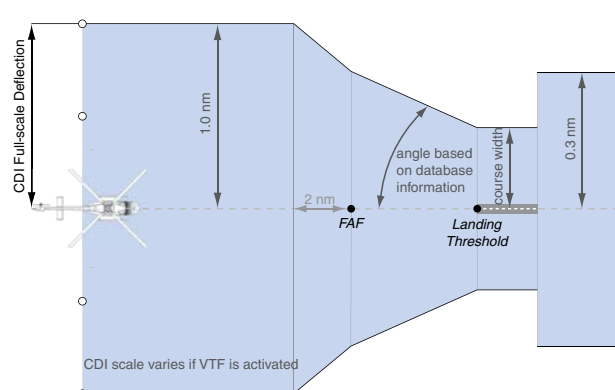**Figure 2-25 Typical LNAV and LNAV+V Approach CDI Scaling**

Figure 2-26 Typical LNAV/VNAV, LPV, and LP 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 (Non-precision)	LNAV	1.0 nm decreasing to 350 feet depending on variables (see Figure 2-25)
Approach (Non-precision with Vertical Guidance)	LNAV + V	
Approach (LNAV/VNAV)	L/VNAV	1.0 nm decreasing to a specified course width, then 0.3 nm, depending on variables (see Figure 2-26)
Approach (LPV)	LPV	
Approach (LP)	LP	
Missed Approach	MAPR	0.3 nm

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.
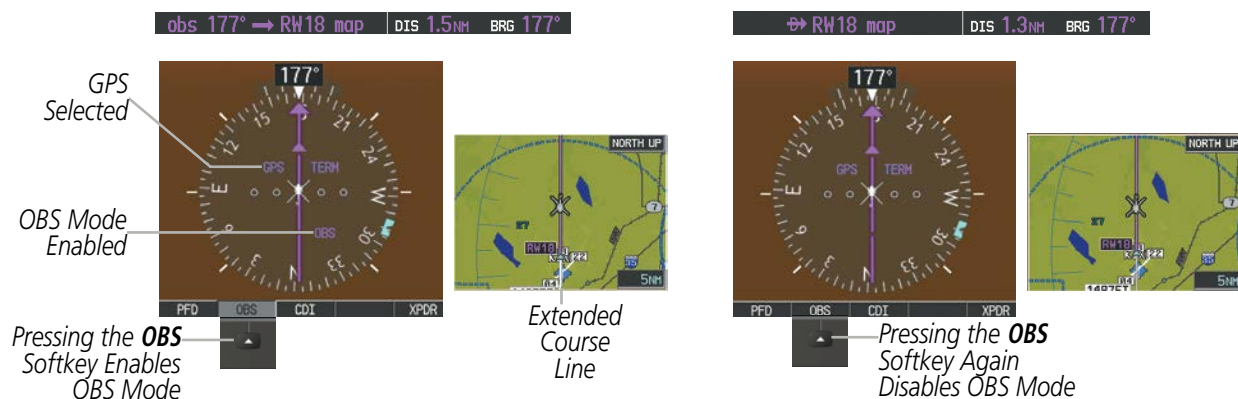

GPS Selected

OBS Mode Enabled

*Pressing the **OBS** Softkey Enables OBS Mode*

Extended Course Line

*Pressing the **OBS** Softkey Again Disables OBS Mode*

Figure 2-27 Omni-bearing Selector (OBS) Mode

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

1) Select 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) Select 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 2-28. Selecting the **SUSP** Softkey, deactivates the suspension and resumes automatic sequencing of approach waypoints.
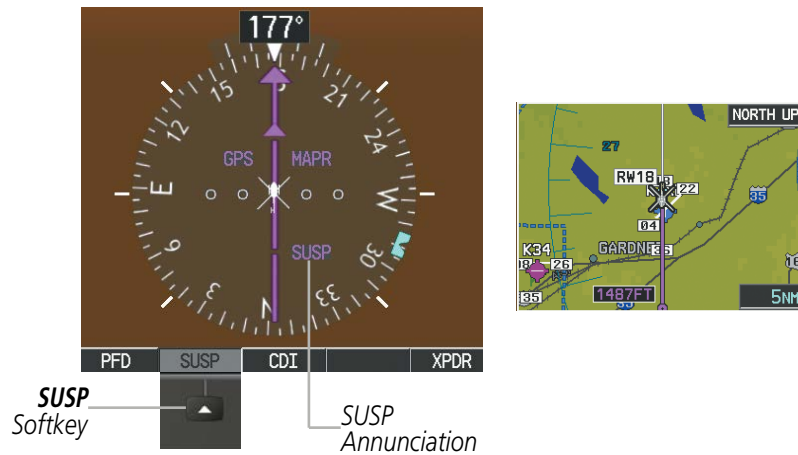

Figure 2-28 Suspending Automatic Waypoint Sequencing

GARMIN.

2.2 SUPPLEMENTAL FLIGHT DATA

NOTE: *Selecting the **DFLTS** 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 temperatures, wind data, and Vertical Navigation (VNV) indications.

TEMPERATURE DISPLAYS

The Outside Air Temperature (OAT) is displayed to the left of the Horizontal Situation Indicator in degrees Celsius (°C).

Figure 2-29 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:
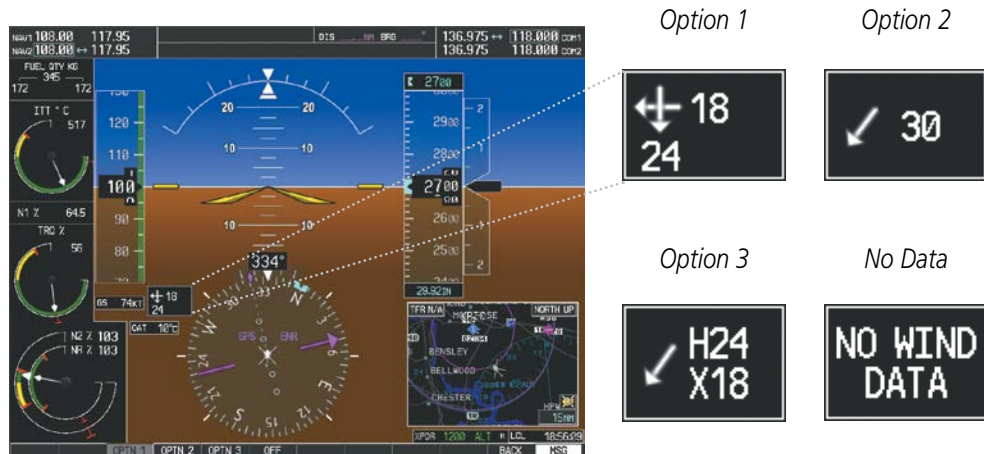

Figure 2-30 Wind Data

Displaying wind data:

1) Select the **PFD** Softkey.

2) Select the **WIND** Softkey to display wind data display options.

3) Select one of the **OPTN** softkeys to change how wind data is displayed:

 • **OPTN 1**: Wind direction arrows with numeric headwind/tailwind and crosswind components

 • **OPTN 2**: Wind direction arrow and numeric speed

 • **OPTN 3**: Wind direction arrow with headwind (H) or tailwind (T) and crosswind (X) speed components

4) To remove the window, select the **OFF** Softkey.

VERTICAL NAVIGATION (VNV) INDICATIONS

When a VNV flight plan has been activated, VNV indications (VNV Target Altitude, RSVI, 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 2-31 Vertical Navigation Indications (PFD)

Criteria	VNV Indication Removed		
	Required Vertical Speed (RSVI)	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 the Engine Indication System (EIS) Section for information on the Crew Alerting System (CAS) and to Appendix A for more information on alerts and annunciations.

SYSTEM ALERTING

The System Messages Window conveys messages to the flight crew regarding problems with the G1000H System. When a new message is issued, the **MSG** Softkey flashes to alert the flight crew. It continues to flash until pressed, which opens the System Messages Window and acknowledges the message(s) which initiated the flashing. When the window is open, messages for conditions which are no longer active turn gray. Messages generated while the window is open are not automatically displayed, but cause the **MSG** Softkey to begin flashing again. Pressing the **MSG** Softkey while the System Messages Window is open closes the window unless the **MSG** Softkey is flashing.

Figure 2-32 Alerting System

TRAFFIC ANNUNCIATION

Traffic is displayed symbolically on the PFD Inset Map, the MFD Navigation Map Page, and various other MFD page maps. Refer to the Hazard Avoidance Section and the Appendix 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 (Figure 2-33) 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 Hazard Avoidance section for alerts generated by TAS equipment)

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

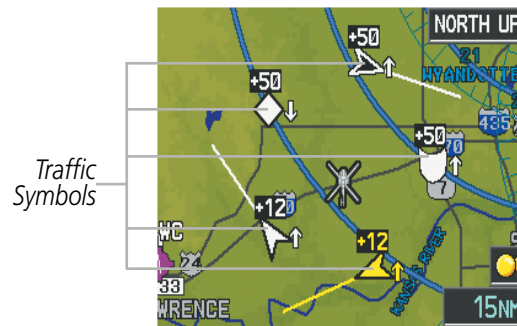**Figure 2-33 Traffic Annunciation**

Figure 2-34 Inset Map with Traffic Displayed

HTAWS ANNUNCIATIONS

Helicopter Terrain Awareness and Warning System (HTAWS) annunciations appear on the PFD to the upper left of the Altimeter. Refer to the Hazard Avoidance Section and Appendix A for information on HTAWS alerts and annunciations.

Figure 2-35 Traffic and Example HTAWS Annunciations

ALTITUDE ALERTING

The Altitude Alerting function provides visual and audio alerts when approaching the Selected Altitude. Whenever the Selected Altitude is changed, Altitude Alerting is reset. Altitude Alerting is based on the altitude information shown on the PFD.

The following occur when approaching the Selected Altitude:

• Upon passing through 1000 feet of the Selected Altitude, the Selected Altitude Box changes to black text on a light blue background, flashes for 5 seconds, and an aural tone is generated.

• When the aircraft passes within 200 feet 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 Box changes to yellow text on a black background, flashes for 5 seconds, and an aural tone is generated.

Within 1000 ft   Within 200 ft   Deviation of ±200 ft

Figure 2-36 Altitude Alerting Visual Annunciations

LOW ALTITUDE ANNUNCIATION

NOTE: *The Low Altitude Annunciation is available only when SBAS is available. This annunciation is not shown unless HTAWS alerting is inhibited.*

When the Final Approach Fix (FAF) is the active waypoint in a GPS SBAS 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 left of the Altimeter, flashing for several seconds then remaining displayed until the condition is resolved.

Figure 2-37 Low Altitude on GPS SBAS Approach

MINIMUM DESCENT ALTITUDE/DECISION HEIGHT ALERTING

For altitude awareness, a Minimum Descent Altitude (MDA) or Decision Height (DH), based on barometric altitude or radar altitude, can be set. 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 visible range of the tape). The following visual annunciations alert the pilot when approaching the MDA or DH:

- When the aircraft altitude descends to within 2500 feet of the MDA/DH setting, a box labeled BARO MIN, RA MIN, or COMP MIN (based on the selected altitude source) appears with the altitude in light blue (BARO MIN or RA MIN) or magenta (TEMP COMP) text. The bug appears in light blue (BARO MIN or RA MIN) or magenta (TEMP COMP) on the altitude tape at the corresponding altitude once in range.

- When the aircraft passes through 100 feet of the MDA or 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. When the radar altimeter is selected as the altitude source for the Minimum Descent Altitude alerting function, the color of the current radar height changes to yellow.
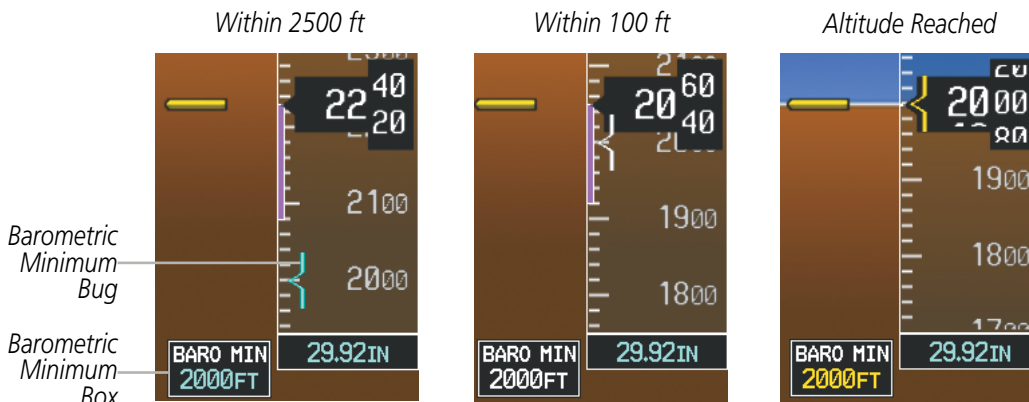
Within 2500 ft   *Within 100 ft*   *Altitude Reached*

Barometric Minimum Bug

Barometric Minimum Box

Figure 2-38 Minimum Descent Altitude/Decision Height Alerting Visual Annunciations

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.

The MDA/DH may be set on the PFD. The function is reset when the power is cycled.

Setting the Minimum Descent Altitude/Decision Height and bug:

1) Press the **TMR/REF** Softkey.

2) Turn the large **FMS** Knob to highlight the Minimums field.

3) Turn the small **FMS** Knob to select the barometric (BARO), radar altimeter (RAD ALT), or temperature compensated (TEMP COMP) altitude source. 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 (BARO or TEMP COMP from zero to 16,000 feet, RAD ALT from zero to 2,500 feet). If TEMP COMP is selected, a field for entering the airport temperature will appear. Press the **ENT** Key or turn the large **FMS** Knob to highlight this field, and use the small **FMS** Knob to enter the temperature.

5) To remove the window, press the **CLR** Key or press the **TMR/REF** Softkey.

Figure 2-39 Timer/References Window, MDA/DH Setting

RADAR ALTIMETER

When the radar height (the aircraft altitude above ground level detected by the radar altimeter) is between zero and 2500 feet, the current value is displayed in green above the selected course (Figure 2-40). Display of radar height becomes more sensitive as the height above ground decreases (Table 2-3).
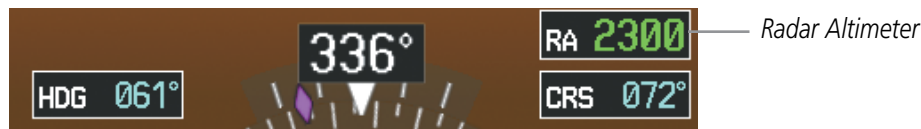

Radar Altimeter

Figure 2-40 Current Radar Height

Radar Height Range	Shown to Nearest
0 to 50 feet	1 foot
50 to 200 feet	5 feet
200 to 1500 feet	10 feet
1500 to 2500 feet	50 feet

Table 2-3 Radar Altimeter Sensitivity

When the radar altimeter is selected as the altitude source for the minimum descent altitude/decision height alerting function (Figure 2-41), the color of the radar height readout changes from green to yellow upon descent to or below this altitude (Figure 2-42). Refer to the Minimum Descent Altitude/Decision Height Alerting discussion in this section for more information about this function.

Figure 2-41 RAD ALT Setting
(Timer/References Window)

Figure 2-42 RA as Altitude Source for MDA/DH

A ground line (Figure 2-43) is shown on the Altimeter to display the aircraft's height relative to the ground. If the data becomes invalid, the message "RA FAIL" is displayed in yellow in place of the current radar height (Figure 2-44).
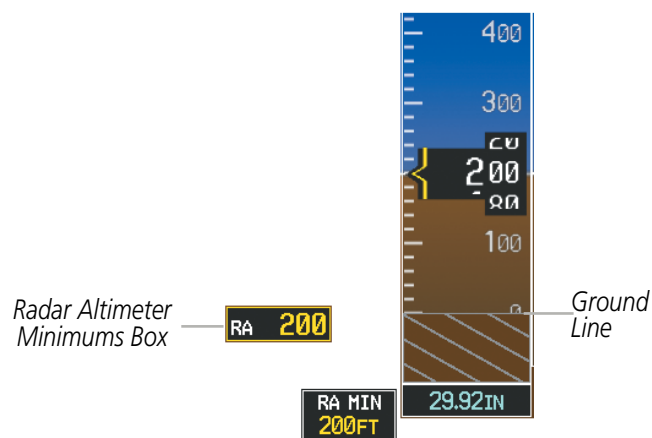

Radar Altimeter Minimums Box

Ground Line

Figure 2-43 Altimeter Displaying the Ground Line (RAD ALT)

Figure 2-44 Radar Altimeter Invalid Data

2.4 ABNORMAL OPERATIONS

ABNORMAL GPS CONDITIONS

The annunciations listed in Table 2-3 can appear on the HSI when abnormal GPS conditions occur. 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 2-4 Abnormal GPS Conditions Annunciated on HSI

Figure 2-45 Example HSI Annunciations

In Dead Reckoning Mode, the CDI is removed (when GPS is the selected navigation source), and the following items on the PFD are then shown in yellow:

- Current Track Bug

- Wind Data

- Distances in the Bearing Information windows

- GPS bearing pointers

- Distance and Bearing information in the Navigation Status Box

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

UNUSUAL ATTITUDES

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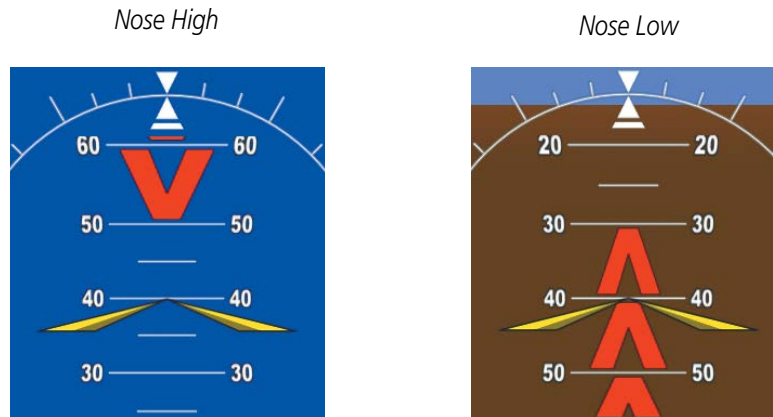
Nose High

Nose Low

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, 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
- Windows displayed in the lower right corner of the PFD:
  – Timer/References

  – Nearest Airports
  – Flight Plan
  – Alerts
  – Procedures
- Minimum Descent Altitude/ Decision Height readout
- Vertical Deviation, Glideslope, and Glidepath Indicators
- Altimeter Barometric Setting

- Selected Altitude
- VNV Target Altitude
- Selected Heading
- Selected Course
- PFD Setup Menu

SECTION 3 ENGINE INDICATION SYSTEM

✓ **NOTE:** *Refer to the Rotorcraft Flight Manual (RFM) for limitations.*

The G1000H Engine Indication System (EIS) displays critical engine, electrical, fuel, and other system parameters on the left side of the Primary Flight Display (PFD) and Multi Function Display (MFD) during normal operations (Figure 3-1). Pressing the **ENGINE** Softkey on the MFD or the START/AUTOROT pushbutton on the Cyclic, displays the EIS - Engine Page which provides a full screen view of all engine instuments. The EIS - Engine Page is automatically displayed when N1 < 51%.

PFD

EIS Strip

MFD

EIS Strip
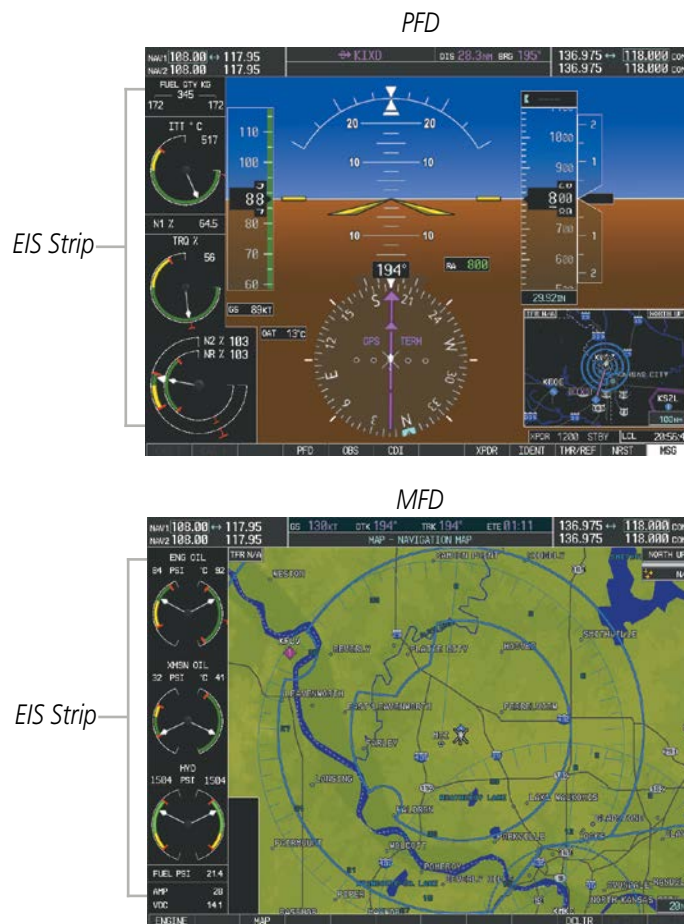
Figure 3-1 EIS (Normal)

Green bands on the instruments indicate normal ranges of operation; yellow 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. Red "T's" indicate transient limits. 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. If sensor data for a readout is out of range, dashes are displayed instead of a readout.

In the event of a display failure, the G1000H System automatically switches to reversionary (backup) mode. In reversionary mode, flight information is presented on the remaining display in the same format as the PFD operating in normal mode. The secondary EIS indications normally presented on the MFD are no longer available in reversionary mode. However, a CAS message is displayed on the remaining display in the event that a secondary EIS indication is out-of-range

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3.1 ENGINE INDICATION SYSTEM (EIS) DISPLAY

✔ **NOTE:** *Depictions of equipment may differ from the installed equipment. Examples shown may differ from the actual aircraft configuration.*

|		
①	**Fuel Quantity Indicator (FUEL QTY KG)**	Displays the quantity of fuel in each fuel tank as well as the total fuel in Kilograms
②	**Inter Turbine Temperature (ITT)**	Displays the current Inter Turbine Air Temperature
③	**Gas Generator Speed (N1)**	Displays a digital readout of the Gas Generator Compressor Speed as a percentage.
④	**Torque (TRQ)**	Displays current fuel engine Torque as a percentage
⑤	**Power Turbine Speed (N2)**	Displays current Power Turbine Speed as a percentage on a round dial, a digital readout is shown to the side
⑥	**Rotor Speed (NR)**	Displays Rotor Speed as a percentage, a digital readout is shown to the side
⑦	**Engine Oil Pressure Indicator (ENG OIL PSI)**	Displays the oil pressure supplied to the engine in pounds per square inch
⑧	**Engine Oil Temperature Indicator (ENG OIL °C)**	Displays engine oil temperature in degrees Celsius
⑨	**Transmission Oil Pressure (XMSN OIL PSI)**	Display the pressure of oil supplied to the transmission in pounds per square inch
⑩	**Transmission Oil Temperature (XMSN OIL °C)**	Displays the transmission oil temperature in degrees Celsius
⑪	**Hydraulic Pressure (HYD PSI)**	Displays the current Hydraulic Pressure for both hydraulic systems in pounds per square inch
⑫	**Fuel PSI**	Displays the current Fuel Pressure in pounds per square inch
⑬	**Generator Ammeter (AMP)**	Displays the generator load in amperes
⑭	**Generator Voltmeter (VDC)**	Displays the generator voltage
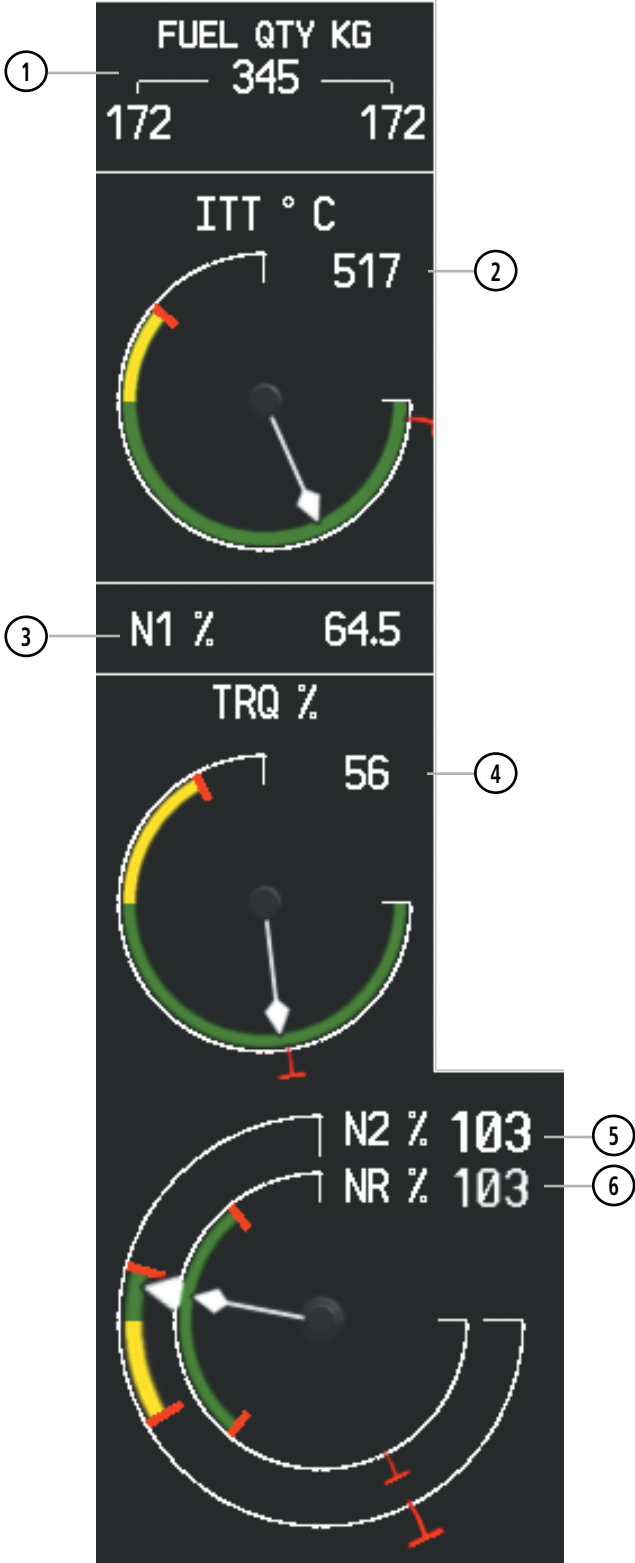
Figure 3-2 EIS Display (PFD)
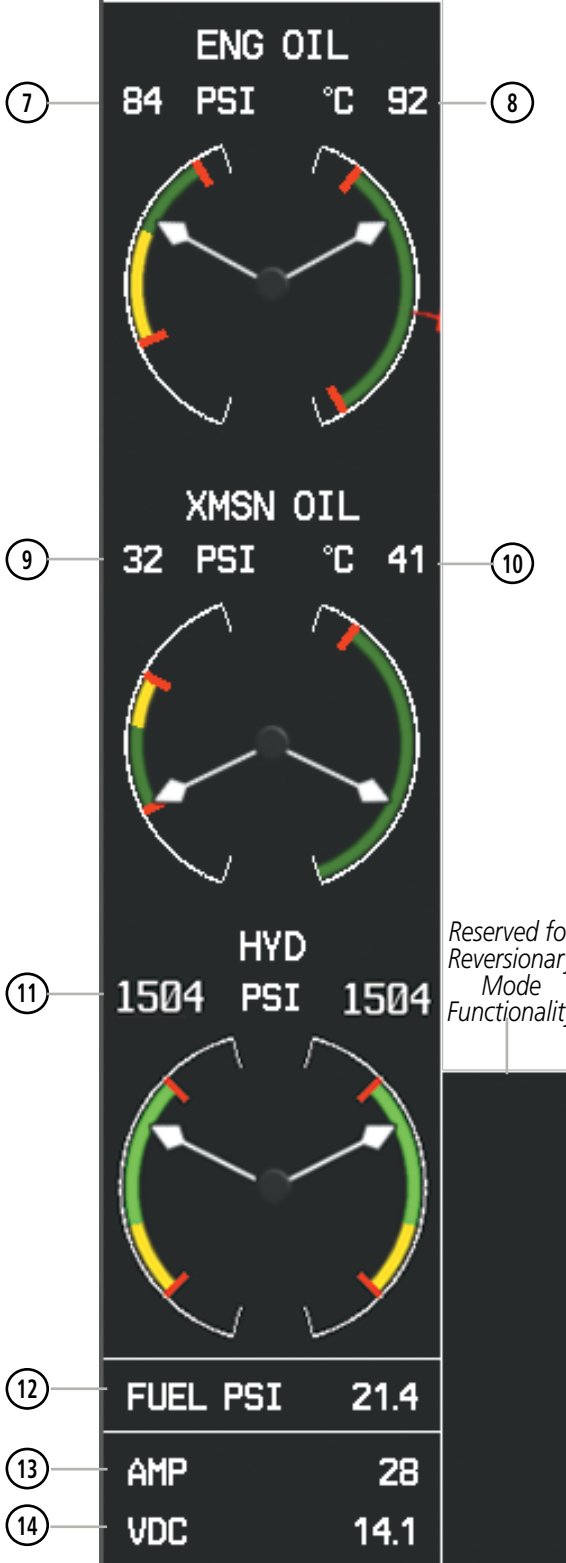
Figure 3-3 EIS Display (MFD)

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3.2 ENGINE PAGE

> *NOTE: Refer to the Rotorcraft Flight Manual (RFM) for engine operating limitations and corrective actions.*

Pressing the **ENGINE** Softkey on the MFD or the START/AUTOROT pushbutton on the Cyclic, displays the EIS - Engine Page, which provides a full screen view of all engine instruments. To return to the previous softkey level and exit the Engine page, press the **ENGINE** Softkey again, or press the **CLR** Key, or turn the large **FMS** Knob. The Engine Page is not available in reversionary mode.

	Engine Parameters	
1	**Power Turbine Speed (N2)**	Displays current Power Turbine Speed as a percentage on a round dial, a digital readout is shown to the side
2	**Rotor Speed (NR)**	Displays Rotor Speed as a percentage, a digital readout is shown to the side
3	**Torque (TRQ)**	Displays current fuel engine Torque as a percentage
4	**Gas Generator Speed (N1)**	Displays the Gas Generator Compressor Speed as a percentage
5	**Inter Turbine Temperature (ITT)**	Displays the current Inter Turbine Air Temperature.

	Fuel System	
6	**Fuel Quantity Indicator**	Displays the quantity of fuel in each fuel tank as well as the total fuel in Kilograms
7	**Fuel PSI**	Displays the current Fuel Pressure in pounds per square inch

	Electrical System	
8	**Generator Voltmeter (VOLT)**	Displays the generator voltage.
9	**Generator Ammeter (AMP)**	Displays the generator load in amperes

	Hydraulic System	
10	**Hydraulic Pressure (HYD PSI)**	Displays the current Hydraulic Pressure for both hydraulic systems in pounds per square inch

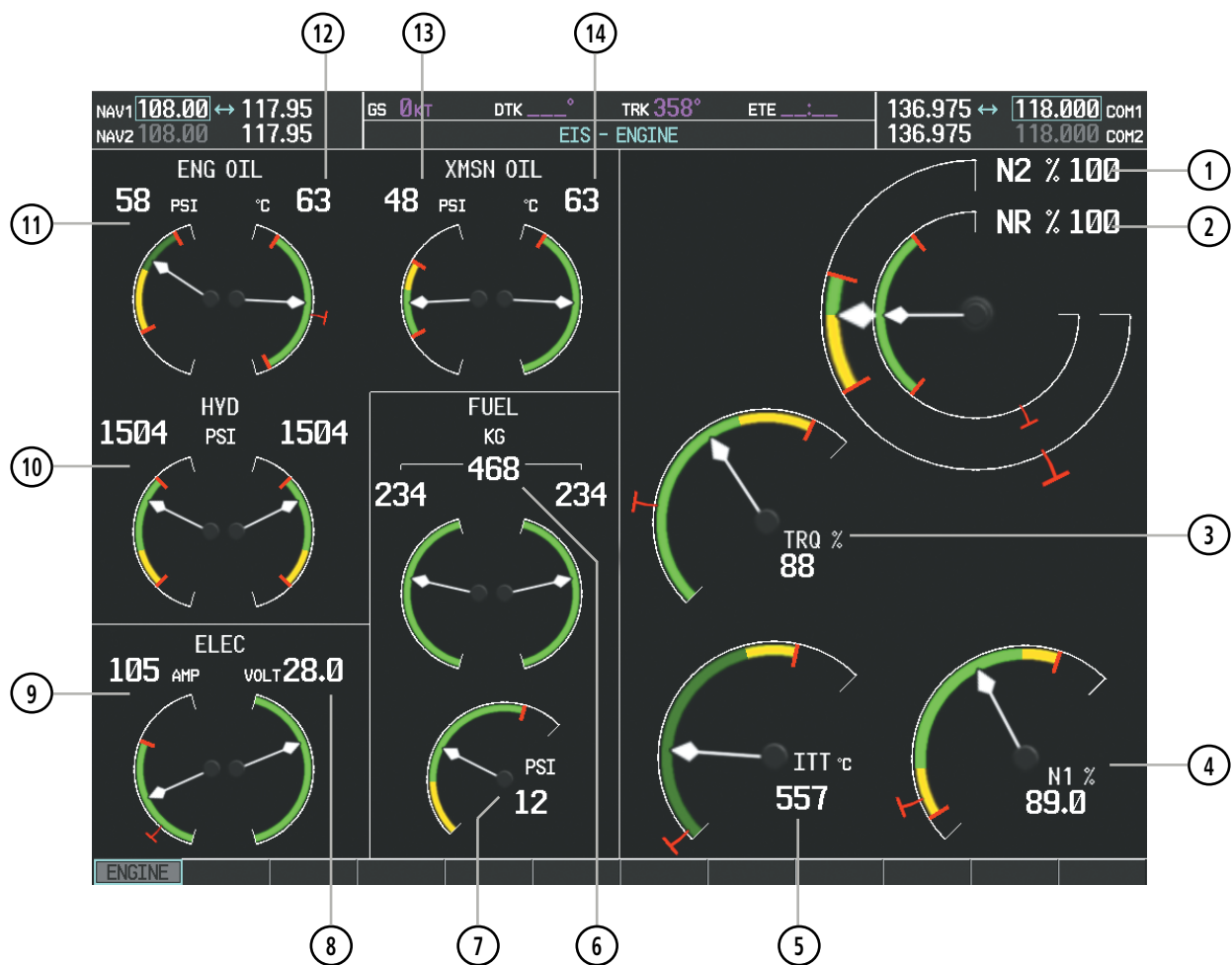|	Engine/Transmission Oil	
11	**Engine Oil Pressure Indicator (ENG OIL PSI)**	Displays the oil pressure supplied to the engine in pounds per square inch
12	**Engine Oil Temperature Indicator (ENG OIL °C)**	Displays engine oil temperature in degrees Celsius
13	**Transmission Oil Pressure (XMSN OIL PSI)**	Display the pressure of oil supplied to the transmission in pounds per square inch
14	**Transmission Oil Temperature (XMSN OIL °C)**	Displays the transmission oil temperature in degrees Celsius

Figure 3-4 Engine Page Display (MFD)

BLANK PAGE

SECTION 4 COM/NAV/TRANSPONDER

4.1 OVERVIEW

> **NOTE:** *The System Overview Section provides a block diagram description of the communication, navigation, and transponder interconnection.*

Communication, navigation, and transponder operation in the AW119Kx is performed by the following Line Replaceable Units (LRUs):

- Primary Flight Display (PFD)
- Multi Function Display (MFD)
- Integrated Avionics Unit (2)
- Mode S Transponder

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

The Mode S transponder is 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 reply status (Figure 4-1).

MFD/PFD CONTROLS AND FREQUENCY DISPLAY

Figure 4-1 MFD/PFD Controls and NAV/COM Frequency Tuning Boxes

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.

⑤ **COM Frequency Box** – Displays COM standby and active frequency fields and volume.

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 **ENT Key** – Validates or confirms Auto-tune selection.

⑩ **FMS Knob** – Flight Management System Knob, used to enter transponder codes, and Auto-tune entries when the 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.

⑪ **Transponder Data Box** – Indicates the selected transponder code, operating mode, reply, and ident status for the transponder.

4.2 COM OPERATION

COM TRANSCEIVER SELECTION AND ACTIVATION

> ✓ **NOTE:** *When turning on the system 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. During reception of audio from the COM radio selected for transmission, audio from the other COM radio is muted.
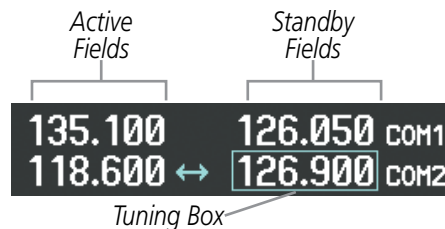

Figure 4-2 Selecting a COM Radio for Transmit

TRANSMIT/RECEIVE INDICATIONS

During COM transmission, a white TX appears by the active COM frequency replacing the Frequency Transfer Arrow.

During COM signal reception, a white RX appears by the active COM frequency replacing the Frequency Transfer Arrow. Entertainment audio, if selected, is muted during active COM radio reception.
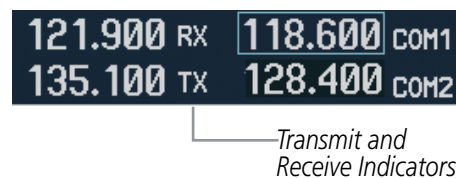
Figure 4-3 COM Radio Transmit and Receive Indications

COM TRANSCEIVER MANUAL TUNING

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

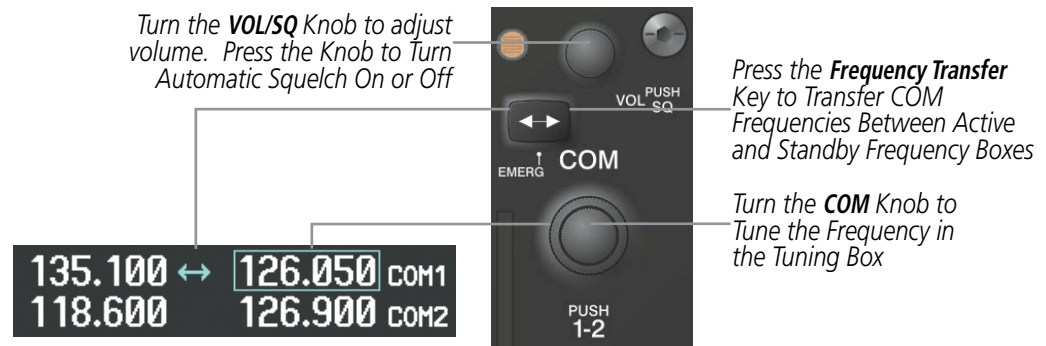4) Press the COM **VOL/SQ** Knob to turn automatic COM squelch on and off.

Turn the **VOL/SQ** Knob to adjust volume. Press the Knob to Turn Automatic Squelch On or Off

Press the **Frequency Transfer** Key to Transfer COM Frequencies Between Active and Standby Frequency Boxes

Turn the **COM** Knob to Tune the Frequency in the Tuning Box

Figure 4-4 COM Frequency Tuning

SELECTING THE RADIO TO BE TUNED

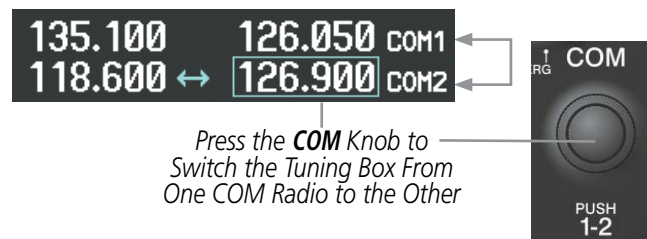Press the small **COM** Knob to transfer the frequency tuning box and Frequency Transfer Arrow between the upper and lower radio frequency fields.

Press the **COM** Knob to Switch the Tuning Box From One COM Radio to the Other

Figure 4-5 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).

Press for Two Seconds to Load 121.500 MHz
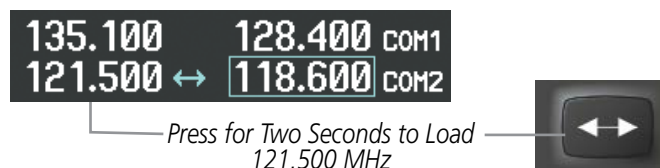
Figure 4-6 Quickly Tuning 121.500 MHz

AUTO-TUNING THE COM FREQUENCY

COM frequencies can be automatically tuned from the following:

• Nearest Airports Window (PFD)

• NRST – Nearest Frequencies Page (ARTCC, FSS, WX)

• WPT – Airport Information Page

• NRST – Nearest Airspaces Page

• NRST – Nearest Airports Page

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AUTO-TUNING FROM THE PFD

COM frequencies for the nearest airports can be automatically tuned 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.

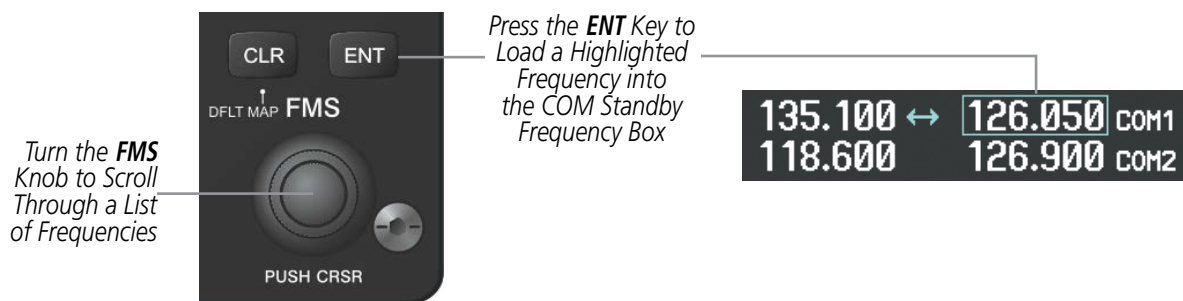4) Press the **Frequency Transfer** Key to transfer the frequency to the COM Active Frequency Field.

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

Figure 4-7 Nearest Airports Window (PFD)

AUTO-TUNING FROM THE MFD

Frequencies can be automatically loaded into the COM Frequency Box from pages in the NRST or WPT page group by highlighting the frequency and pressing the **ENT** Key (Figures 4-8, 4-9, and 4-10).

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 the appropriate softkey.

2) Turn the **FMS** Knob to place the cursor on the desired COM frequency (Figure 4-10).

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 4-8 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.

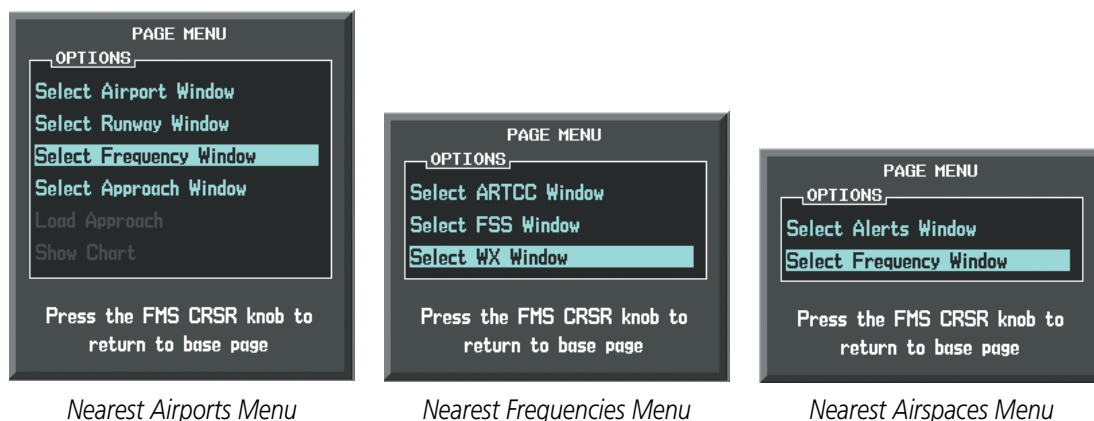Nearest Airports Menu   Nearest Frequencies Menu   Nearest Airspaces Menu

Figure 4-9 Nearest Pages Menus

On the WPT - Airport Information Page, the cursor can be placed on the frequency field by pressing the **FMS** Knob and scrolling through the list. The frequency is transferred to the COM Standby Field with the **ENT** Key.

*Press **Frequency Transfer** Key to Load Frequency into COM Active Frequency Field*

Selected Airport Identifier and Information

Runway Information

*Press **ENT** Key to Load Frequency into COM Standby Field. Cursor then Advances to Next Frequency.*

*Press **INFO-x** Softkey for AIRPORT, RUNWAYS, FREQUENCIES, and AOPA Data*

Figure 4-10 WPT – Airport Information Page

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COM frequencies can also be auto-tuned 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.
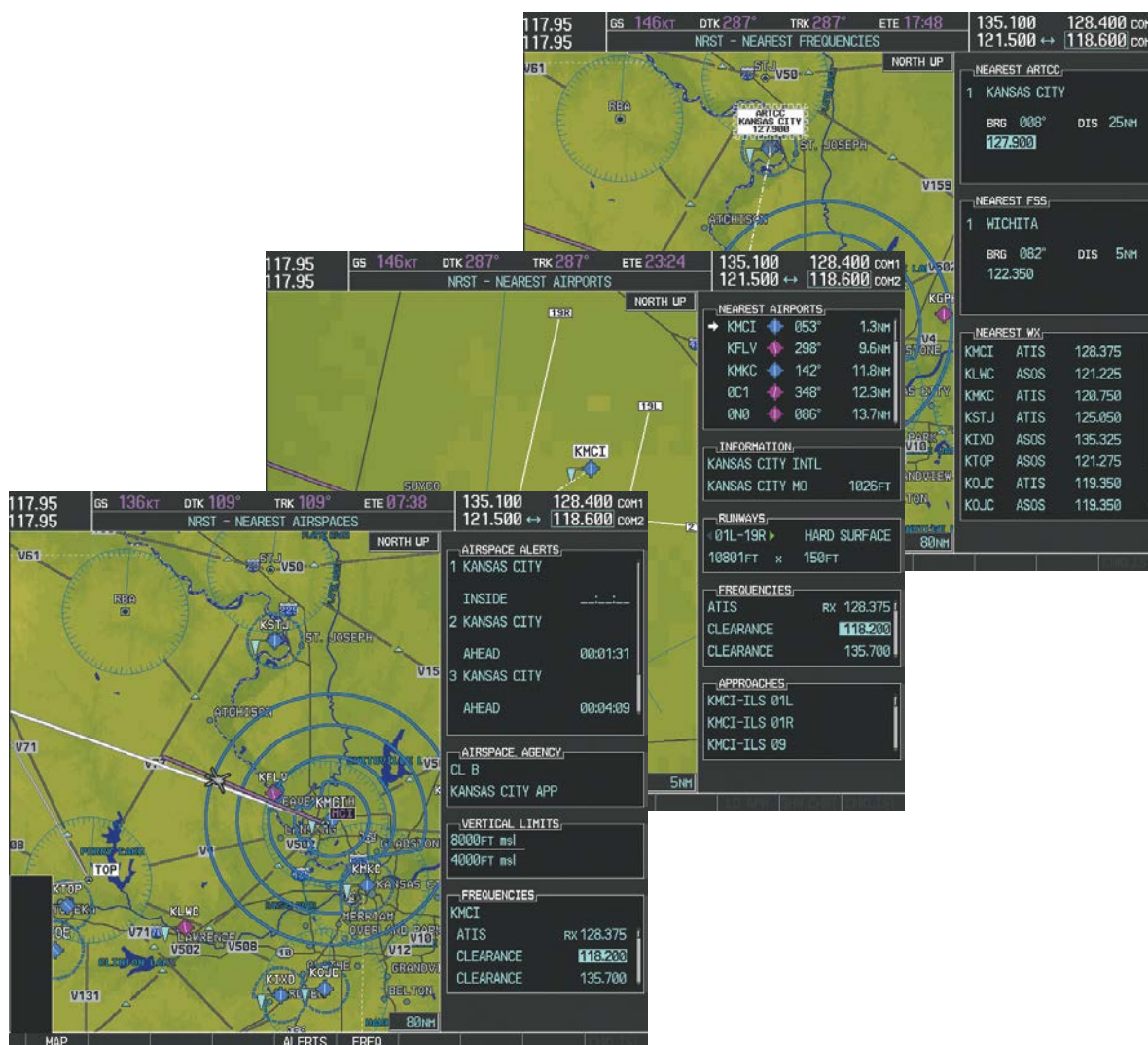
Figure 4-11 NRST – Nearest Airspaces, NRST – Nearest Airports, and NRST – Nearest Frequencies Pages

FREQUENCY SPACING

The 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 4-12 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 system softkeys are blank.
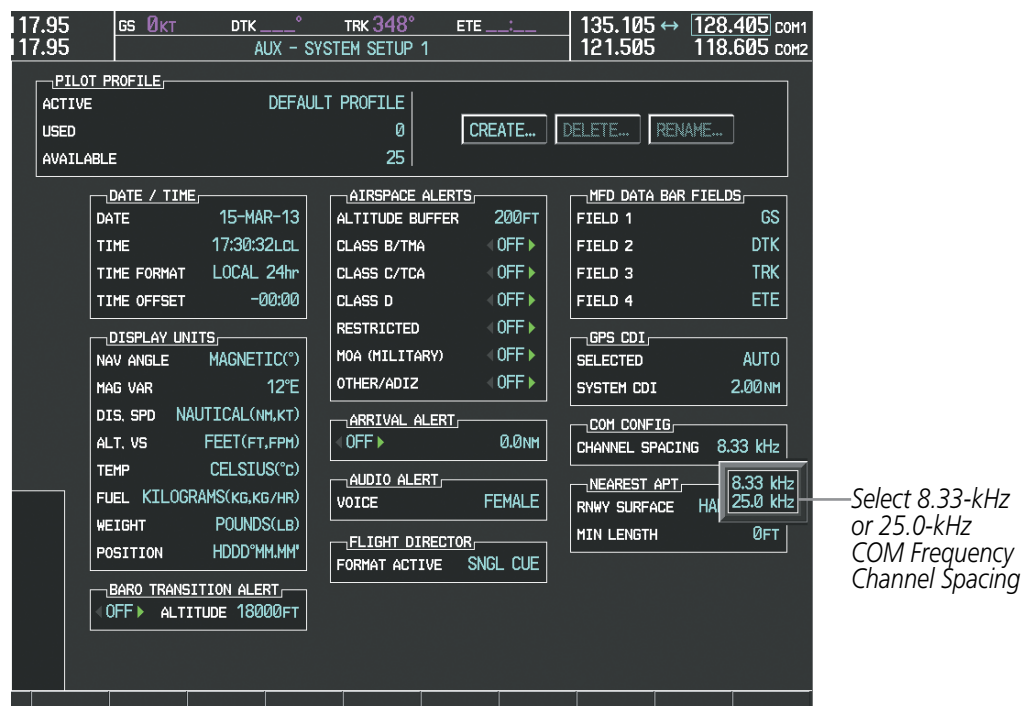
Figure 4-13 AUX – System Setup Page

AUTOMATIC SQUELCH

Automatic COM Squelch quiets unwanted static noise when no audio signal is received, while still providing good sensitivity to weak COM signals. To disable Automatic COM Squelch, press the **VOL/SQ** Knob. When Automatic COM Squelch is disabled, COM audio reception is always on. Continuous static noise is heard over the headsets and speaker, if selected. Pressing the **VOL/SQ** Knob again enables Automatic COM Squelch.
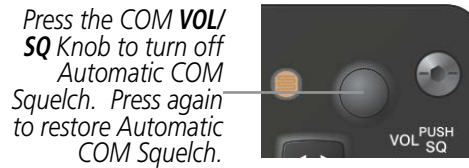
Press the COM VOL/SQ Knob to turn off Automatic COM Squelch. Press again to restore Automatic COM Squelch.

Figure 4-14 Overriding Automatic COM Squelch

COM VOLUME

COM radio volume level can be adjusted 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.

COM Volume Level Remains for Two Seconds
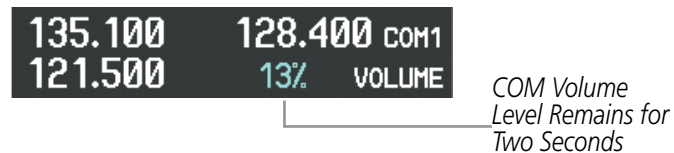
Figure 4-15 COM Volume Level

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.

A NAV radio is selected for navigation by pressing the **CDI** Softkey located on the PFD. 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.

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.

• VOR2 (or LOC2) – If NAV2 is selected, a green double line arrow (shown) labeled either VOR2 or LOC2 is displayed on the HSI.

• 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.
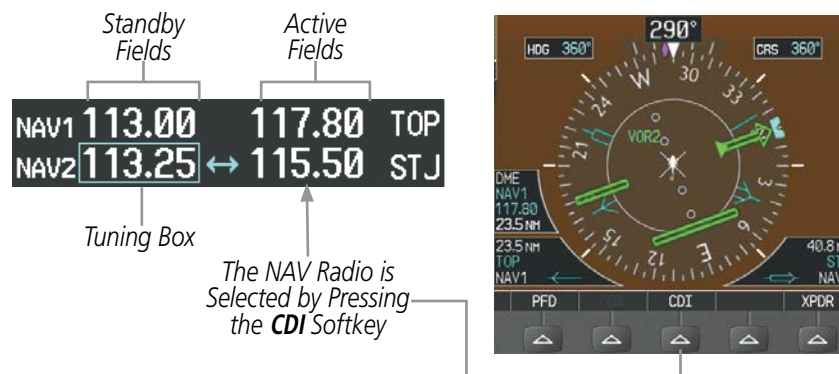

Figure 4-16 Selecting a NAV Radio for Navigation

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

NAV RECEIVER MANUAL TUNING

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

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.

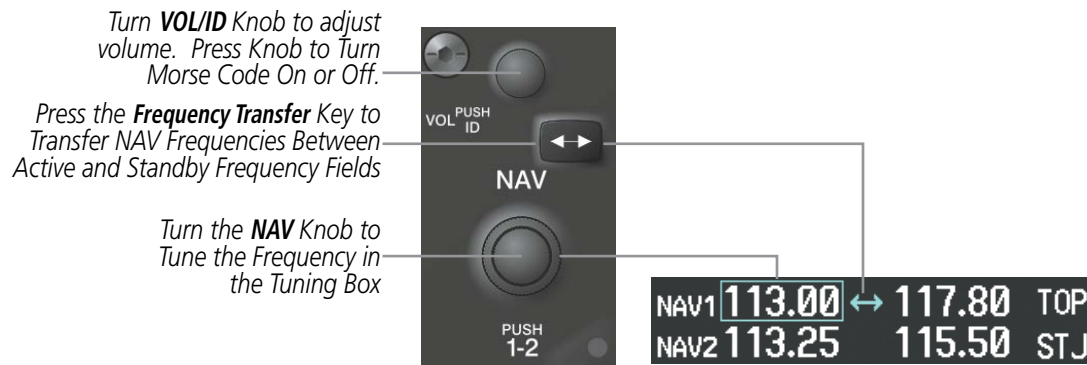4) Press the NAV **VOL/ID** Knob to turn the Morse code identifier audio on and off.

*Turn **VOL/ID** Knob to adjust volume. Press Knob to Turn Morse Code On or Off.*

*Press the **Frequency Transfer** Key to Transfer NAV Frequencies Between Active and Standby Frequency Fields*

*Turn the **NAV** Knob to Tune the Frequency in the Tuning Box*

Figure 4-17 NAV Frequency Tuning

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.

*Press the **NAV** Knob to Switch the Tuning Box From one NAV Radio to the Other*
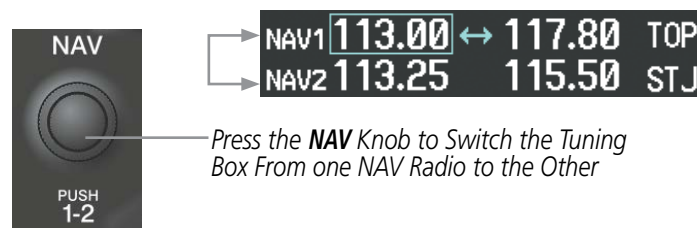
Figure 4-18 Switching NAV Tuning Boxes

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.

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.
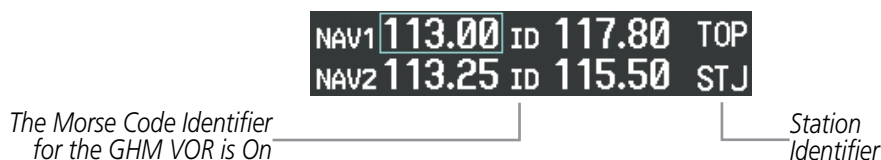
The Morse Code Identifier for the GHM VOR is On — *Station Identifier*

Figure 4-19 NAV Radio ID Indication

NAV VOLUME

NAV Radio volume level can be adjusted 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.

NAV Volume Level Remains for Two Seconds

Figure 4-20 NAV Volume Levels

AUTO-TUNING A NAV FREQUENCY FROM THE MFD

NAV frequencies can be selected and loaded 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.

Frequencies can be automatically loaded into the NAV Frequency Box from pages in the NRST or WPT page group by highlighting the frequency and pressing the **ENT** Key (Figures 4-21, 4-22, and 4-23).

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 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 and Nearest Airports pages, press the **FREQ** Softkey to place the cursor on the NAV frequency (Figure 4-23).

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.

Turn the **FMS** Knob to Scroll Through a List of Frequencies

Press the **ENT** Key to Load a Highlighted Frequency into the NAV Standby Frequency Box
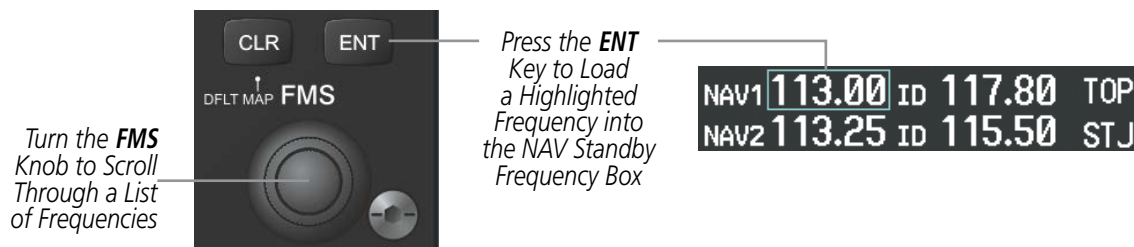
Figure 4-21 NAV Frequency Auto-Tuning from the MFD

Or:

1) When on the Nearest VOR, Nearest Airspaces, and Nearest Airports 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*
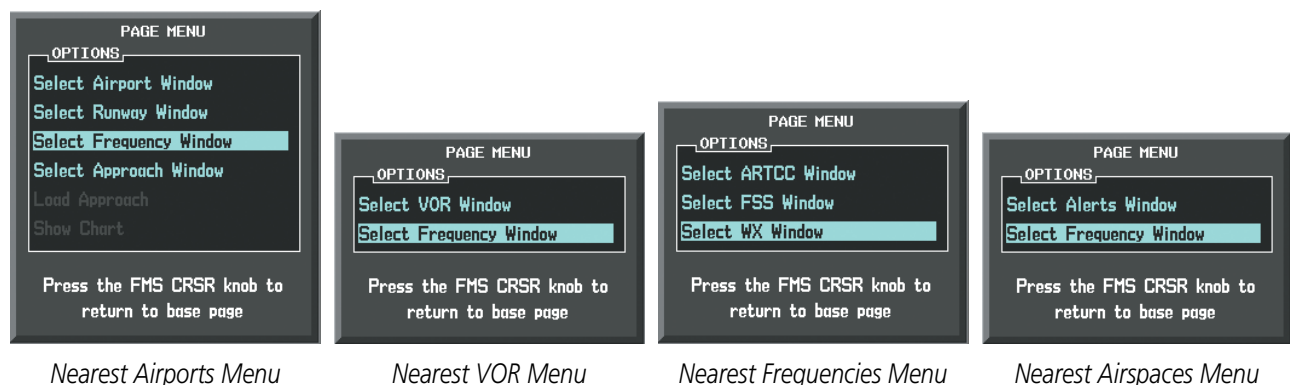
Figure 4-22 Nearest Pages Menus

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

*Press the **ENT** Key to Load the Frequency into the NAV Standby Field.*

*Press the **VOR** Softkey to Place the Cursor on the VOR Identifier*

*Press the **FREQ** Softkey to Place the Cursor on the VOR Frequency*

Figure 4-23 Loading the NAV Frequency from the NRST – Nearest VOR Page

While enroute, NAV frequencies can also be auto-tuned 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.
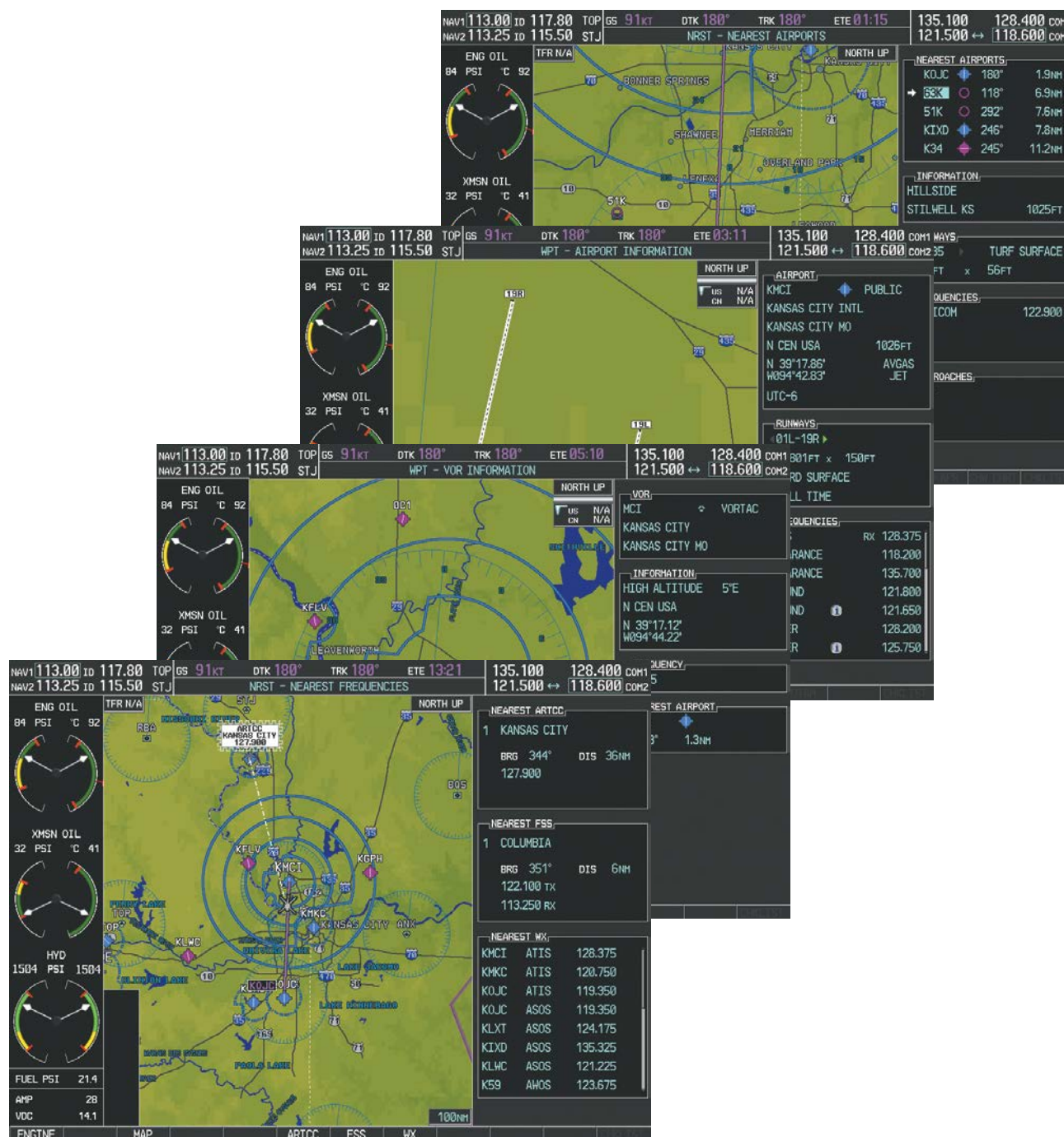
Figure 4-24 NRST – Nearest Frequencies, WPT – VOR Information, WPT – Airport Information, and NRST – Nearest Airports Pages

GARMIN

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 while navigating by GPS, the system automatically switches to LOC 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 active frequency field. The frequency that was previously in the NAV1 active frequency field is transferred to standby.

- If the current CDI navigation source is GPS, and if the approach frequency is already loaded into the NAV1 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.

4.4 GTX 33H MODE S TRANSPONDER

The GTX 33H Mode S Transponder provides 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 (used to exchange information between aircraft and 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

- 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 – Transmits the Automatic Dependent Surveillance-Broadcast (ADS-B) position, velocity, and heading information periodically without requiring an interrogation.

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 pressed, the Mode Selection softkeys appear: **STBY**, **ON**, **ALT**, **GND**, **VFR**, **CODE**, **IDENT**, **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, the code selection cursor can be moved back to the left one digit with each press of the **BKSP** Softkey.

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 the 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 softkey inactivity, the system reverts back to the top-level softkeys.
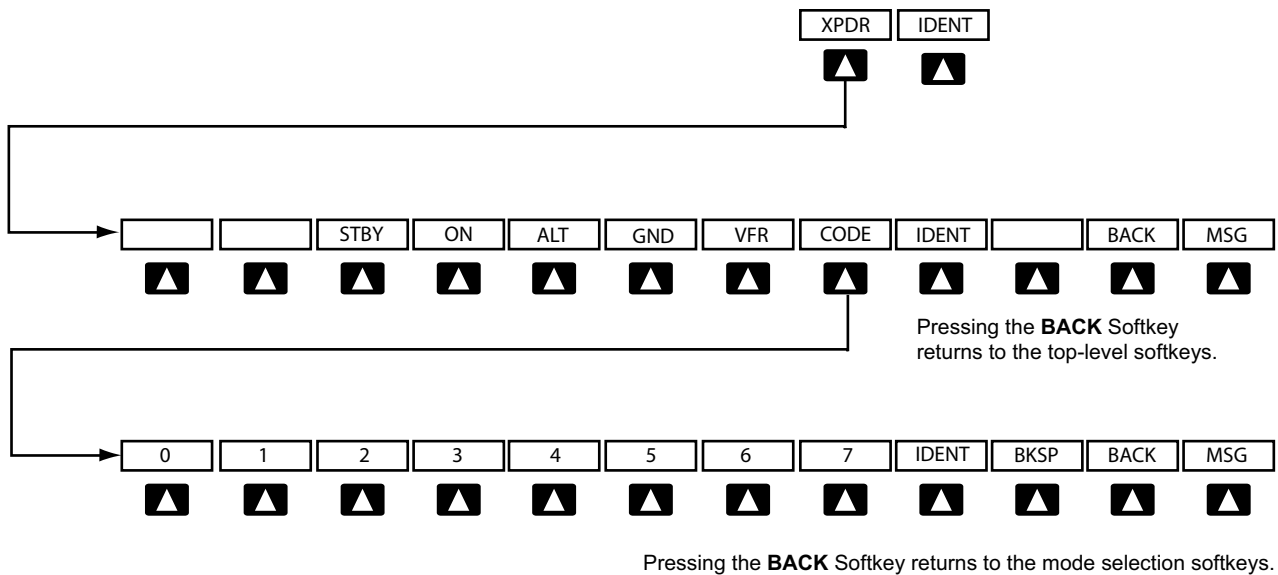
Figure 4-25 Transponder Softkeys (PFD)

TRANSPONDER MODE SELECTION

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

Selecting a transponder mode:

1) Press the **XPDR** Softkey to display the Transponder Mode Selection Softkeys.

2) Press the desired softkey to activate the transponder mode.

GROUND MODE

Ground Mode is normally selected automatically when the aircraft is on the ground. The transponder powers up in the last mode it was in when shut down. Ground Mode can be overridden by pressing any one of the Mode Selection Softkeys. A green GND indication and transponder code appear in the mode field of the Transponder Data Box. In Ground Mode, the transponder does not allow Mode A and Mode C replies, but it does permit acquisition squitter and replies to discretely addressed Mode S interrogations.

When Standby Mode has been selected on the ground, the transponder can be returned to Ground Mode by pressing the **GND** Softkey.
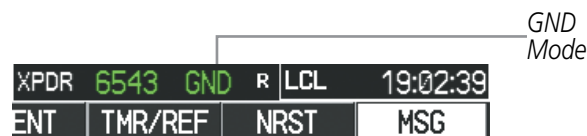
Figure 4-26 Ground Mode

STANDBY MODE (MANUAL)

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

Standby Mode can be selected at any time by pressing the **STBY** Softkey. In Standby, the transponder does not reply to interrogations, but new codes can be entered. When Standby is selected, a white STBY indication and transponder code appear in the mode field of the Transponder Data Box. In all other modes, these fields appear in green.

STBY Mode (White Code Number and Mode)
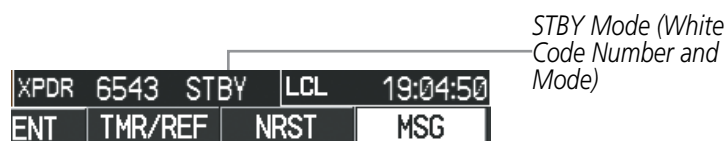
Figure 4-27 Standby Mode

MANUAL ON MODE

ON Mode can be selected at any time by pressing the **ON** Softkey. ON Mode generates Mode A and Mode S replies, but 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.

ON Mode (No Altitude Reporting)
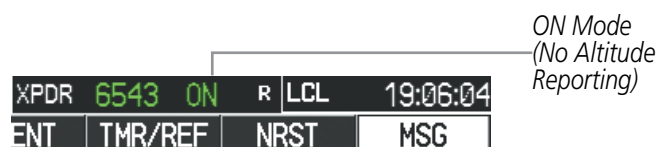
Figure 4-28 ON Mode

ALTITUDE MODE (AUTOMATIC OR MANUAL)

Altitude Mode is automatically selected when the aircraft becomes airborne. Altitude Mode may also be selected manually by pressing the **ALT** Softkey.

If Altitude Mode is selected, 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.

ALT Mode (Mode C Altitude Reporting)

Figure 4-29 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 4-30 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 pressed within 10 seconds, or the entry is cancelled and restored to the previous code. Pressing the **BKSP** Softkey moves the code selection cursor to the previous digit. Five seconds after the fourth digit has been entered, the transponder code becomes active.

Figure 4-31 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 on the PFD 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.
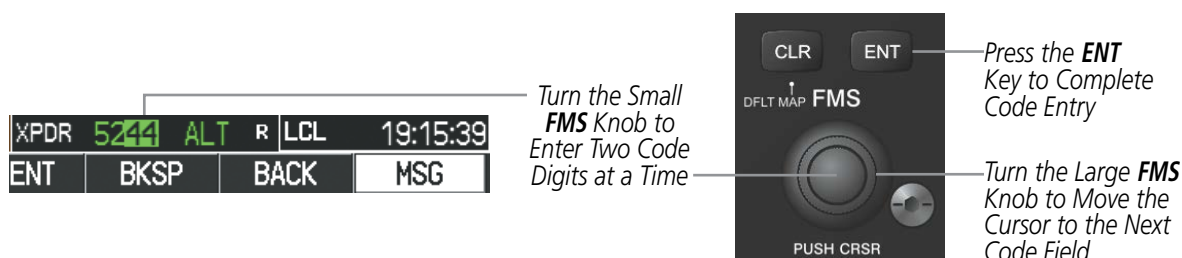
Figure 4-32 Entering a Code with the FMS Knob

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.

VFR Code

XPDR	1200	ALT	R	LCL	19:17:46
ENT	TMR/REF		NRST		MSG

Figure 4-33 VFR Code

IDENT FUNCTION

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

Pressing the **IDENT** Softkey sends 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.

IDNT Indication

XPDR	1200	IDNT	R	LCL	19:20:18
IDENT	TMR/REF		NRST		MSG

*Press the **IDENT** Softkey to Initiate the ID Function*

Figure 4-34 IDENT Softkey and Indication

4.5 ABNORMAL OPERATION

Abnormal operation of the system includes equipment failures of the system 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 pilot of a stuck microphone.
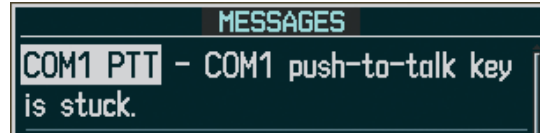
Figure 4-35 Stuck Microphone Alert

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 4-36 COM Tuning Failure

SECTION 5 FLIGHT MANAGEMENT

5.1 INTRODUCTION

The G1000H is an integrated flight, engine, communication, navigation and surveillance system. This section of the Pilot's Guide explains flight management using the G1000H.

The most prominent part of the system are the two full color displays: a Primary Flight Display (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), Approach (LNAV, LNAV+V, L/VNAV, LP, LPV), or Missed Approach (MAPR)). L/VNAV, LP, and LPV approaches are only available with SBAS. L/VNAV approaches will be flown as a Baro VNAV approach when SBAS is not available.

The Inset Map is a small version of the MFD Navigation Map and is displayed in the lower right corner of the PFD.

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 selecting 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
→	Active Leg
⊕→	Direct-to
	Right Procedure Turn
	Left Procedure Turn
	Right Holding Pattern
	Left Holding Pattern
vtf	Vector to Final
	Right DME Arc
	Left DME Arc

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

- Bearing (BRG)
- Distance (DIS)
- Desired Track (DTK)
- Endurance (END)
- Enroute Safe Altitude (ESA)
- Estimated Time of Arrival (ETA)
- Estimated Time Enroute (ETE)
- Fuel on Board (FOB)
- Fuel over Destination (FOD)
- Ground Speed (GS)
- Minimum Safe Altitude (MSA)
- True Air Speed (TAS)
- Track Angle Error (TKE)
- Track (TRK)
- Vertical Speed Required (VSR)
- Crosstrack Error (XTK)

GS 146KT   DTK 286°   TRK 286°   ETE 11:42

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.

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 system to provide situational awareness in flight. Most system maps can display the following information:

- Airports, NAVAIDs, airspaces, airways, land data (highways, cities, lakes, rivers, borders, etc.) with names

- Map Pointer information (distance and bearing to pointer, location of pointer, name, and other pertinent information)

- Map range

- Wind direction and speed

- Map orientation

- Icons for enabled map features

- Aircraft icon (representing present position)

- Nav range ring

- Fuel range ring

- 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.

Map Setup Selection

Figure 5-4 Navigation Map Page Menu Window

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

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

Map Group Selection
Orientation Field
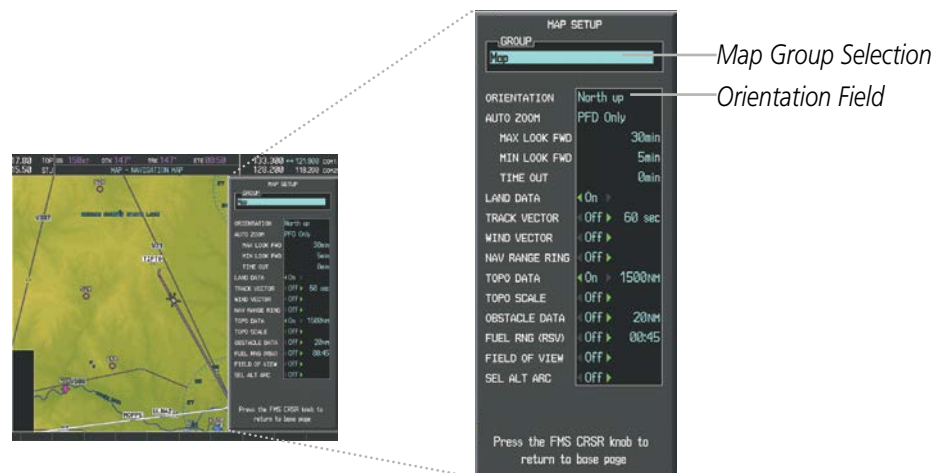
Figure 5-5 Map Setup Menu Window - Map Group

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

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

6) Press the **FMS** Knob to return to the base 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 system 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 system 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, any map page displaying TAWS/TERRAIN data automatically adjusts to the smallest map range clearly showing the highest priority alert. 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 PFDs 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 determines 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.

Map Pointer Information ———

Map 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.

Information about Point of Interest

Map Pointer on POI

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.

Information about Airspace

Map Pointer on Airspace

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.
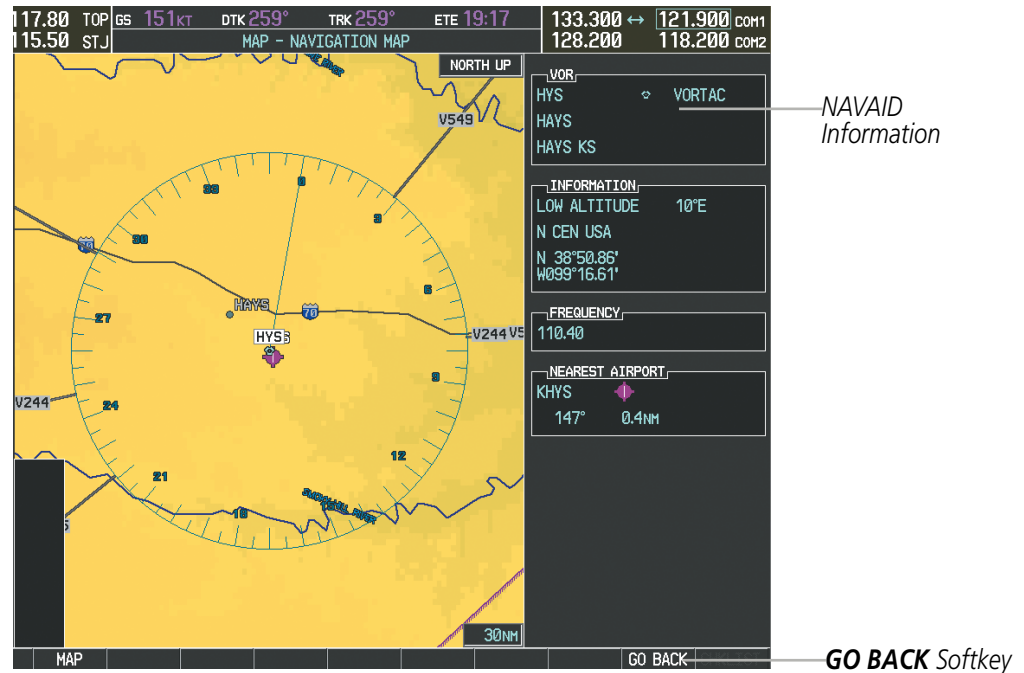
Figure 5-11 Navigation Map - Information Window - NAVAID

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.
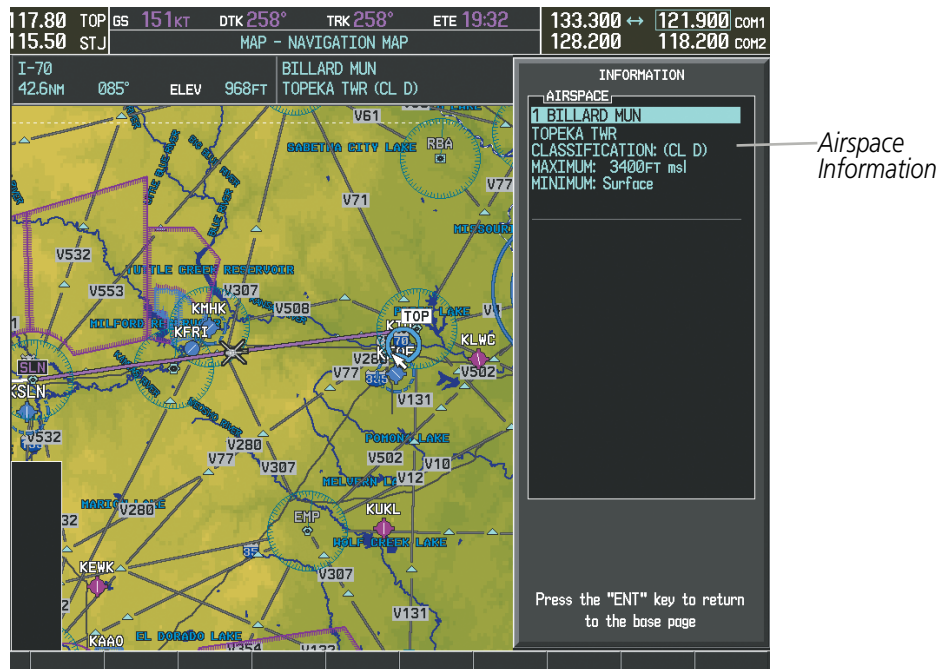
Figure 5-12 Navigation Map - Information Window - Airspace

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.
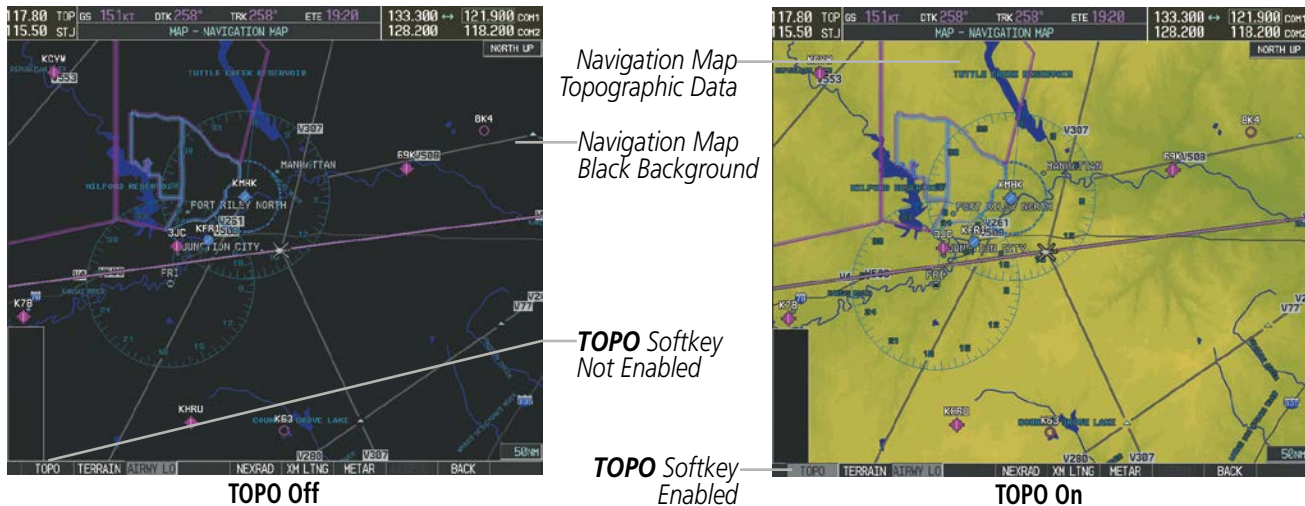
Figure 5-14 Navigation Map - Topographic Data

Displaying/removing topographic data on all pages displaying navigation maps:

1) Press the **MAP** Softkey.

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.
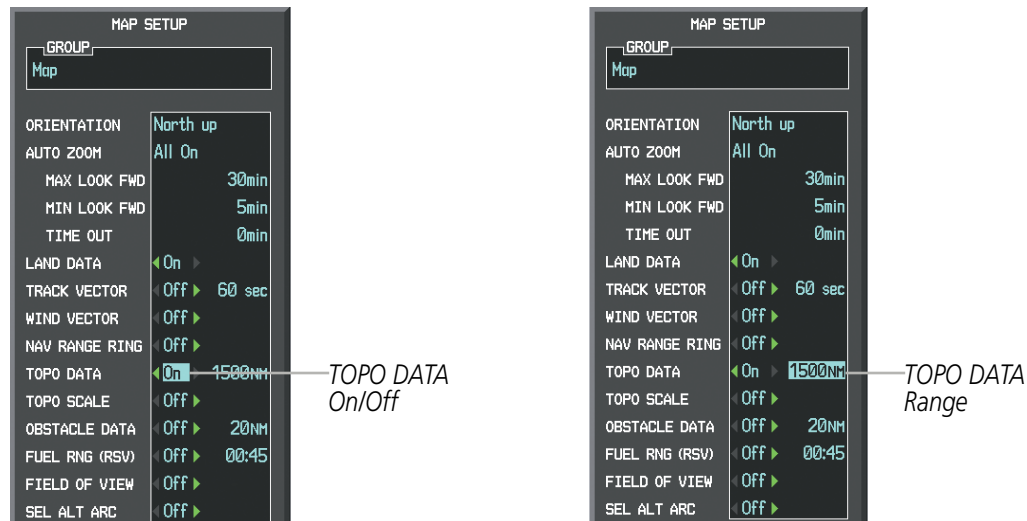
Figure 5-15 Navigation Map Setup Menu - TOPO DATA Setup

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.

Maximum Displayed Elevation
Minimum Displayed Elevation
Aircraft Altitude (MSL)
Range of Displayed Elevations
Ground Elevation at Map Pointer Location (only visible when Map Pointer is displayed)
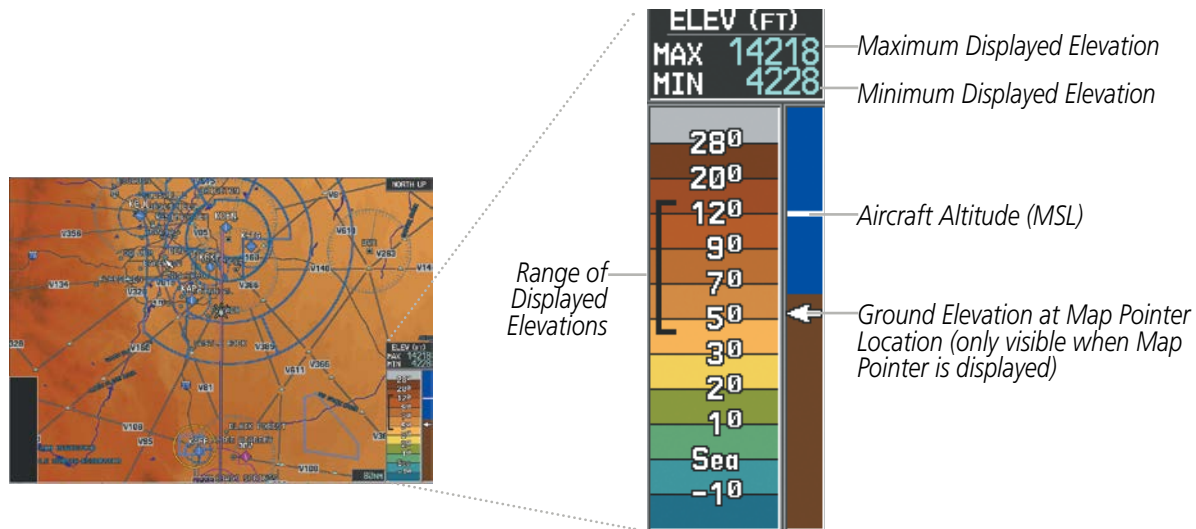
Figure 5-16 Navigation Map - TOPO SCALE

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 select 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.

TOPO SCALE On/Off
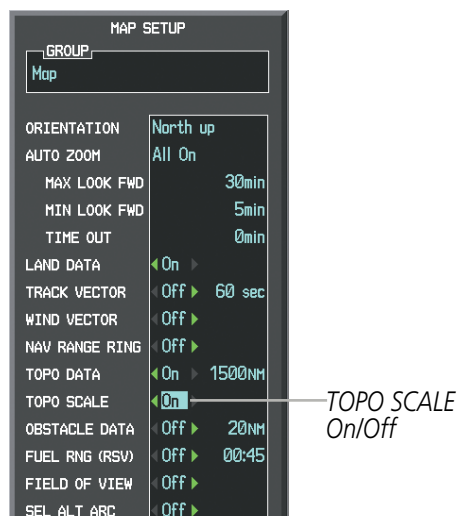
Figure 5-17 Navigation Map Setup Menu - TOPO SCALE Setup

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:
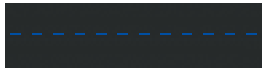
Land Symbols (Text label size can be None, Small, Medium (Med), or Large (Lrg))	Symbol	Default Range (nm)	Maximum Range (nm)
Latitude/Longitude (LAT/LON)		Off	2000
Highways and Roads			
Interstate Highway (FREEWAY)		300	800
International Highway (FREEWAY)		300	800
US Highway (NATIONAL HWY)		30	80
State 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)	ST/PRV BORDER	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:

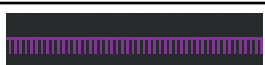| Aviation Symbols *(Text label size can be None, Small, Medium (Med), or Large (Lrg))*	Symbol	Default Range (nm)	Maximum Range (nm)
Active Flight Plan Leg (ACTIVE FPL)		2000	2000
Non-active Flight Plan Leg (ACTIVE FPL)		2000	2000
Active Flight Plan Waypoint (ACTIVE FPL WPT)	See Airports, NAVAIDs	2000	2000
Large Airports (LARGE APT)		250	500
Medium Airports (MEDIUM APT)		150	300
Small Airports (SMALL APT)		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
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.
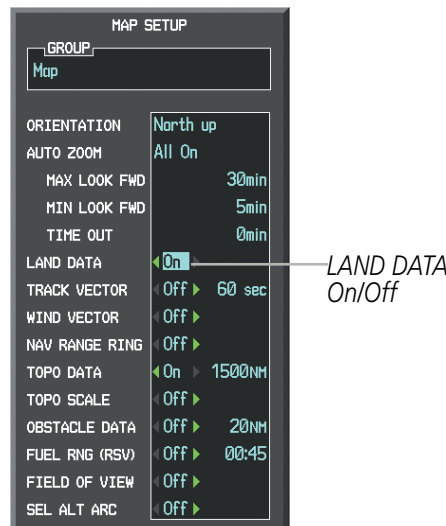
Figure 5-18 Navigation Map Setup Menu - LAND DATA Setup

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.

Text Label Size
(None, Small, Med, or Lrg)

Maximum Display Range

Figure 5-19 Navigation Map Setup Menu - LAND GROUP Setup

Text Label Size
(None, Small, Med, or Lrg)

Maximum Display Range

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**
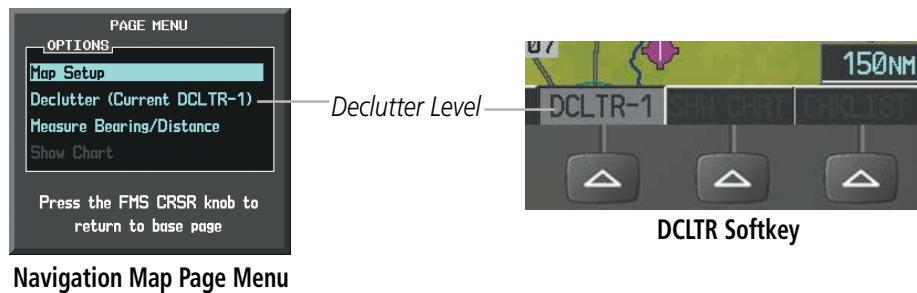
Figure 5-21 Navigation Map - Declutter Level Indications

Decluttering the map:

Select 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.

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	Least
NEXRAD			X
Lightning Data			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 (or Victor Airways) primarily serve smaller piston-engine, propeller-driven airplanes on shorter routes and at lower altitudes. Airways are eight nautical miles wide and 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" before the airway number (hence the name "Victor Airways") since they run primarily between VORs.

High Altitude Airways (or Jet Routes) primarily serve airliners, jets, turboprops, and turbocharged piston aircraft operating above 18,000 feet MSL. Jet Routes start at 18,000 feet MSL and extend upward to 45,000 feet MSL (altitudes above 18,000 feet are called "flight levels" and are described as FL450 for 45,000 feet MSL). Jet Routes are designated with a "J" before the route 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.
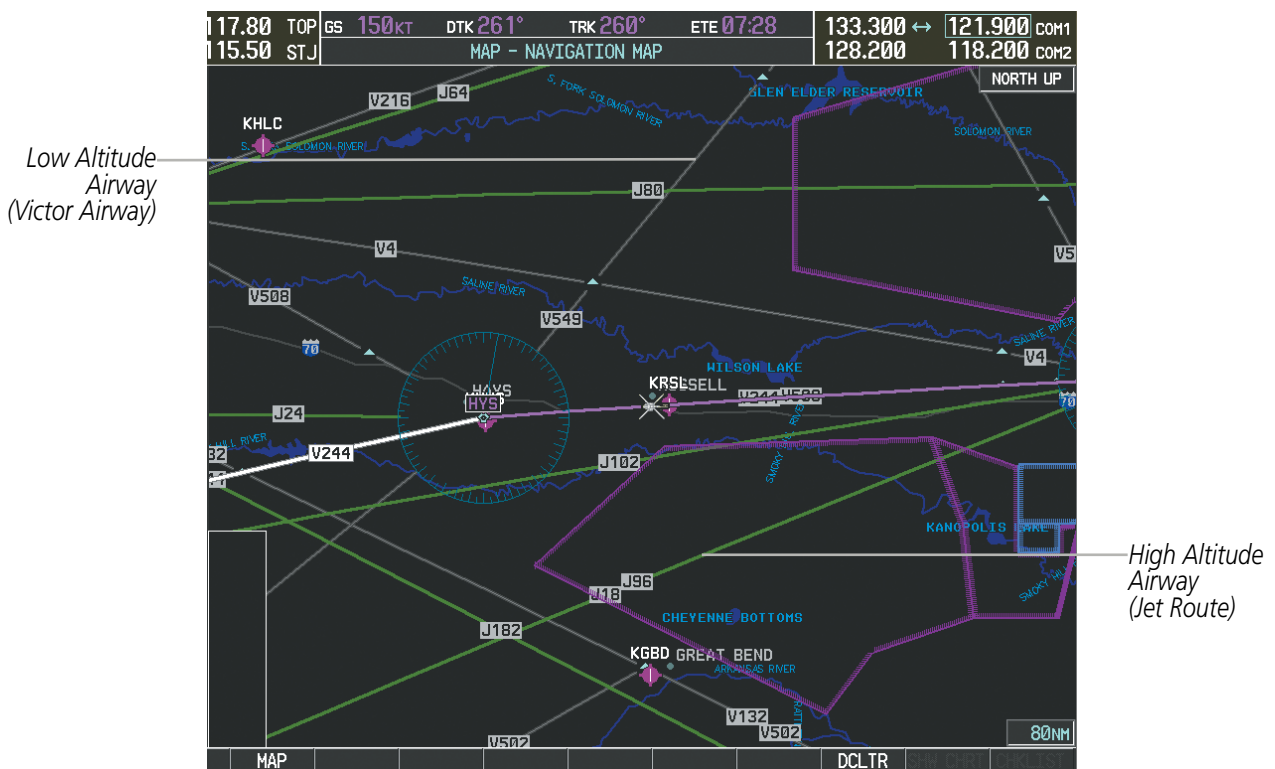

Figure 5-22 Airways on MFD Navigation Page

Airways may be displayed on the map at the pilot's discretion using either a combination of **AIRWAYS** 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) Select the **MAP** Softkey.

2) Select the **AIRWAYS** Softkey. Both High and Low Altitude Airways are displayed (AIRWY ON).

3) Select the softkey again to display Low Altitude Airways only (AIRWY LO).

4) Select the softkey again to display High Altitude Airways only (AIRWY HI).

5) Select the softkey again to remove High Altitude Airways. No airways are displayed (AIRWAYS).

   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.
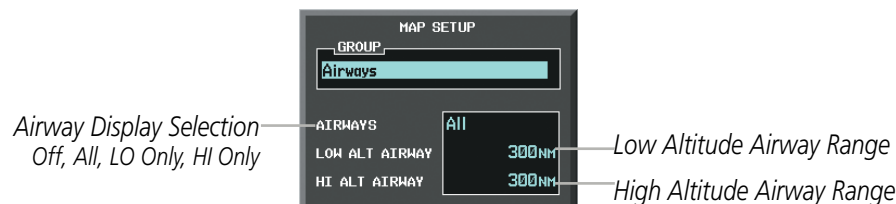
Figure 5-23 Navigation Map Setup Menu - AIRWAYS Setup

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)	V4	200	500
High Altitude Airway (HI ALT AIRWAY)	J24	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 light blue 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. It is always a straight line for the 2 min, 5 min, 10 min and 20 min settings.
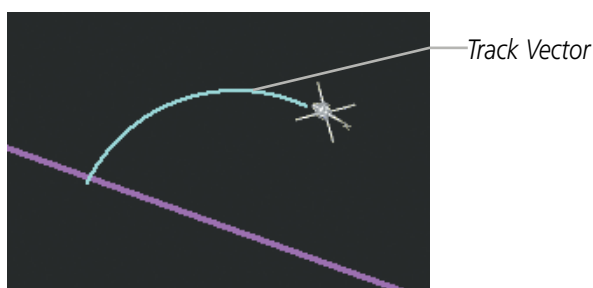
Track Vector

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.
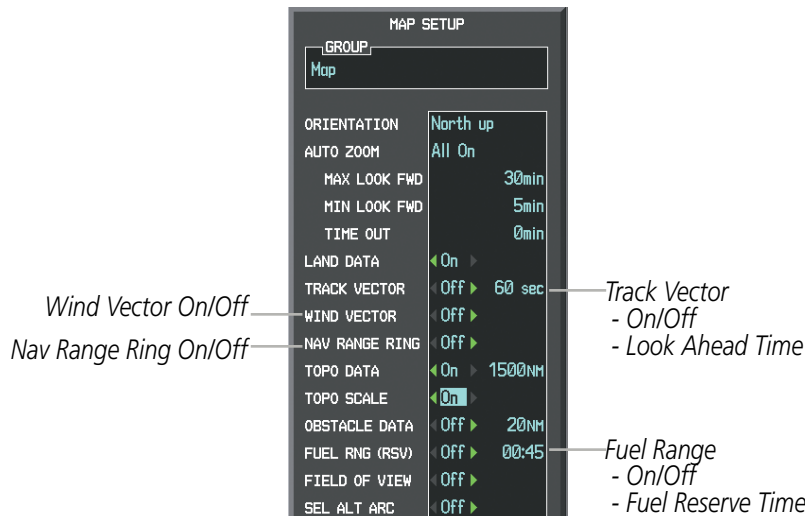
Figure 5-25 Navigation Map Setup Menu -TRACK VECTOR, WIND VECTOR, NAV RANGE RING, FUEL RANGE RING Setup

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).

Range (radius)
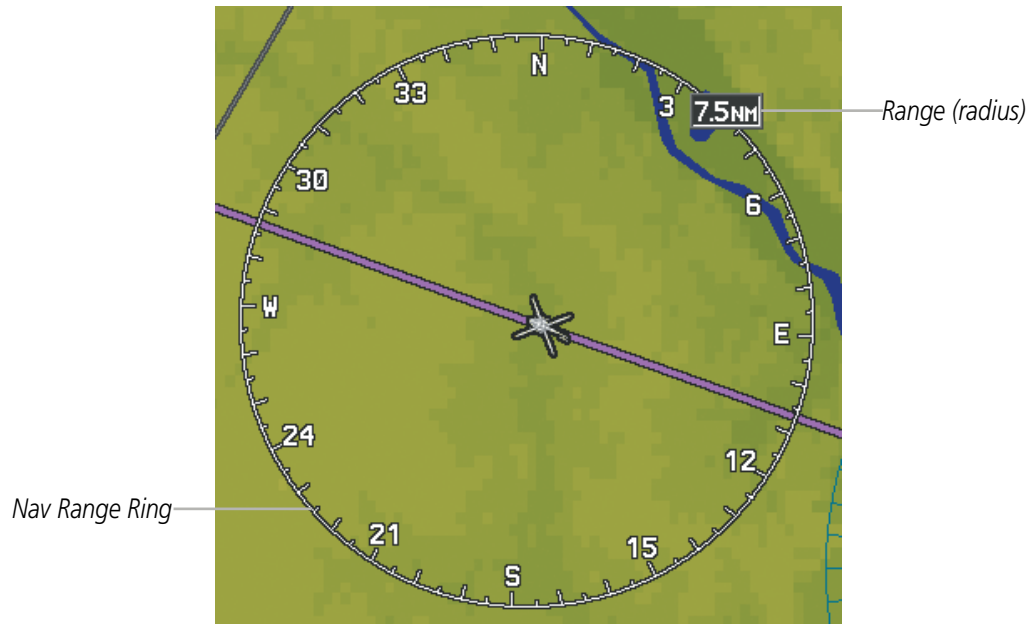
Nav Range Ring

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 yellow circle.

> ✅ *NOTE: The fuel range ring is intended as an aid to trip planning only, and may not provide the accuracy upon which to solely base decisions on maximum flight range.*
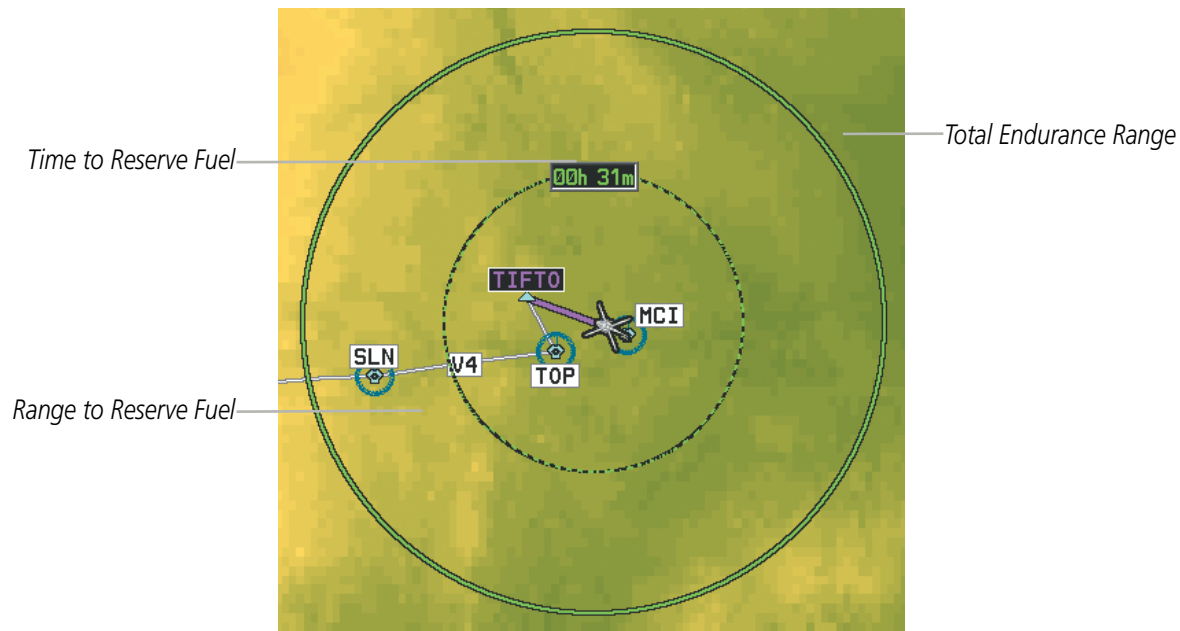
Figure 5-28 Navigation Map - Fuel Range Ring

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 (SVS)

The map can display the boundaries of the PFD Synthetic Vision System (SVS) 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.

Lateral Field of View Boundaries
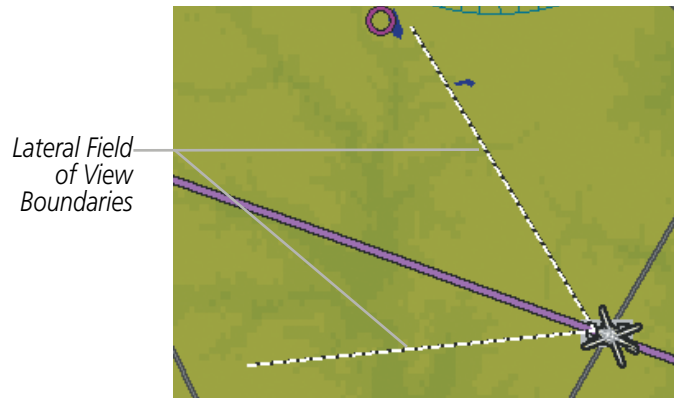
Figure 5-29 Navigation Map - Field of View

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 light blue arc when the aircraft is actuallly climbing or descending.

Range to Altitude Arc
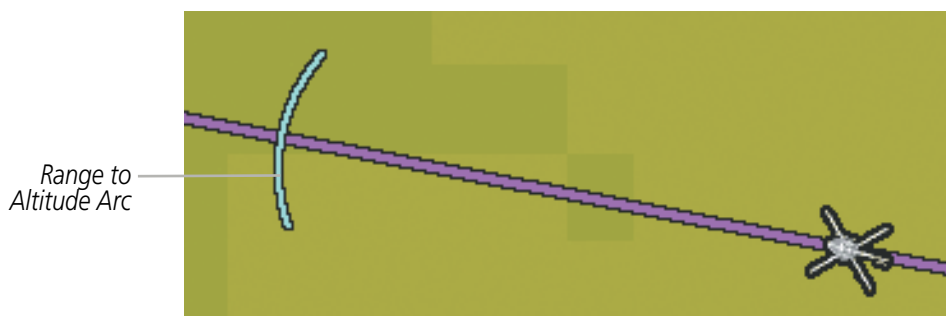
Figure 5-30 Navigation Map - Range to Altitude Arc

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.

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 system. As a waypoint identifier, facility name, or location is entered, the system'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 5-31 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.

Identifier with Duplicates

Duplicate Waypoints

Duplicate Message

Figure 5-32 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.

Navigation Map Showing Selected Airport

Airport/Runway Diagram

Softkeys

Airport Information
- *ID/Facility/City*
- *Usage Type/Region*
- *Lat/Long/Elev*
- *Fuel Available*
- *Time Zone (UTC Offset)*

Runway Information
- *Designation*
- *Length/Width/Surface*
- *Lighting Available*

COM/NAV Freq. Info.
- *Identification*
- *Frequency*
- *Availability*
- *Additional Information*
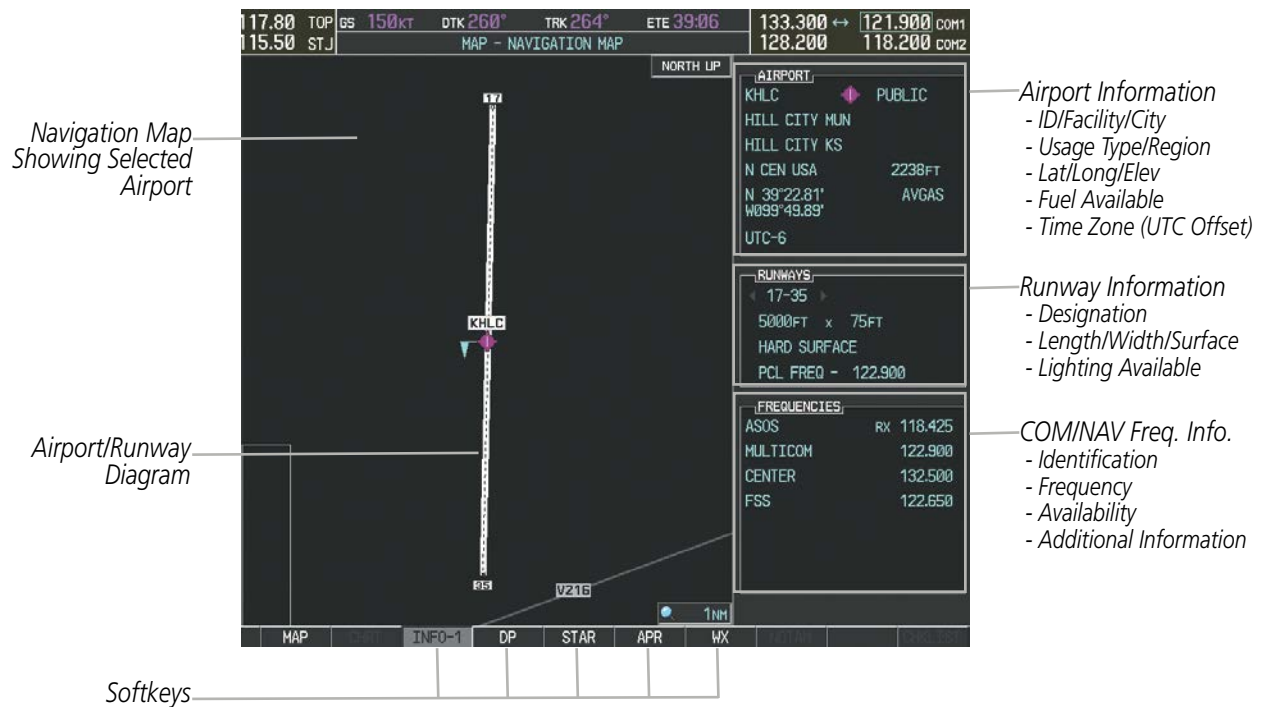
Figure 5-33 Airport Information Page

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 5-34 Airport Directory Page Example

The AOPA directory information is viewed on the Airport Directory Page by pressing the INFO softkey until **INFO-2** is displayed. The following are types of AOPA airport directory information shown (if available) on the Airport Directory Page:
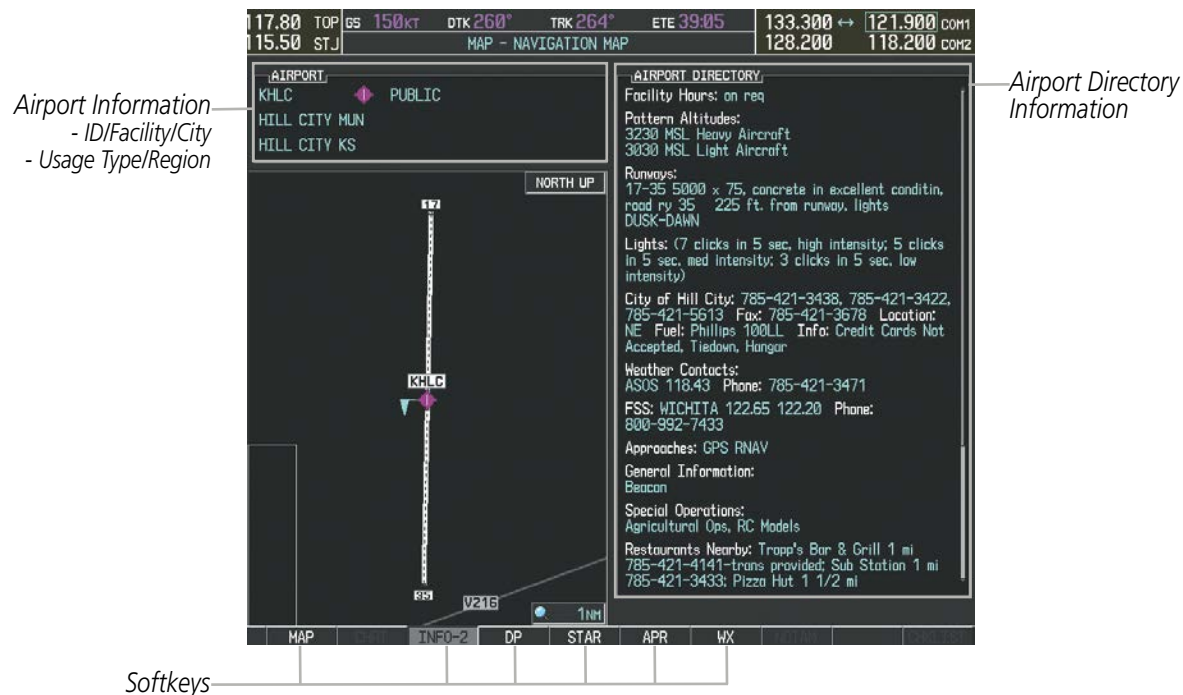
- **Airport**: Identifier, Site Number, Name, City, State
- **Phones**: Phone/Fax Numbers
- **Hours**: Facility Hours, Light Hours, Tower Hours, Beacon Hours
- **Location**: Sectional, Magnetic Variation
- **Frequencies**: Type/Frequency
- **Transportation**: Ground Transportation Type Available
- **Approach**: 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 system 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 the 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.
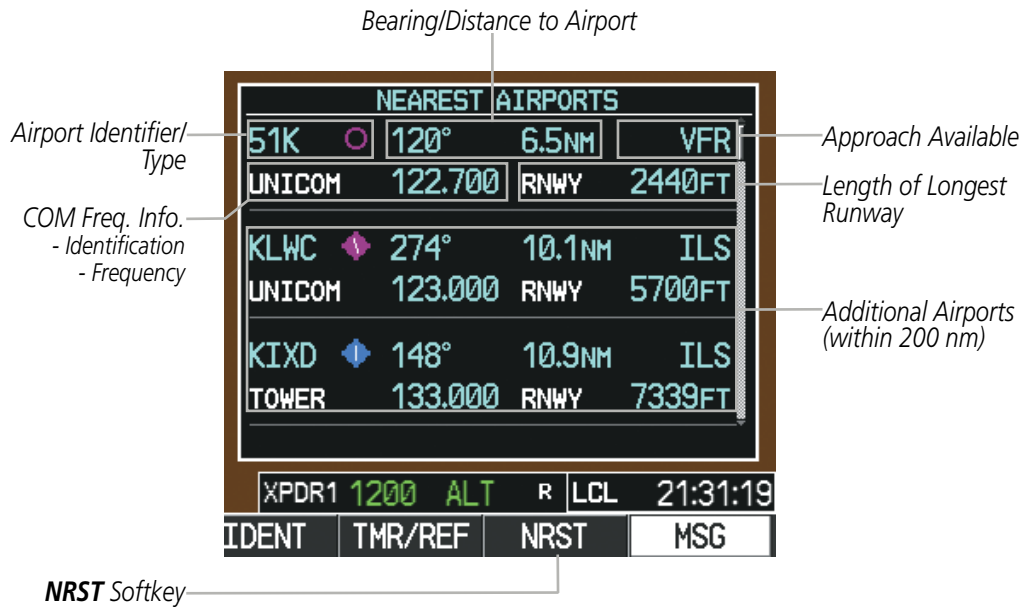
Bearing/Distance to Airport

Figure 5-35 Nearest Airports Window on PFD

Airport Identifier/Type

COM Freq. Info.
- Identification
- Frequency

Approach Available

Length of Longest Runway

Additional Airports (within 200 nm)

NRST *Softkey*

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.
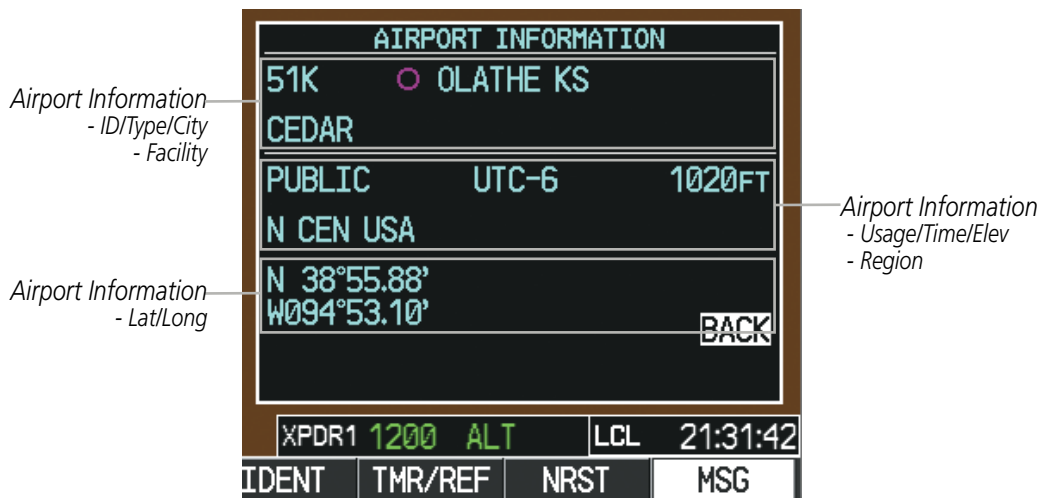

Figure 5-36 Airport Information Window on PFD

Airport Information
- ID/Type/City
- Facility

Airport Information
- Lat/Long

Airport Information
- Usage/Time/Elev
- Region

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 five frequencies, and up to five 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 5-37 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)

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.

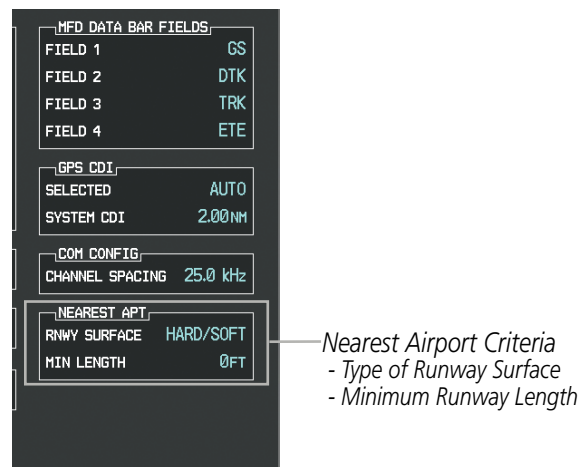**5)** Press the **FMS** Knob to remove the flashing cursor.

Figure 5-38 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 5-39 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.

Navigation Map Showing Nearest Intersection

Intersection Information
- Identifier/Symbol
- Bearing/Distance to intersection from aircraft position

Intersection Lat/Long

Nearest Intersection

Reference VOR Info
- Identifier/Type (symbol)
- VOR Frequency
- Bearing/Distance to VOR

Figure 5-40 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'.
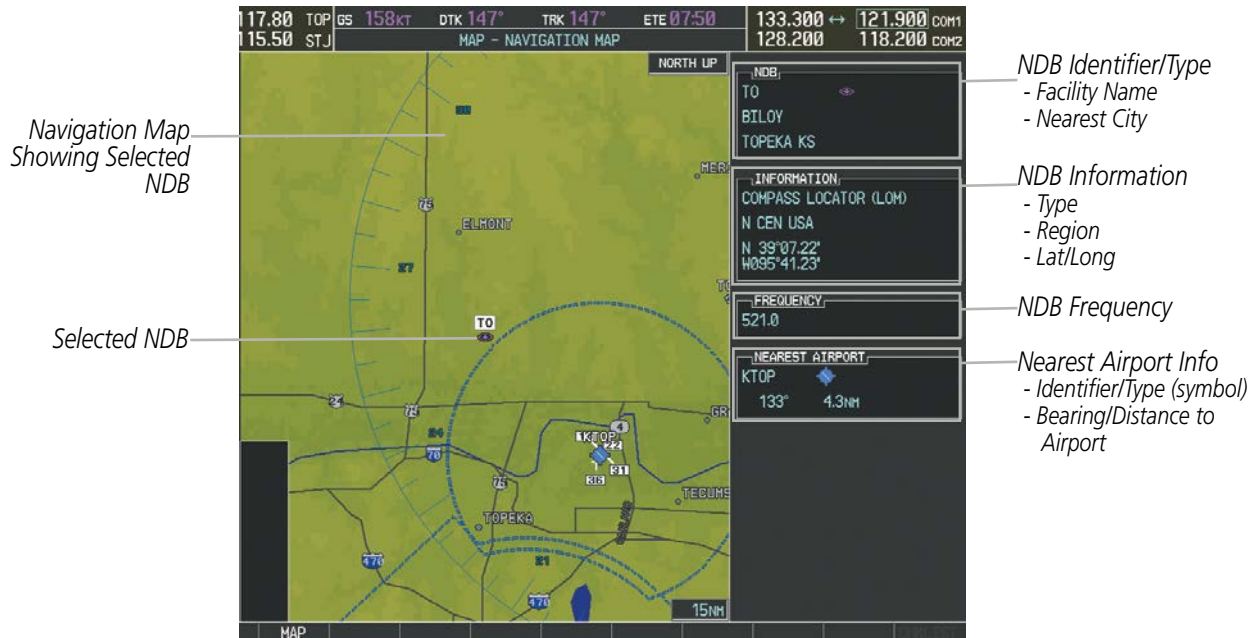

Figure 5-41 NDB Information Page

✏️ **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 5-42 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 i s 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 5-43 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 5-44 Nearest VOR Page

USER WAYPOINTS

The system 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.
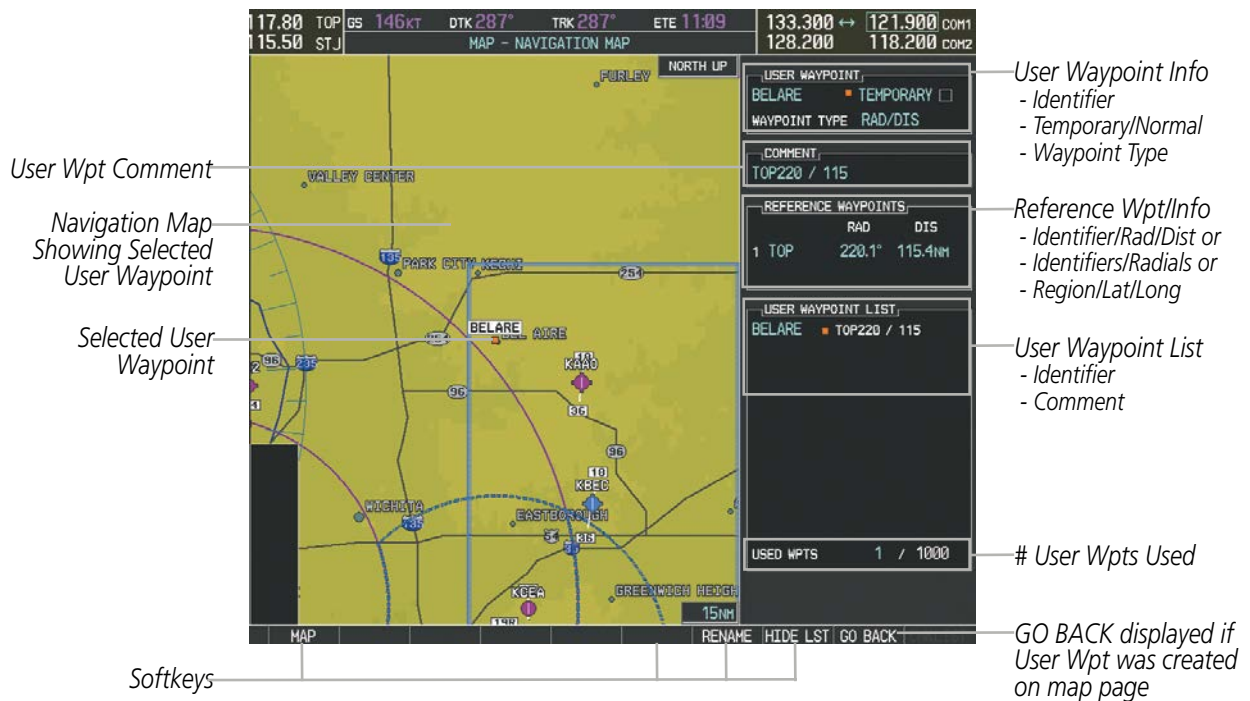
Figure 5-45 User Waypoint Information Page

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.

Navigation Map
Showing Selected
User Waypoint

Nearest User Wpt List
- Identifier
- Bearing/Distance from
  aircraft position

User Waypoint Info
- Comment
- Lat/Long

Reference Wpt Info
- Identifier
- Radial/Distance

Selected User
Waypoint

Figure 5-46 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) Select 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:

   a) 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:

   b) 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:

   c) 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 selecting the **ENT** Key to check or uncheck the box.

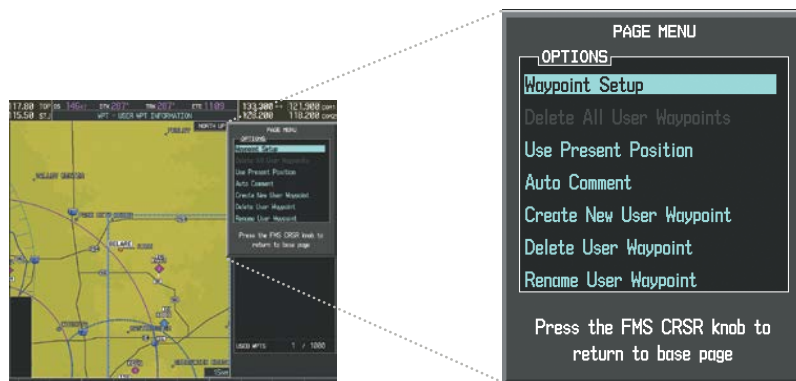7) Press the **FMS** Knob to remove the flashing cursor.

   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:

   a) 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:

   b) 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:

   c) 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 selecting the **ENT** Key to check or uncheck the box.

8) Press the **FMS** Knob to remove the flashing cursor.

Figure 5-47 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:

a) 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:

b) 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:

c) 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 selecting 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 system 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).
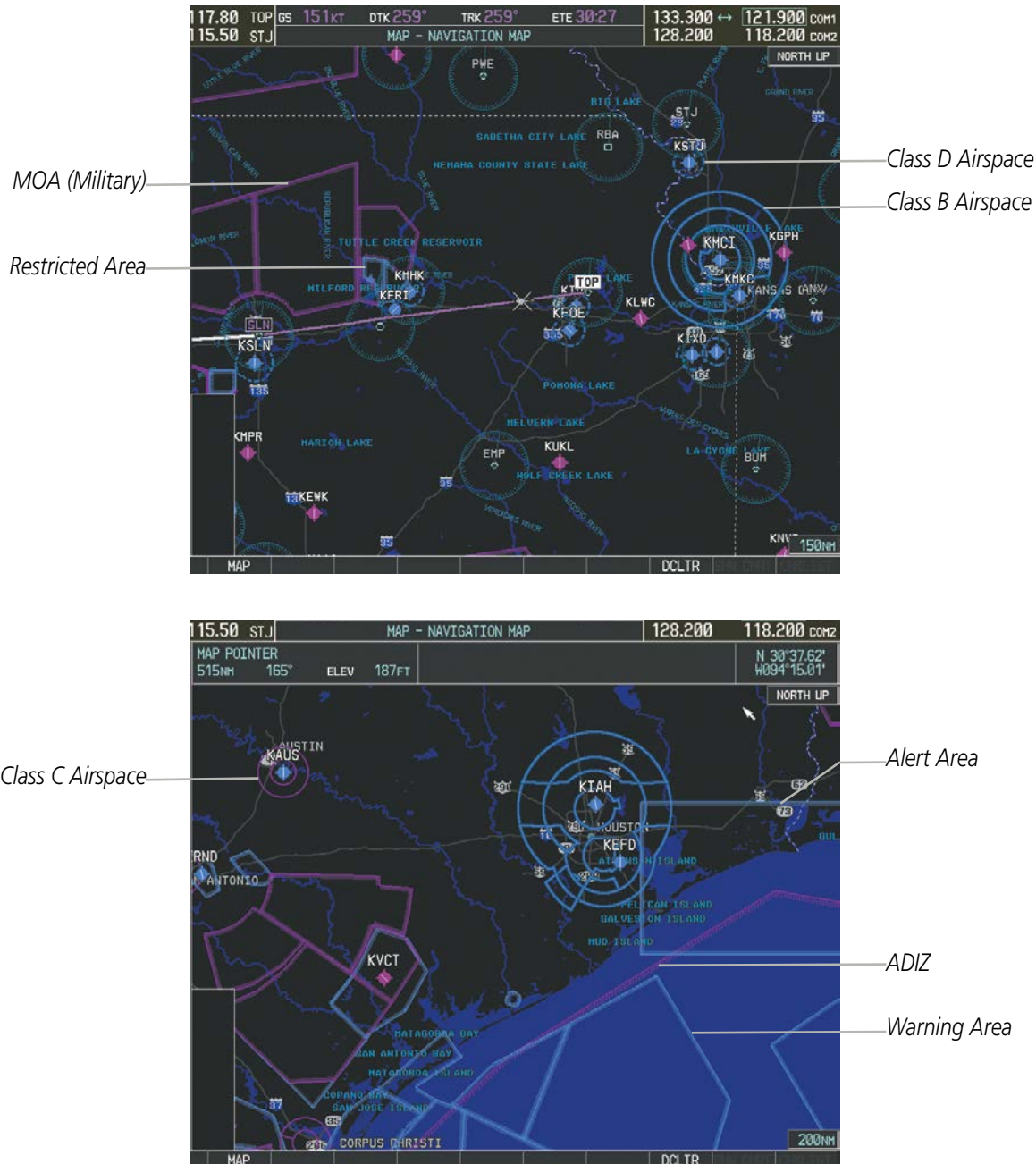
Figure 5-48 Airspaces

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 5-49 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'.
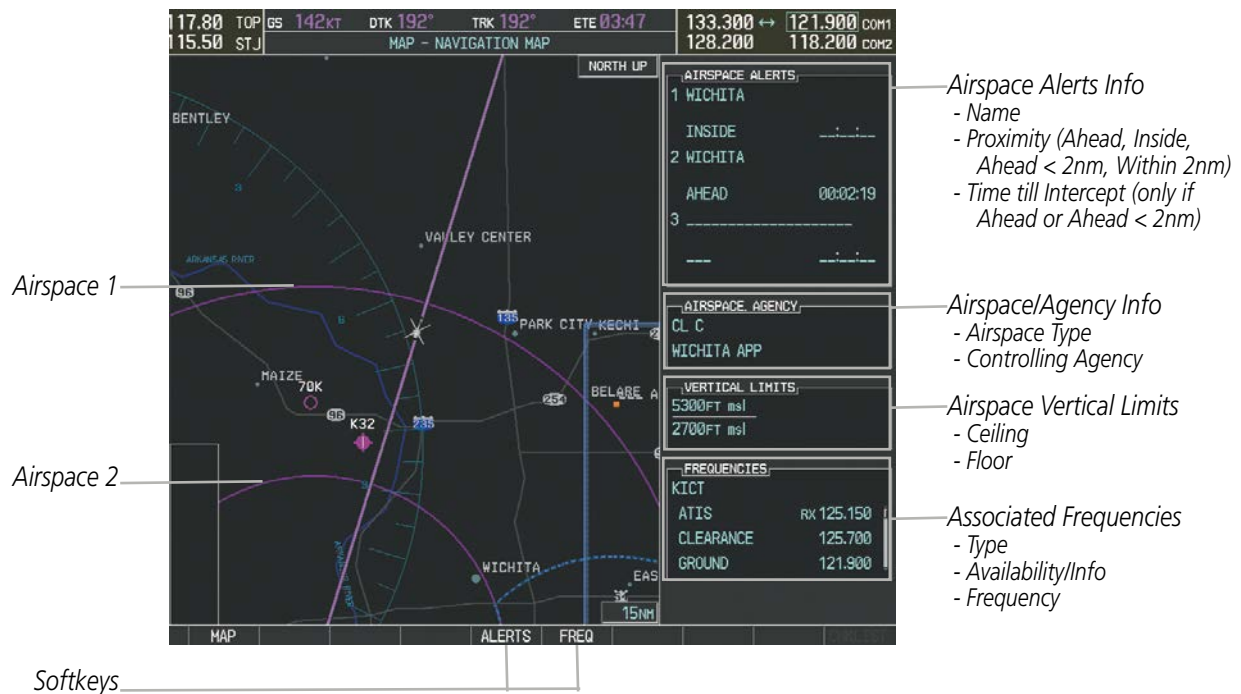
Figure 5-50 Nearest Airspaces Page

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

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 system 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.
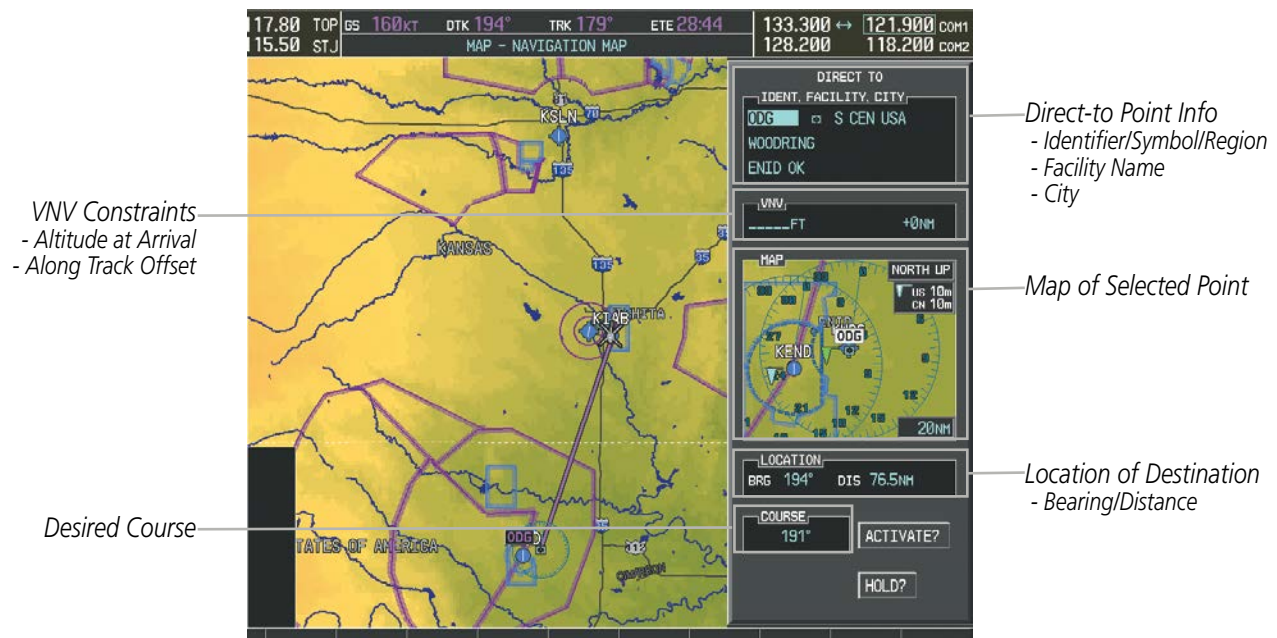
Figure 5-51 Direct-to Window - MFD
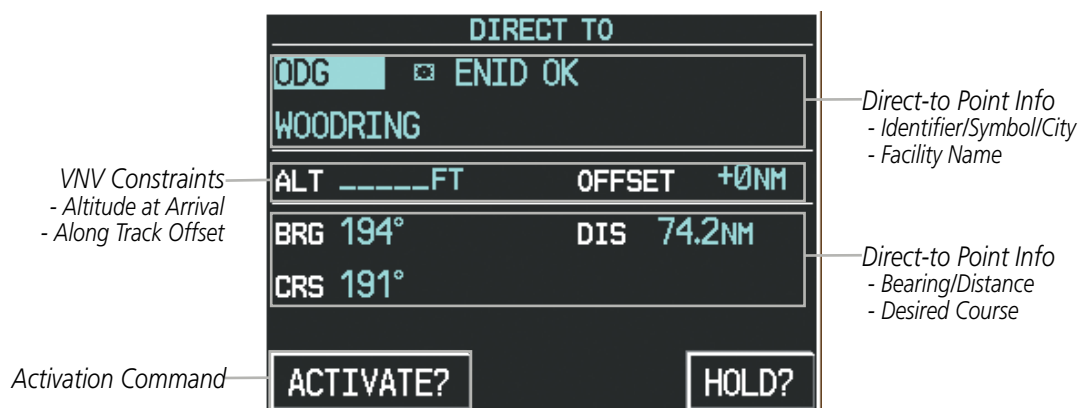
Figure 5-52 Direct-to Window - PFD

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.

Waypoint Submenu
- Flight Plan Waypoints
- Nearest Airports
- Recent Waypoints
- User Waypoints
- Airway Waypoints
* (only available when*
*   active leg is part of an*
*   airway)*
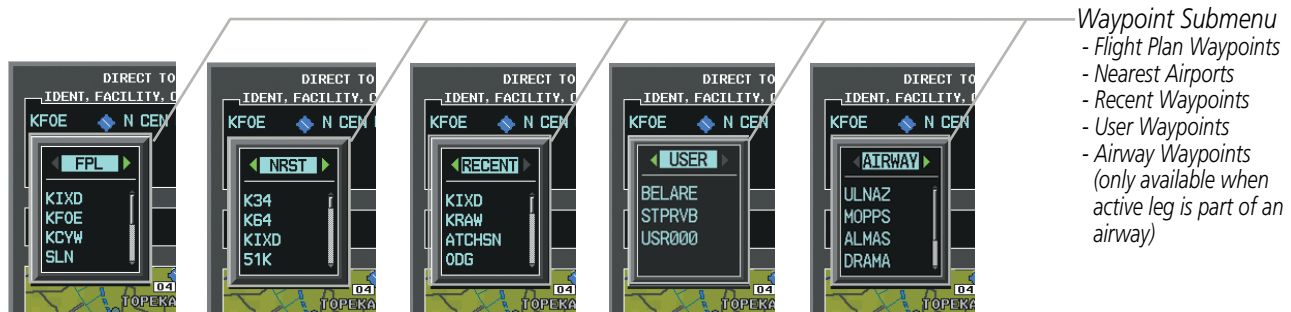
Figure 5-53 Waypoint Submenu

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 waypoints 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) Select 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 system resumes navigating the flight plan along the closest leg.

Page Menu - Cancel Direct-To Navigation

Figure 5-54 Direct-to Window - Cancelling Direct-to Navigation

When navigating a direct-to, the system 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 a direct-to destination that is part of the active flight plan. 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.

GARMIN

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 5-55 Direct-to Window - Clearing Vertical Constraints

5.6 FLIGHT PLANNING

Flight planning on the system 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 system 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).
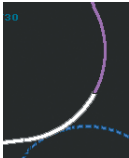
Flight Plan Leg Type	Symbol
Active non-heading Leg	
Active heading Leg	
Non-heading Leg in the current flight segment	
Heading Leg ot in the current flight segment	
Non-heading Leg not in the active flight segment	
Turn Anticipation Arc	

Table 5-7 Flight Plan Leg Symbols

Up to 99 flight plans with up to 99 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 system uses the waypoint information from the current database to define the waypoints. If the database is changed or updated, the system 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)
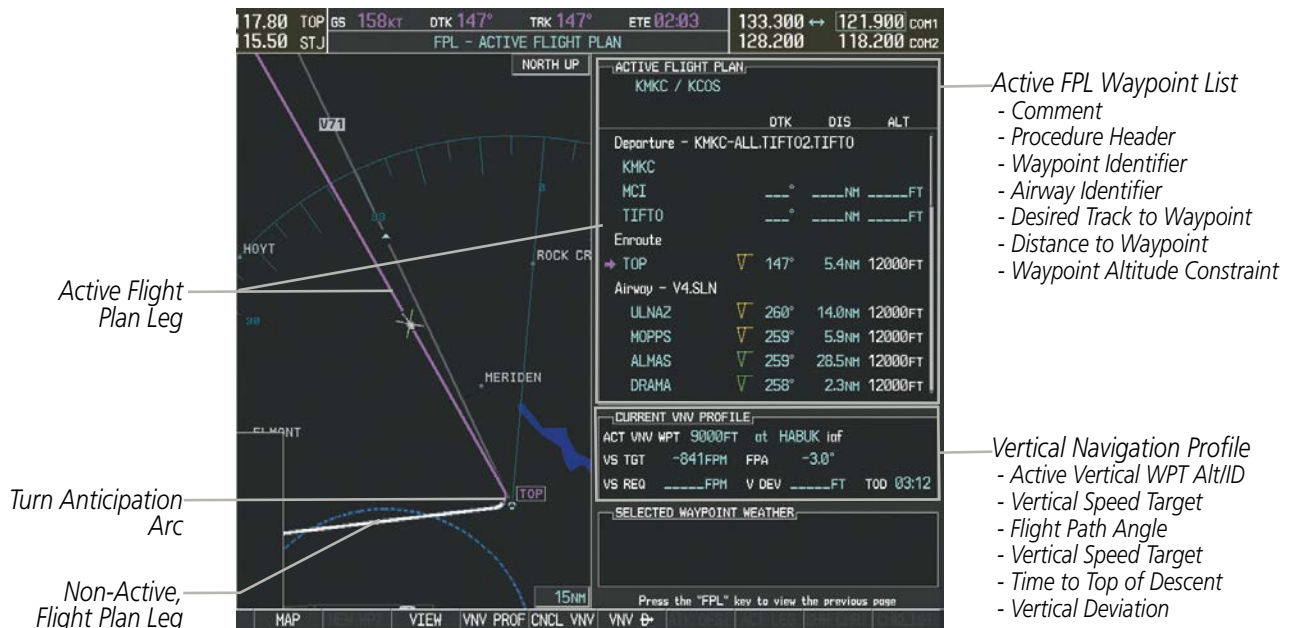
Figure 5-56 Active Flight Plan Page

Figure 5-57 Active Flight Plan Window on PFD

Catalog Contents
- # Used
- # Empty

Flight Plan List
- Comment

Selected
Flight Plan
Map

Selected FPL Info
- Departure Waypoint
- Destination Waypoint
- Total Flight Plan Distance
- Enroute Safe Altitude

Softkeys
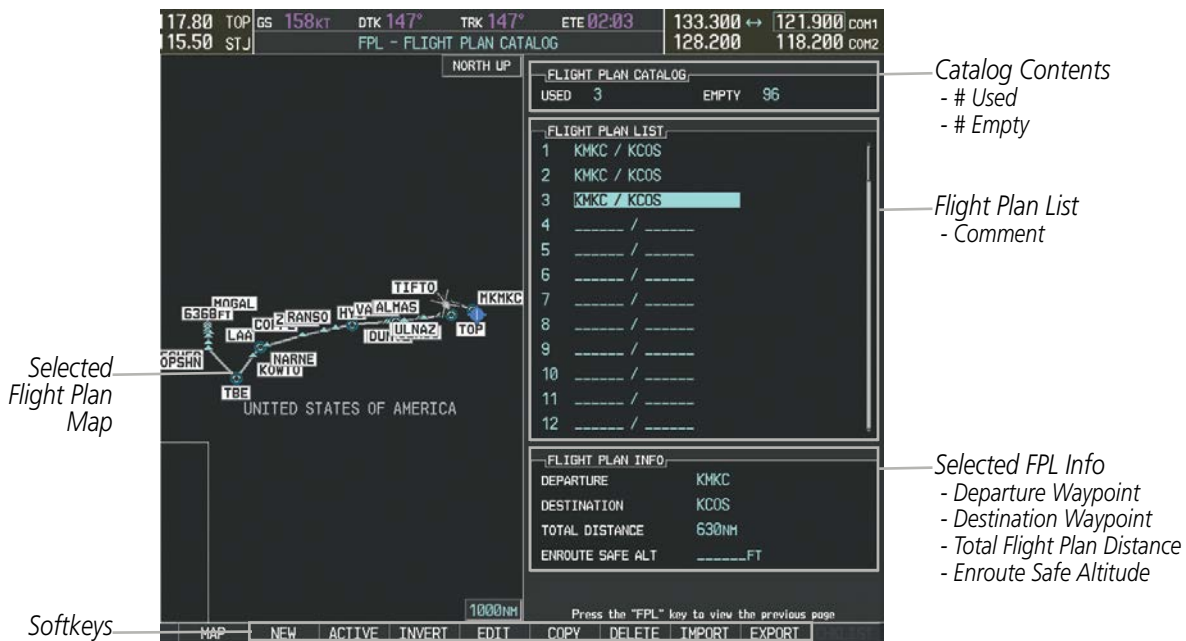
Figure 5-58 Flight Plan Catalog Page

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 system 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).

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) Select 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.
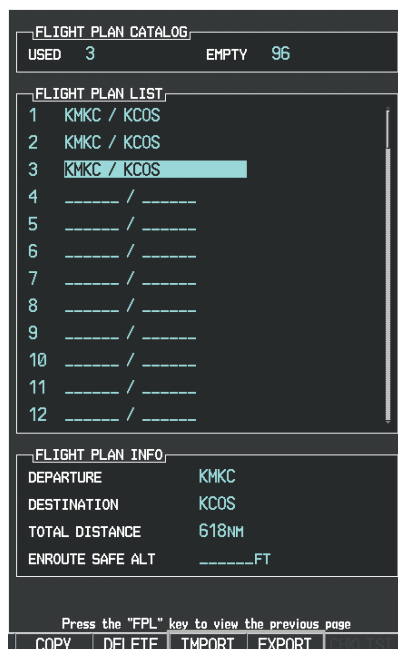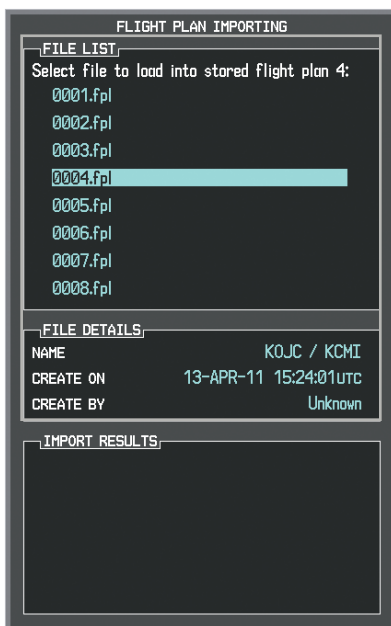
Import/Export Softkeys   List of Flight Plans to Import &   Import Successful
                              Details for the Selected File

Figure 5-59 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 5-60 Flight Plan Export

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 99 waypoints (including waypoints within airways and procedures). If the number of waypoints in the flight plan exceeds 99, the message "Flight plan is full. Remove unnecessary waypoints." appears and the new waypoint(s) are not added to the flight plan.
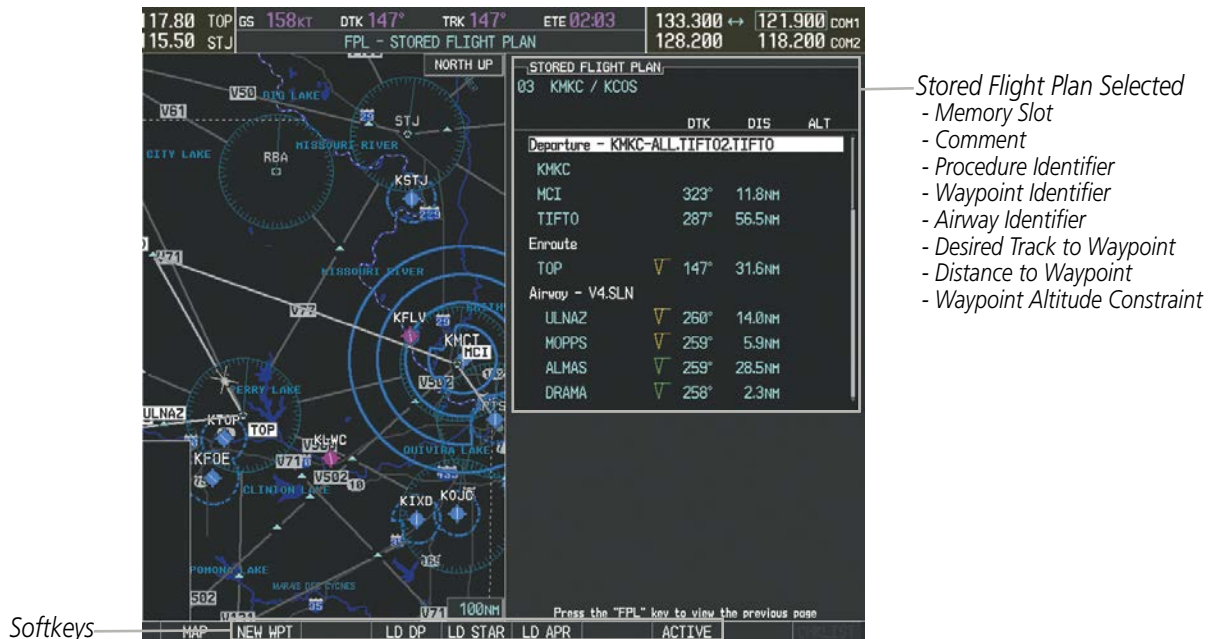
Figure 5-61 Stored Flight Plan Page

Stored Flight Plan Selected
- Memory Slot
- Comment
- Procedure Identifier
- Waypoint Identifier
- Airway Identifier
- Desired Track to Waypoint
- Distance to Waypoint
- Waypoint Altitude Constraint
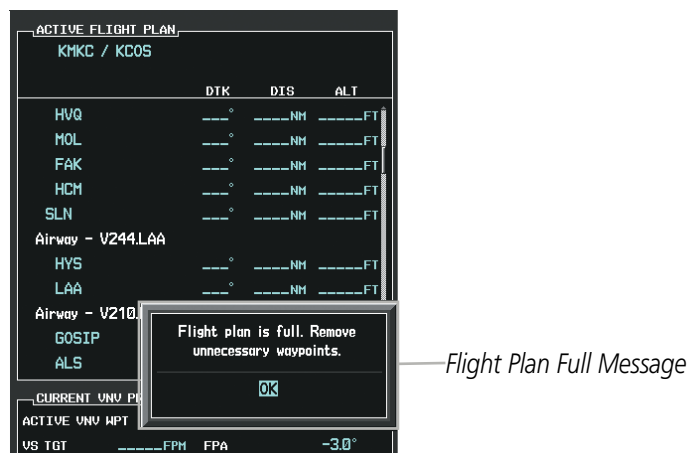
Softkeys

Figure 5-62 Active Flight Plan Page - FPL Full

Flight Plan Full Message

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.*
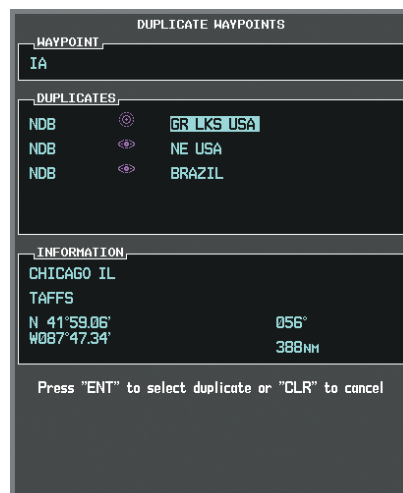
Figure 5-63 Duplicate Waypoints Window

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, 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) Select 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 system also anticipates the desired airway and exit point based on loaded flight plan waypoints.

Figure 5-64 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 select 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.

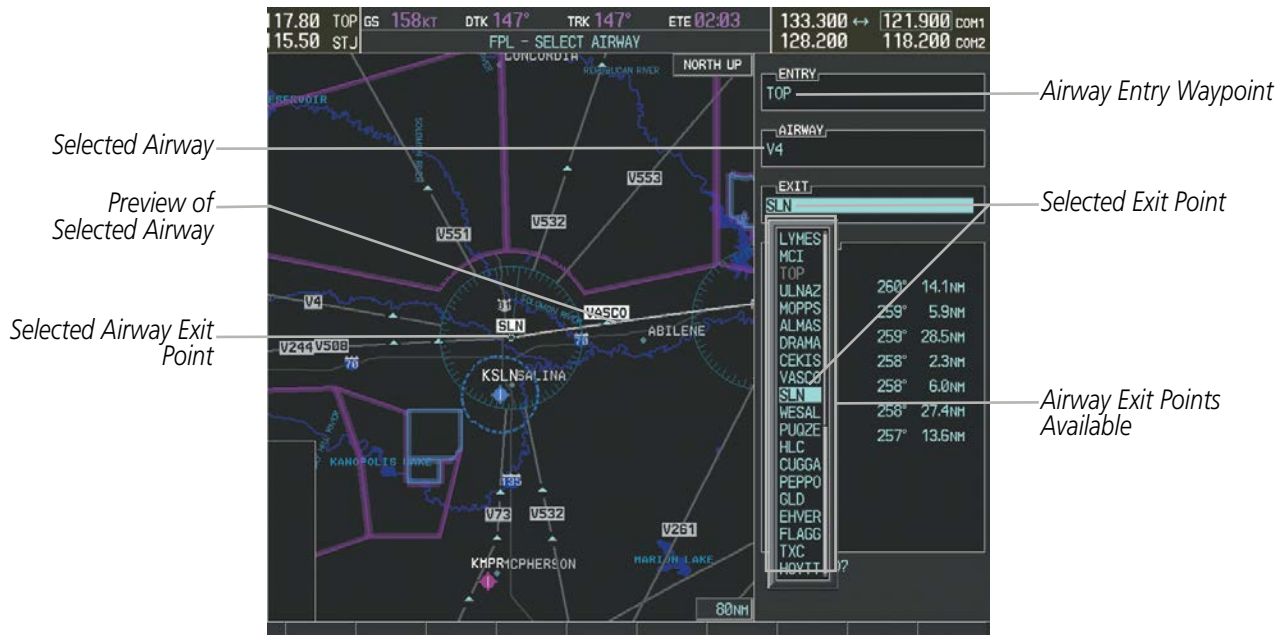7) Press the **ENT** Key. The system returns to editing the flight plan with the new airway inserted.
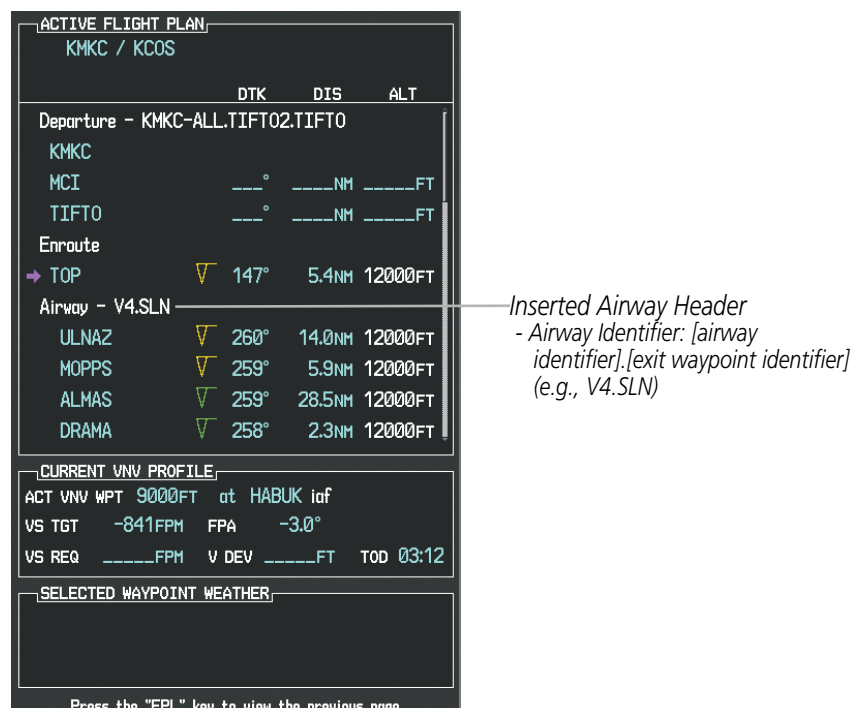

Figure 5-65 Select Airway Page - Selecting Exit Point

Figure 5-66 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 system 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 system 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.
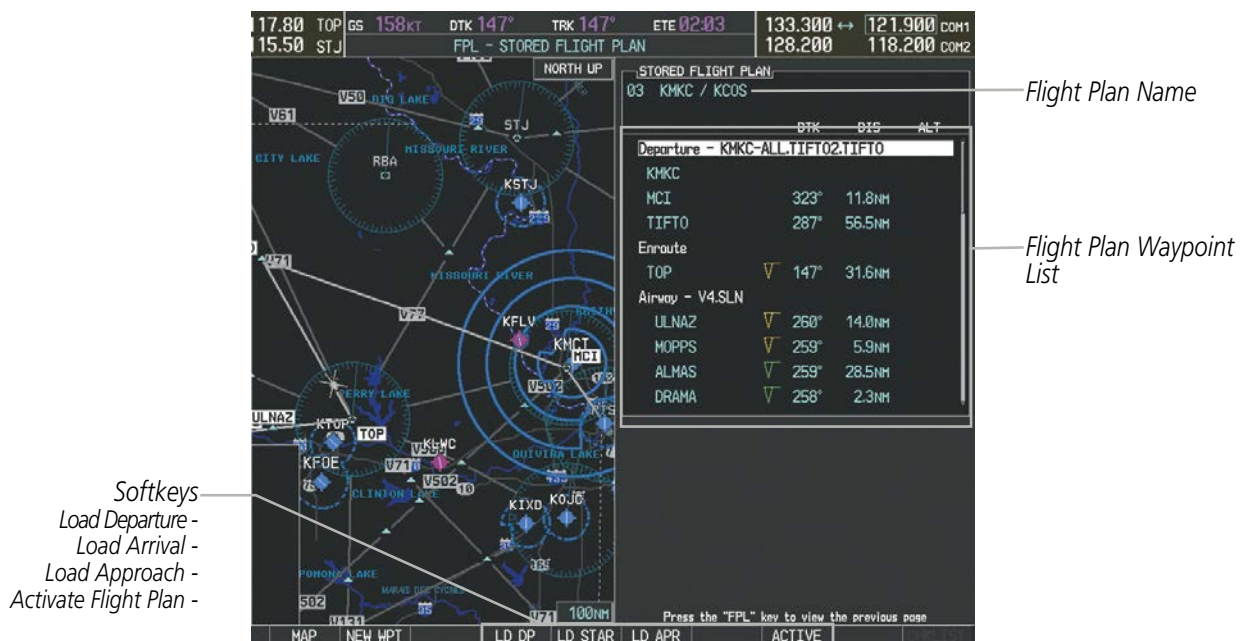
Figure 5-67 Stored Flight Plan Page

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.
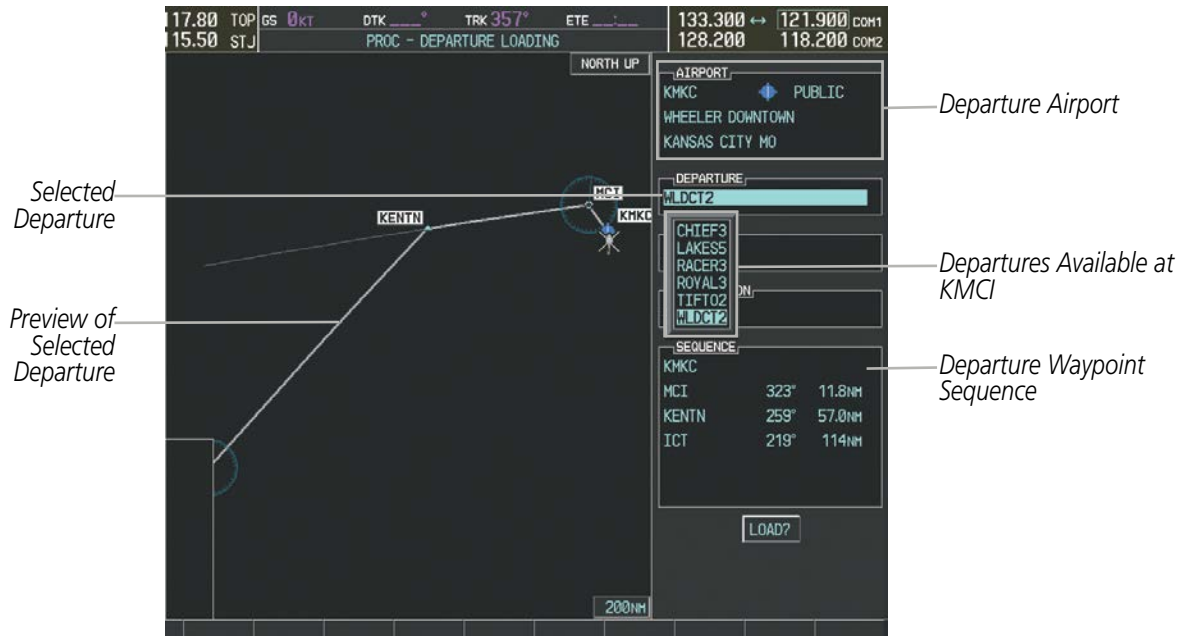
Figure 5-68 Departure Loading Page - Selecting the Departure

Loading a departure procedure into a stored flight plan:

1) Select a stored flight plan from the Flight Plan Catalog Page.

2) Select 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) Select 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.

Departure Airport

Selected Departure

Preview of Selected Departure

Selected Departure End Point

Selected Runway

Selected Transition

Departure Transition Points Available

Figure 5-69 Departure Loading Page - Selecting Transition

Inserted Departure Header
- Departure Identifier: [departure airport]-[departure runway]. [departure transition]. [departure end point] (e.g., KMKC-ALL.WLDCT2.SLN)
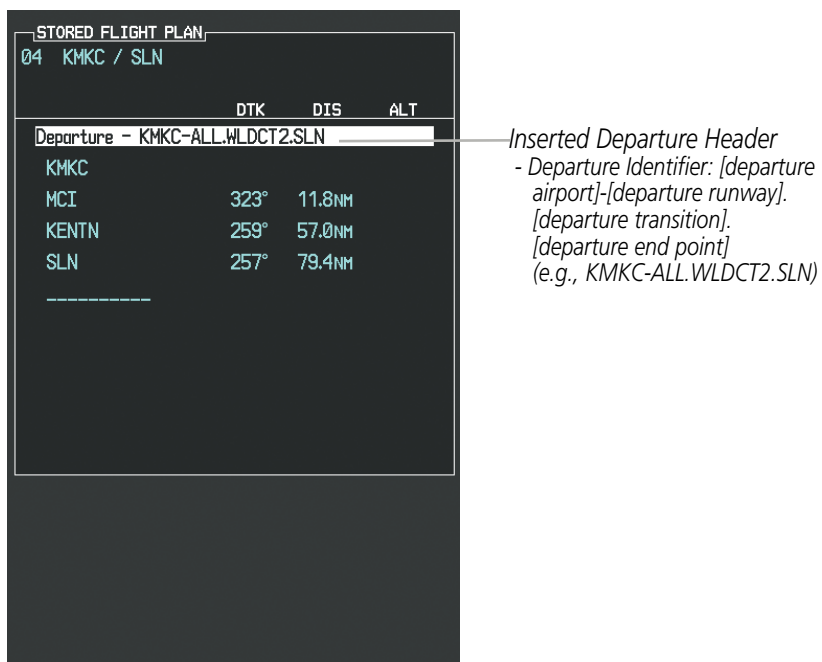
Figure 5-70 Stored Flight Plan Page - Departure Inserted

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.

Destination Airport

Selected Arrival

Arrivals Available at KCOS

Selected Runway

Arrival Waypoint Sequence

Preview of Selected Arrival

Figure 5-71 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) Select 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) Select 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.

Destination Airport

Selected Arrival

Selected Transition

Transitions Available with DBRY1

Arrival Waypoint Sequence

Preview of Selected Arrival
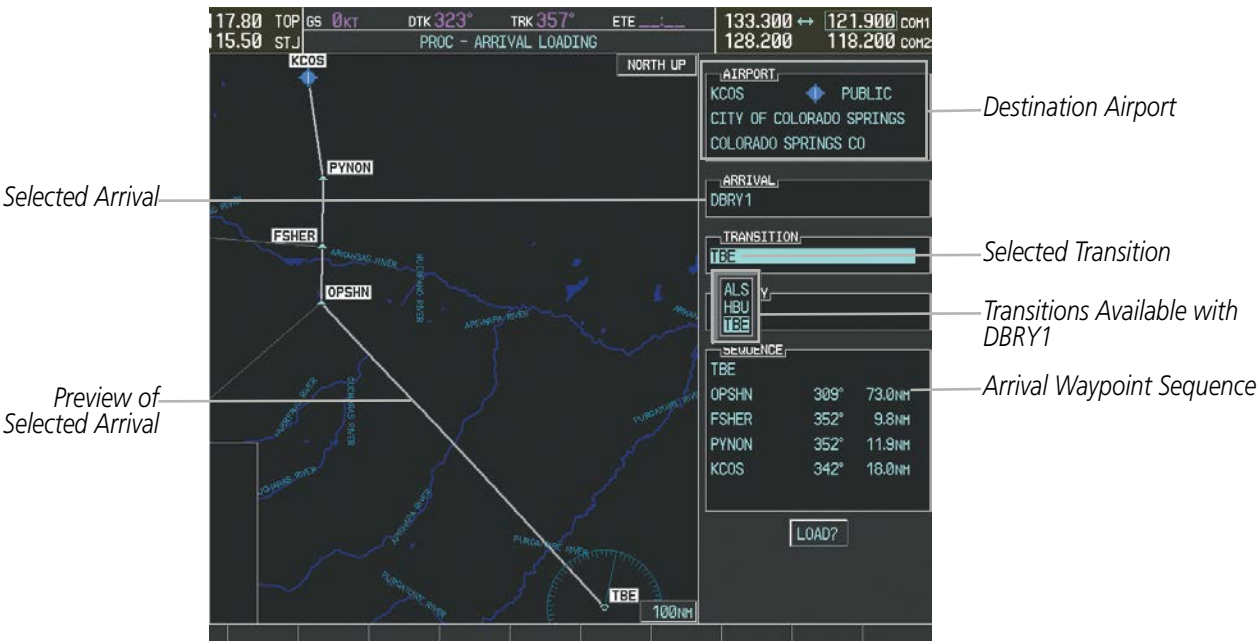
Figure 5-72 Arrival Loading Page - Selecting the Transition

Inserted Arrival Header
- Arrival Identifier:
   [arrival airport]-[arrival transition].
   [arrival].[arrival runway]
   (e.g., KCOS-TBE.DBRY1.ALL)
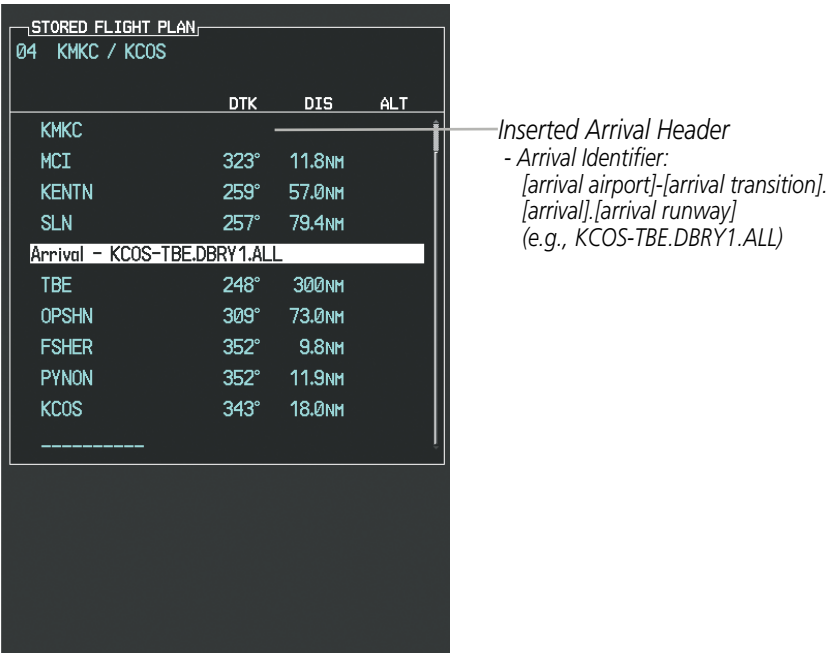
Figure 5-73 Stored Flight Plan Page - Arrival Inserted

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.

Destination Airport

Selected Approach

Approaches Available at KCOS

Barometric Minimum

Preview of Selected Approach

Approach Waypoint Sequence
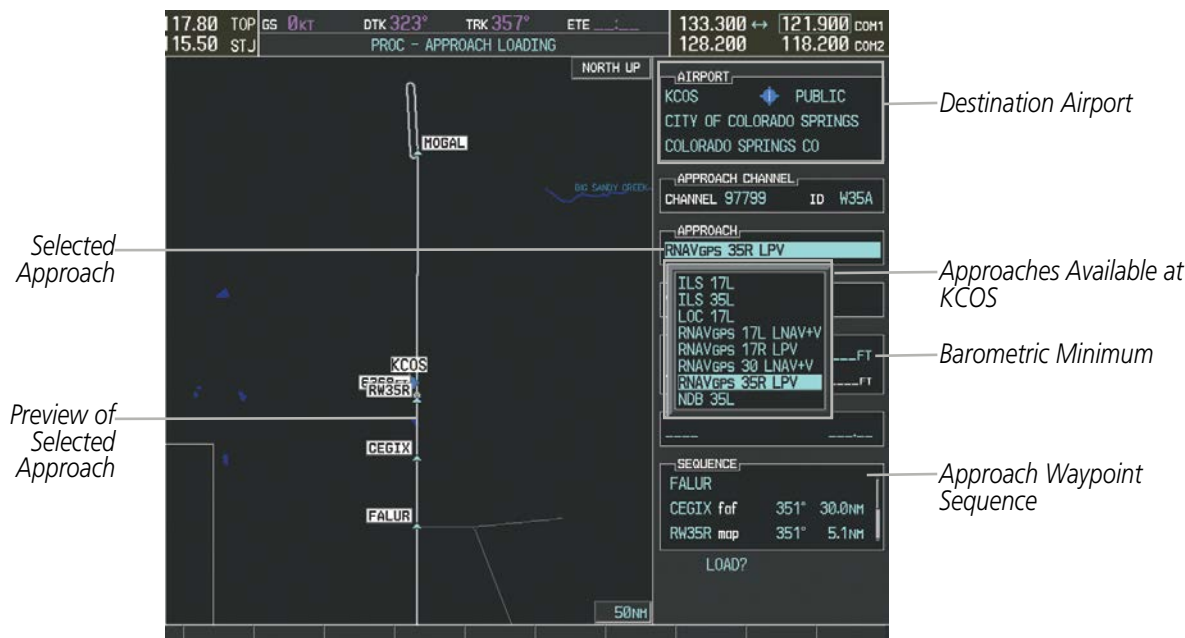
Figure 5-74 Approach Loading Page - Selecting the Approach

Loading an approach procedure into a stored flight plan:

1) Select a stored flight plan from the Flight Plan Catalog Page.

2) Select 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) Select 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 an approach. Press the **ENT** Key.

5) Select a transition for the selected approach. Press the **ENT** Key.

6) Press the **ENT** Key to load the selected approach procedure.

Destination Airport

Selected Approach

Selected Transition

Barometric Minimum

Preview of Selected Approach

Transitions Available with Selected Approach

Approach Waypoint Sequence
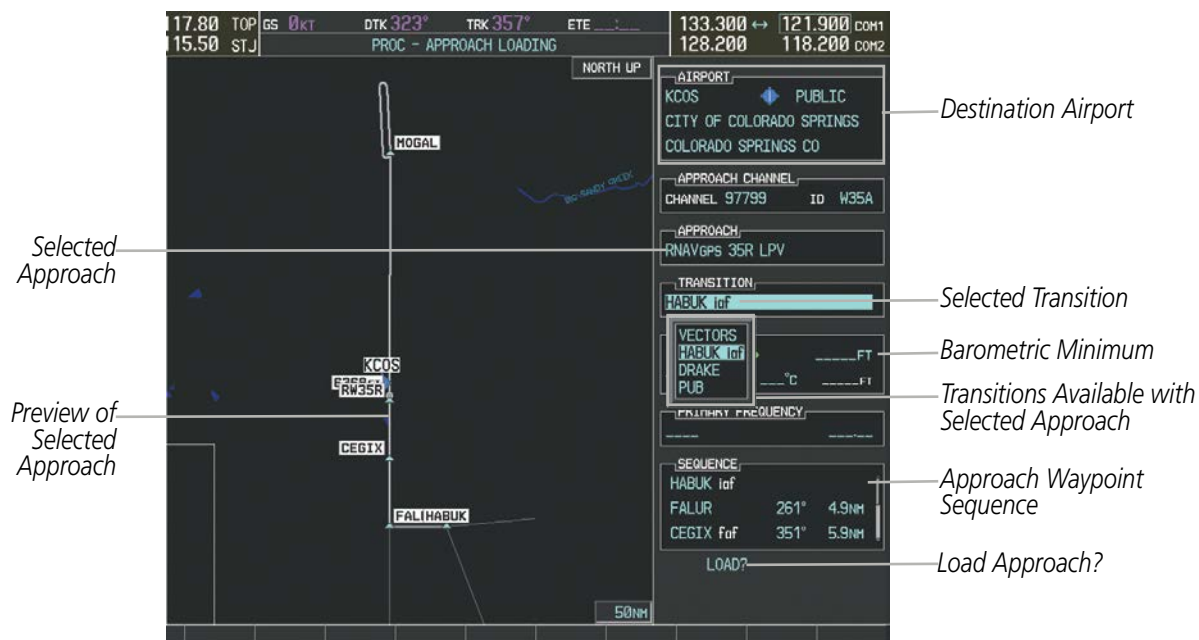
Load Approach?

Figure 5-75 Approach Loading Page - Selecting the Transition

Inserted Approach Header
- Approach Identifier: [approach airport].[runway and approach type] (e.g., KCOS-RNAV 35RGPS LPV)
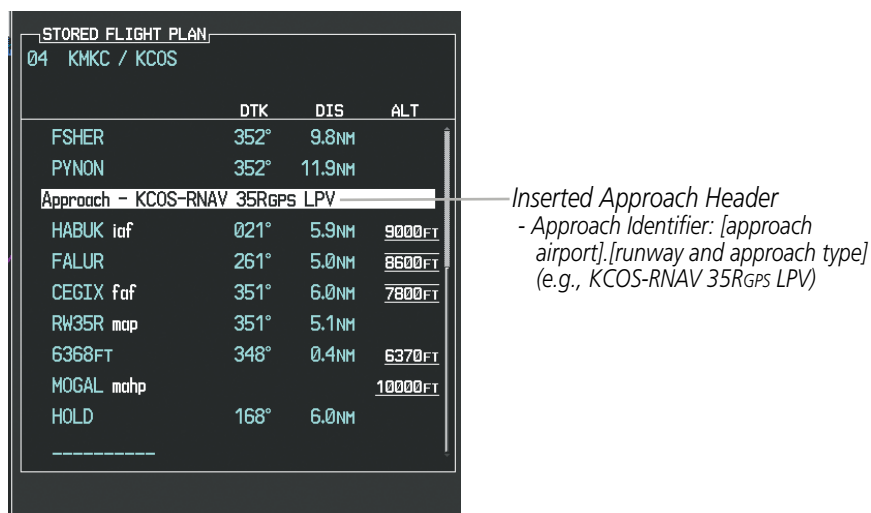
Figure 5-76 Stored Flight Plan Page - Approach Inserted

FLIGHT PLAN STORAGE

The system can store up to 99 flight plans, numbered 1 through 99. The active flight plan is erased when the system 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.
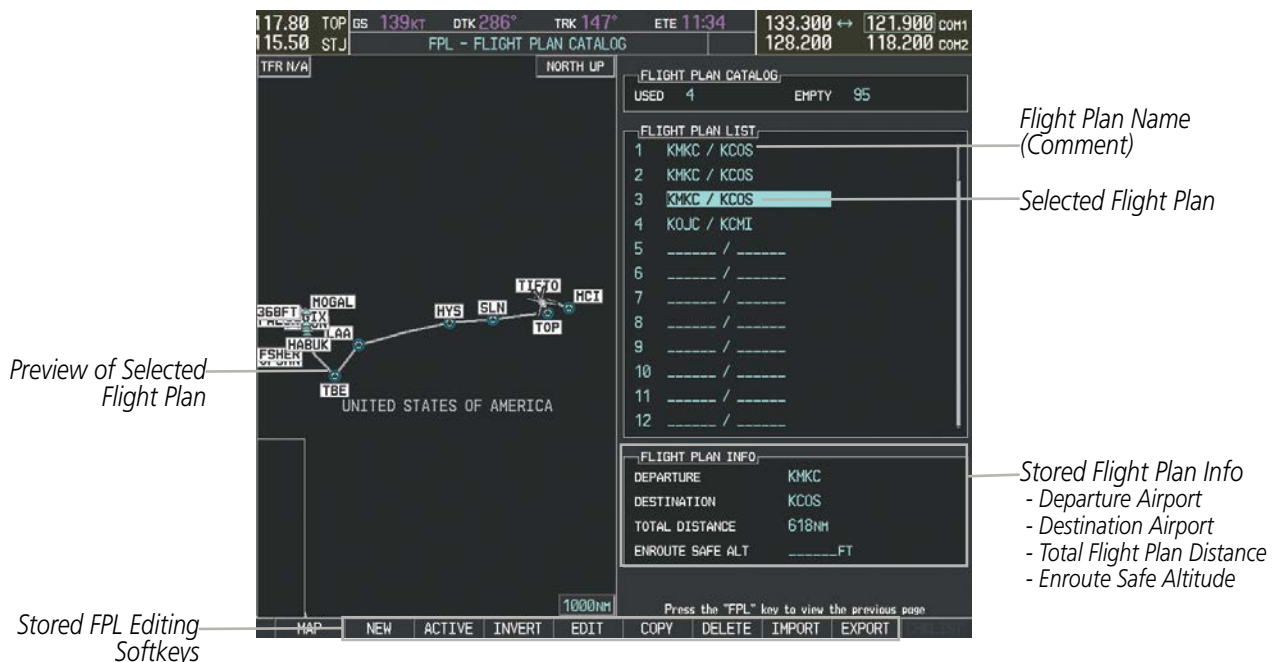
Figure 5-77 Stored Flight Plan Information

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) Select 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, select 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) Select 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 system 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) Select 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 system 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) 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 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 system allows deleting an active flight plan. Deleting the active flight plan suspends navigation by the system.

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) Select 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) Select 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) Select 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) Select 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) Select 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 99 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.

Along Track Offset Waypoint and Distance from Flight Plan Waypoint

Along Track Offset Waypoint and Distance

Figure 5-78 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 99 nm (limited by leg distances).

5) Press the **ENT** Key to create the offset waypoint.

6) Turn the small **FMS** Knob to enter the desired altitude for the offset.

7) 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.*

Active Flight Plan prior to Parallel Track

Selecting Parallel Track
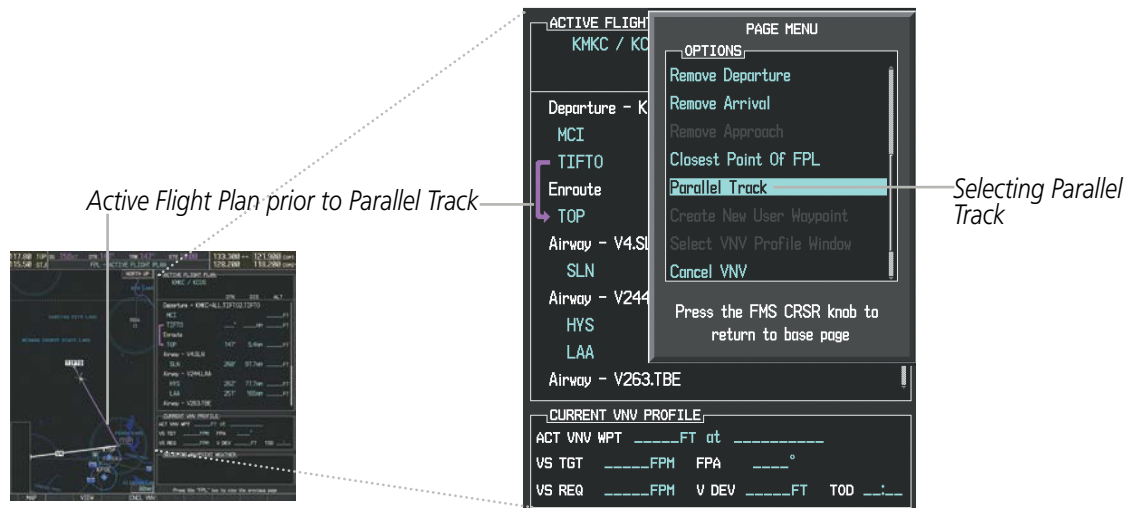
Figure 5-79 Active Flight Plan Window - Selecting Parallel Track

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 5-80 Parallel Track Window
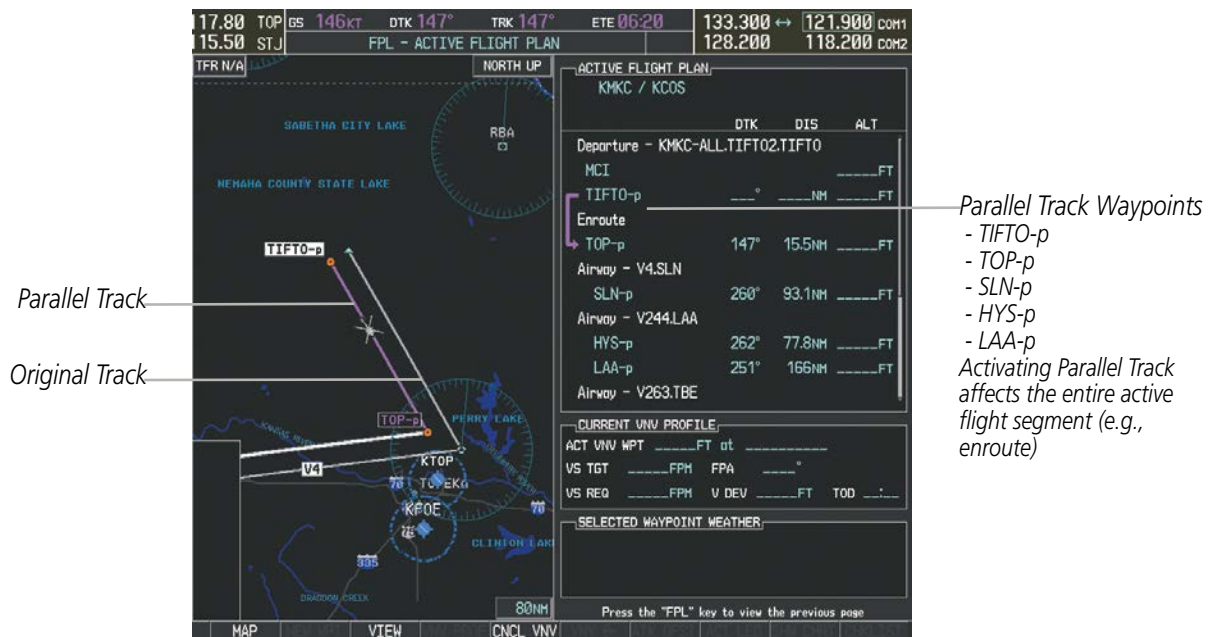
Figure 5-81 Parallel Track Active

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.
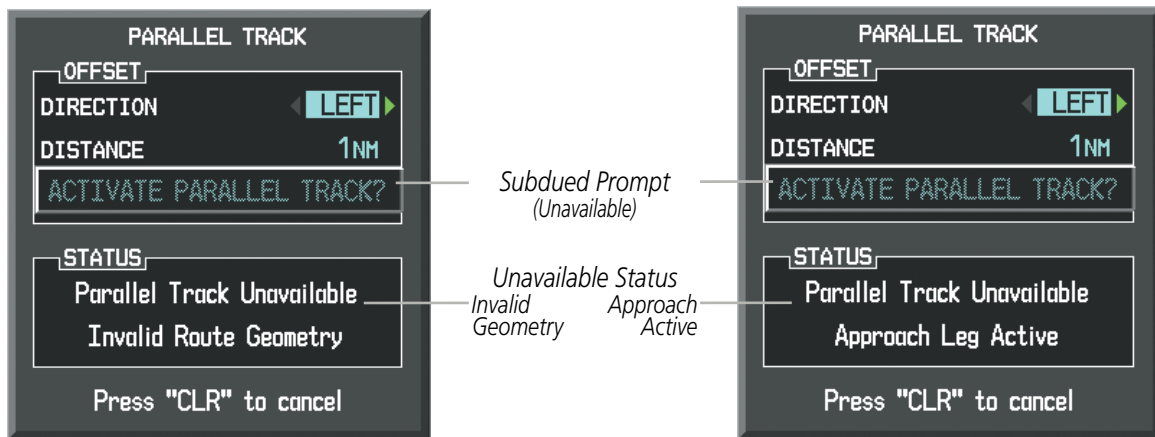
Figure 5-82 Parallel Track Unavailable

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.
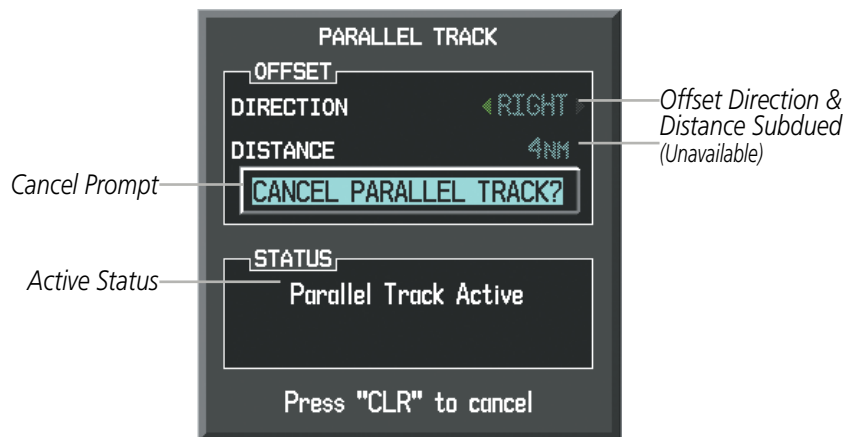
Figure 5-83 Cancelling Parallel Track

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 system 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) Select 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.
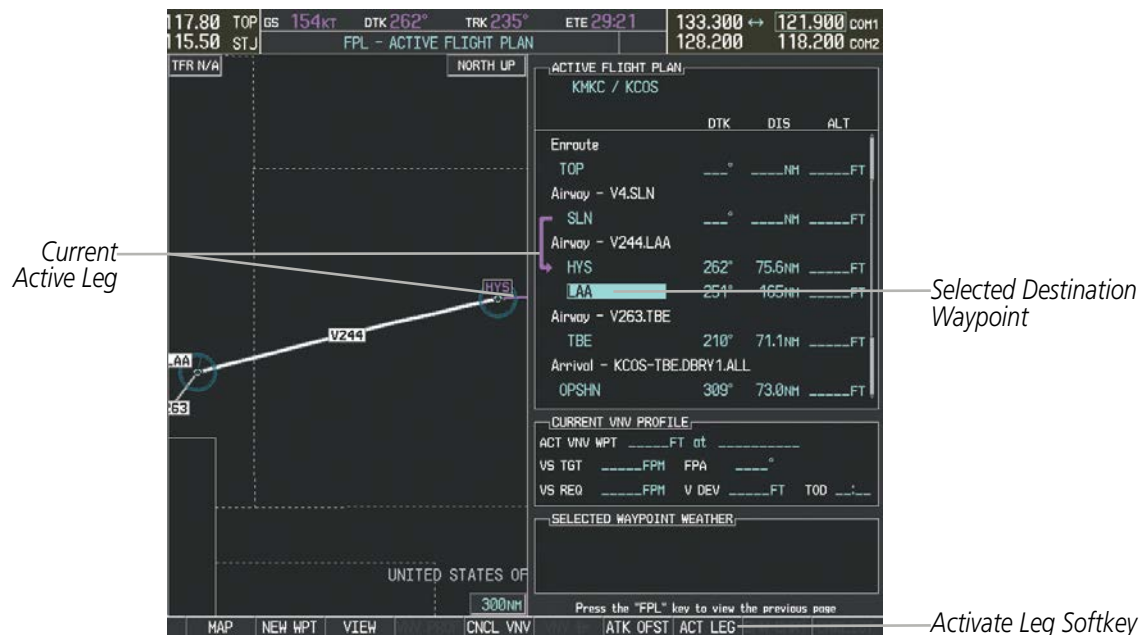
Figure 5-84 Active Flight Plan Page - Selecting the Leg Destination Waypoint

Confirmation Window

New Active Flight Plan Leg
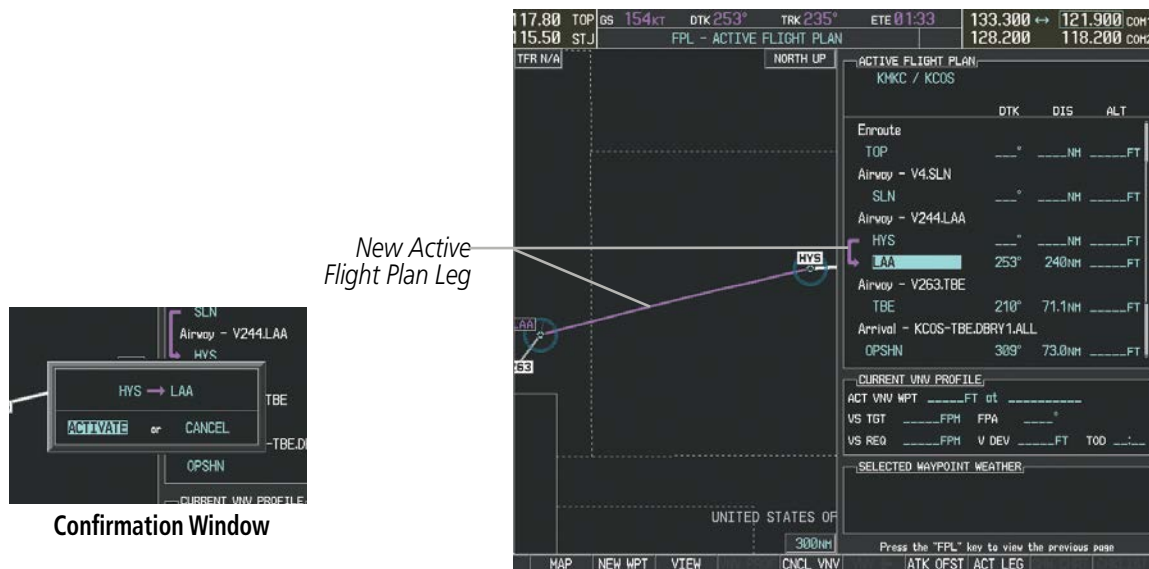
Figure 5-85 Active Flight Plan Page - New Active Leg

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) Select 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*
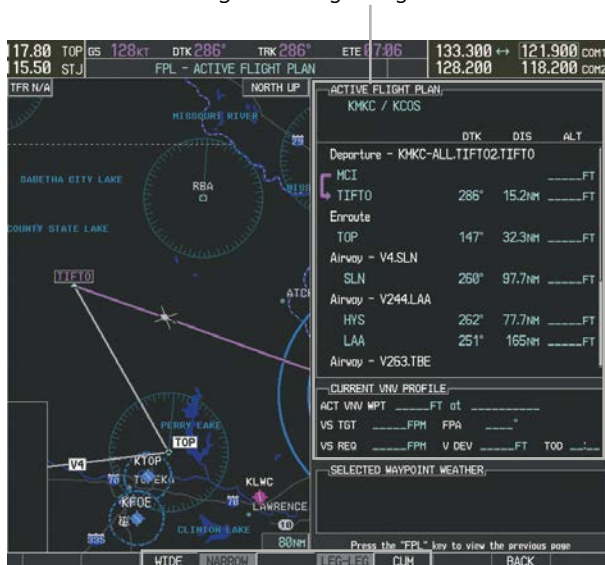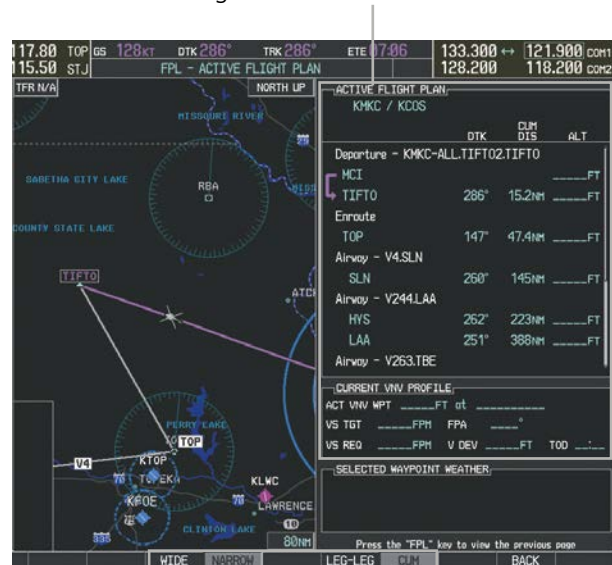
WIDE *Softkey,*   **NARROW** *Softkey,*   **LEG-LEG** *Softkey,*   **CUM** *Softkey*

Figure 5-86 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.

Active Flight Plan Narrow View   *Active Flight Plan Wide View*

WIDE *Softkey*, **NARROW** *Softkey*, **LEG-LEG** *Softkey*, **CUM** *Softkey*

Figure 5-87 Active Flight Plan - Wide vs. Narrow View

COLLAPSING AIRWAYS

The system 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.

Q3.FEPOT Airway
Collapsed View
Expanded View
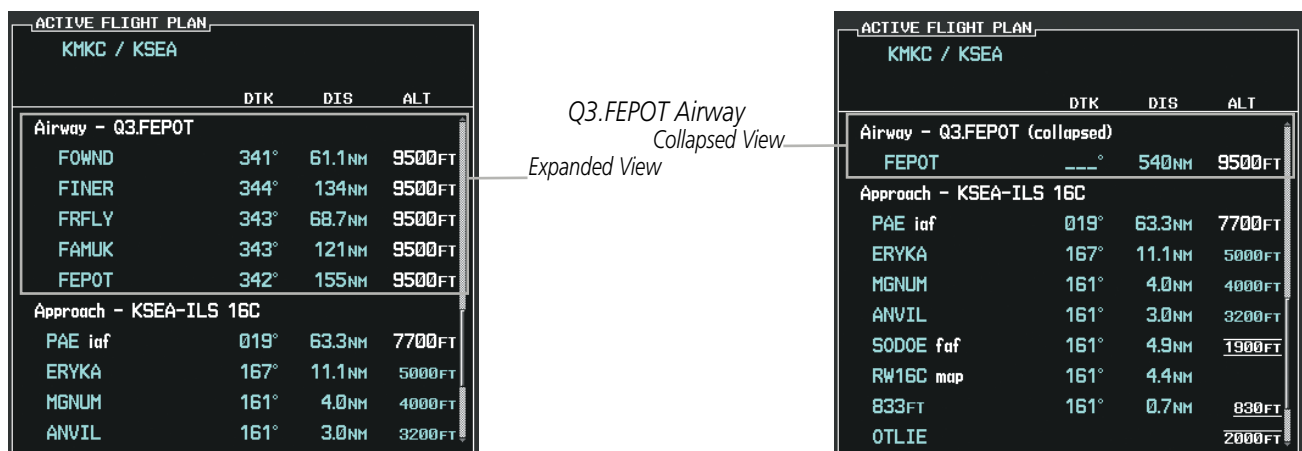
Figure 5-88 Expanded/Collapsed Airways

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 system 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, or at the aircraft present position.

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 add the hold into the flight plan.
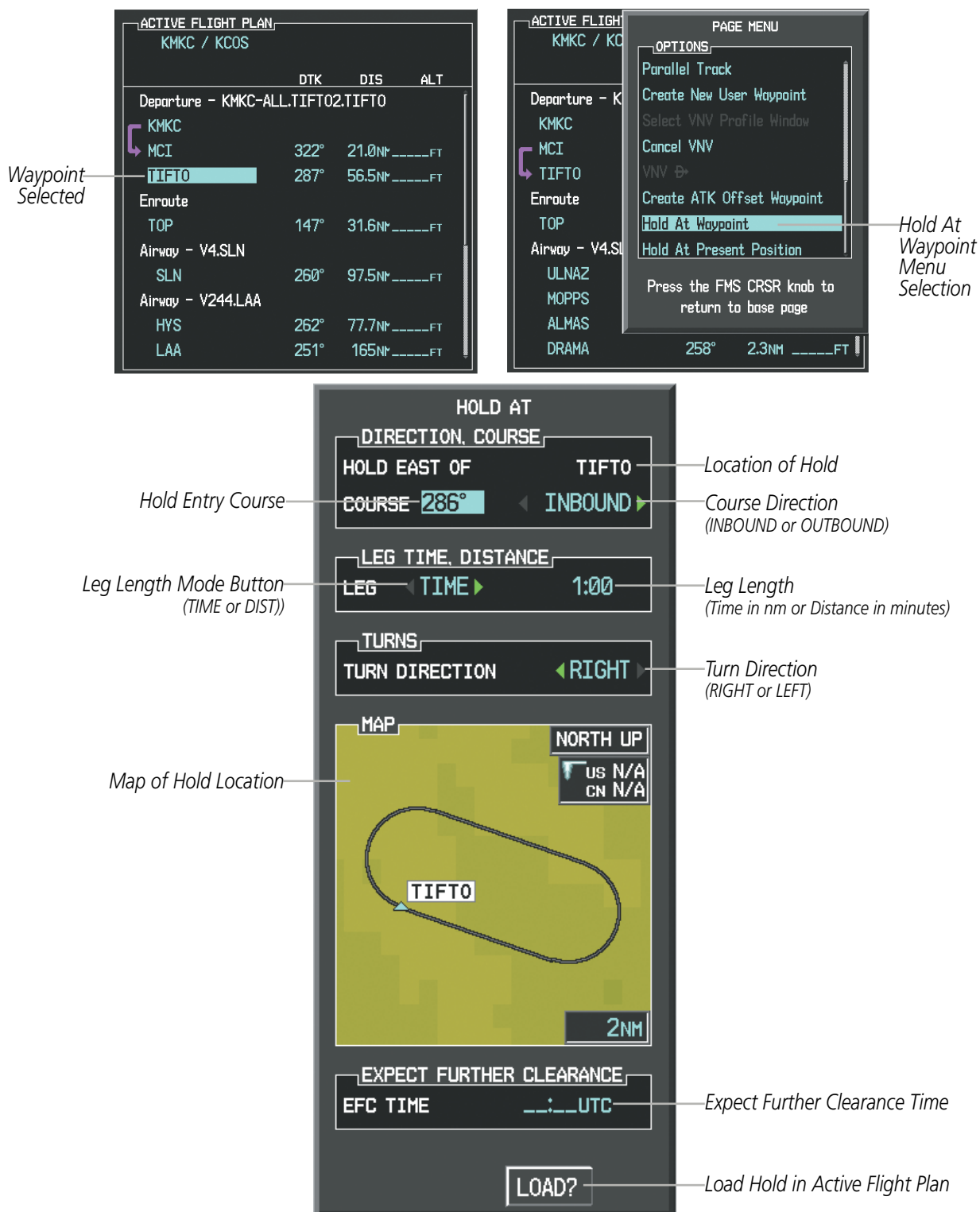
Figure 5-89 Creating a User Defined Holding Pattern at an Active Flight Plan Waypoint

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 Length mode highlighted.

3) Use the small **FMS** Knob to select 'TIME' or 'DIST' length mode, and press the **ENT** Key.

4) Use the **FMS** Knobs to edit the length, and press the **ENT** Key.

5) Use the small **FMS** Knob to select 'RIGHT' or 'LEFT' turn direction, and press the **ENT** Key.

6) Use the **FMS** Knobs to edit the Expect Further Clearance Time (EFC TIME), and press the **ENT** Key.

7) Press the **ENT** Key while 'ACTIVATE?' is highlighted to immediately activate the hold.

Removing a user-defined hold (created 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 **FMS** Knob to activate the cursor (not required on the PFD) and turn the large **FMS** Knob to highlight the PPOS-H 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 (created 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 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.

ACTIVE FLIGHT PLAN
KMKC / KCOS

	DTK	DIS	ALT
Departure – KMKC-ALL.TIFTO2.TIFTO			
KMKC			
MCI	___°	_____NM	_____FT
TIFTO	287°	48.1NM	_____FT
Enroute			
TOP	147°	31.6NM	_____FT
Airway – V4.SLN			
SLN	260°	97.5NM	_____FT
Airway – V244.LAA			
HYS	262°	77.7NM	_____FT
LAA	251°	165NM	_____FT

ACTIVE FLIGH[T]
KMKC / KC[OS]

PAGE MENU
OPTIONS
Parallel Track
Create New User Waypoint
Select VNV Profile Window
Cancel VNV
VNV Ð➔
Create ATK Offset Waypoint
Hold At Waypoint
Hold At Present Position ──── *Hold At Present Position Menu Selection*

Press the FMS CRSR knob to return to base page

Departure – K			
KMKC			
MCI			
TIFTO			
Enroute			
TOP			
Airway – V4.Sl			
ULNAZ			
MOPPS			
ALMAS			
DRAMA	258°	2.3NM	_____FT

HOLD AT

DIRECTION, COURSE
HOLD EAST OF   P.POS ──── *Location of Hold*
Hold Entry Course ──── COURSE **287°**   ◀ INBOUND ▶ ──── *Course Direction (INBOUND or OUTBOUND)*

LEG TIME, DISTANCE
Leg Length Mode Button (TIME or DIST)) ──── LEG ◀ TIME ▶   1:00 ──── *Leg Length (Time in nm or Distance in minutes)*

TURNS
TURN DIRECTION   ◀ RIGHT ▶ ──── *Turn Direction (RIGHT or LEFT)*

MAP
Map of Hold Location ──── NORTH UP
US N/A
CN N/A

PPOS

2NM

EXPECT FURTHER CLEARANCE
EFC TIME   __:__UTC ──── *Expect Further Clearance Time*

ACTIVATE? ──── *Load Hold in Active Flight Plan*

Figure 5-90 Creating a User Defined Holding Pattern at the Aircraft Present Position

5.7 VERTICAL NAVIGATION

> **NOTE:** *The system supports vertical navigation for all lateral leg types except for CA, CI, FA, FM, HA, HM, PI, VA, VD, VI, VR, and VM. Vertical constraints are not retained in stored flight plans.*

The system 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. Both manual and autopilot-coupled guidance are supported.

Current Vertical Navigation Profile
Disabled (fields dashed)

Current Vertical Navigation Profile
Enabled (valid data)

ENBL VNV *Softkey*
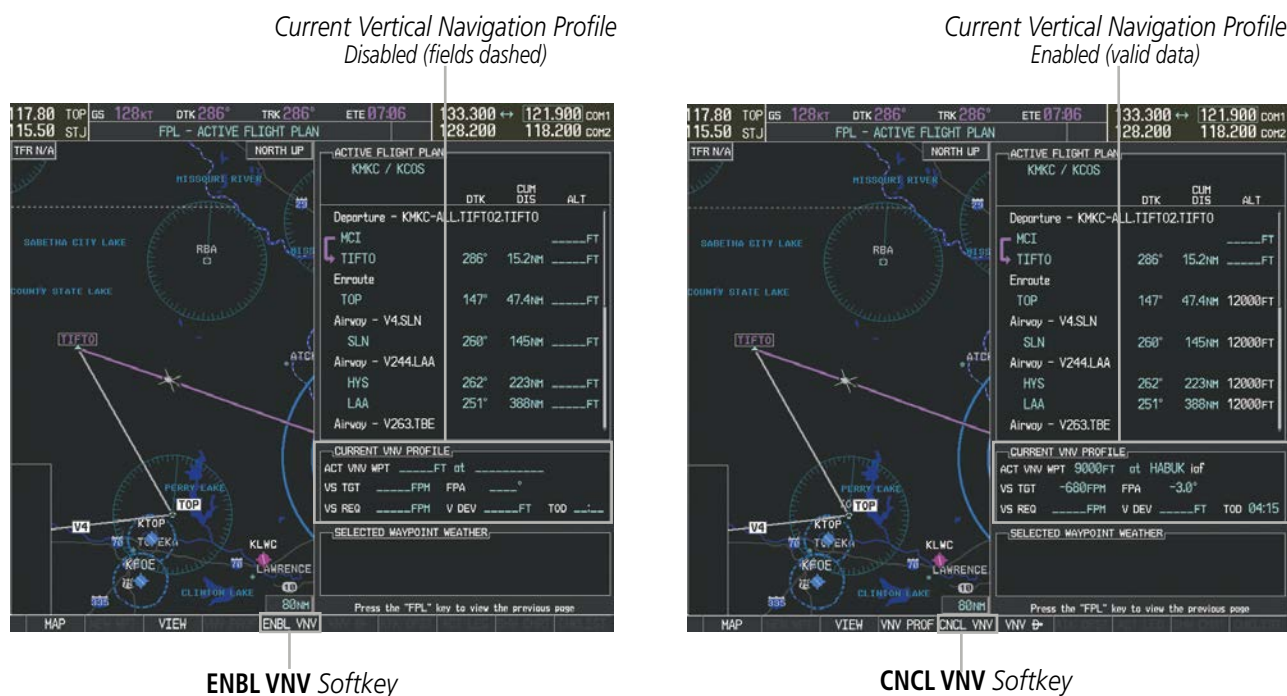
CNCL VNV *Softkey*

Figure 5-91 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 Indicator (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 system allows a vertical navigation direct-to to any waypoint in the active flight plan with an altitude constraint "designated" for vertical guidance. Selecting 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.

Current Vertical Navigation Profile
Prior to VNV Direct-to

Current Vertical Navigation Profile
After VNV Direct-to

VNV Direct-To *Softkey*

VNV PROF *Softkey*
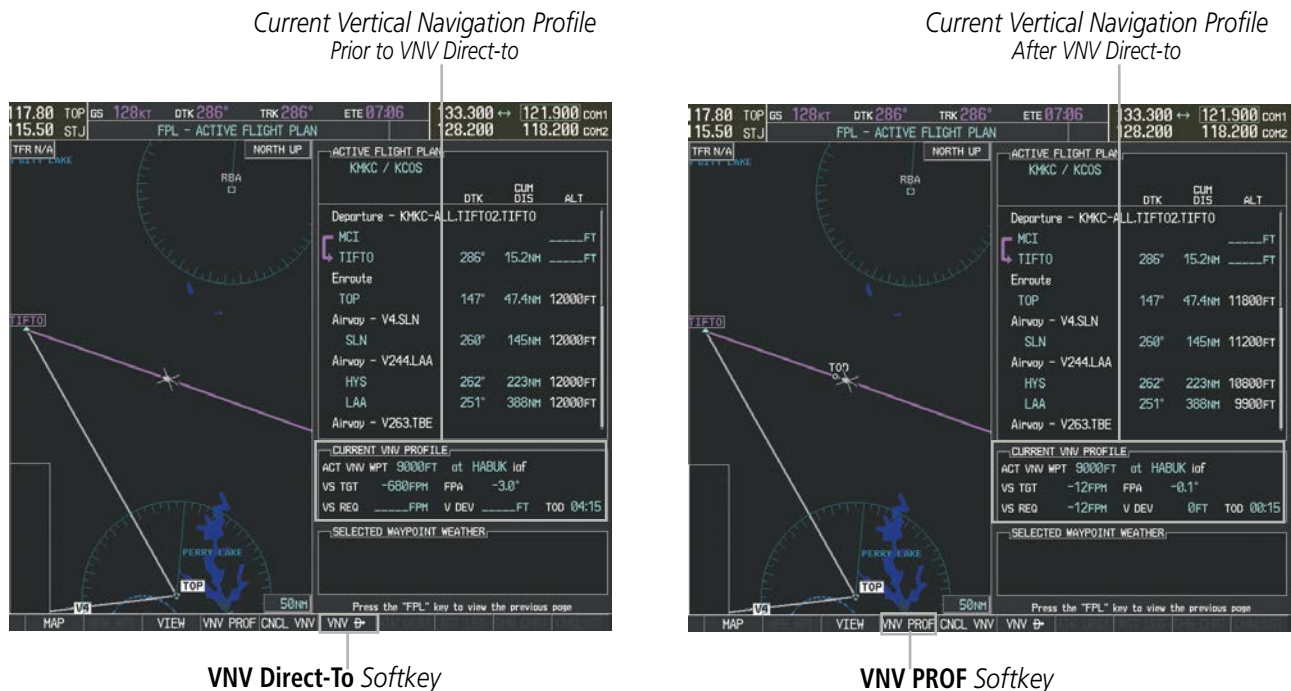
Figure 5-92 Vertical Navigation Direct-To

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 (light blue 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 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.

5000FT
*Cross AT
or ABOVE
5,000 ft*

2300FT
*Cross AT
2,300 ft*

3000FT
*Cross AT
or BELOW
3,000 ft*

**Altitude Constraint
Examples**

ACTIVE FLIGHT PLAN
KIXD / KDFW

	DTK	DIS	ALT
KARLA	221°	11.7NM	13000FT
COVIE	221°	9.0NM	12400FT
LEMYN	220°	8.0NM	9900FT
Approach – KDFW–RNAV 17LGPS LPV			
RIVET iaf	259°	18.8NM	4000FT
DRAAK	176°	3.3NM	2000FT
INWOD	176°	3.2NM	3000FT
MENOL faf	176°	3.9NM	2300FT
RW17L map	176°	5.3NM	
990FT	174°	0.8NM	990FT
POLKE			

**Displayed Text
Examples**

Large White Text

Large Light Blue Text

Small Light Blue Text

*Small Light Blue
Subdued Text*

*Small White Text with
Altitude Restriction Bar*

Figure 5-93 Waypoint Altitude Constraints

	White Text	**Light Blue Text**	**Light Blue 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 blue 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 blue, 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 blue, 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 system 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 system displays the altitude restriction from the database provided no predicted altitude can be provided. The system 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 system 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.

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.

Available Procedure Actions   *Departure Airport*

Loaded Procedures   *Departure Preview*   *Departure Choices*
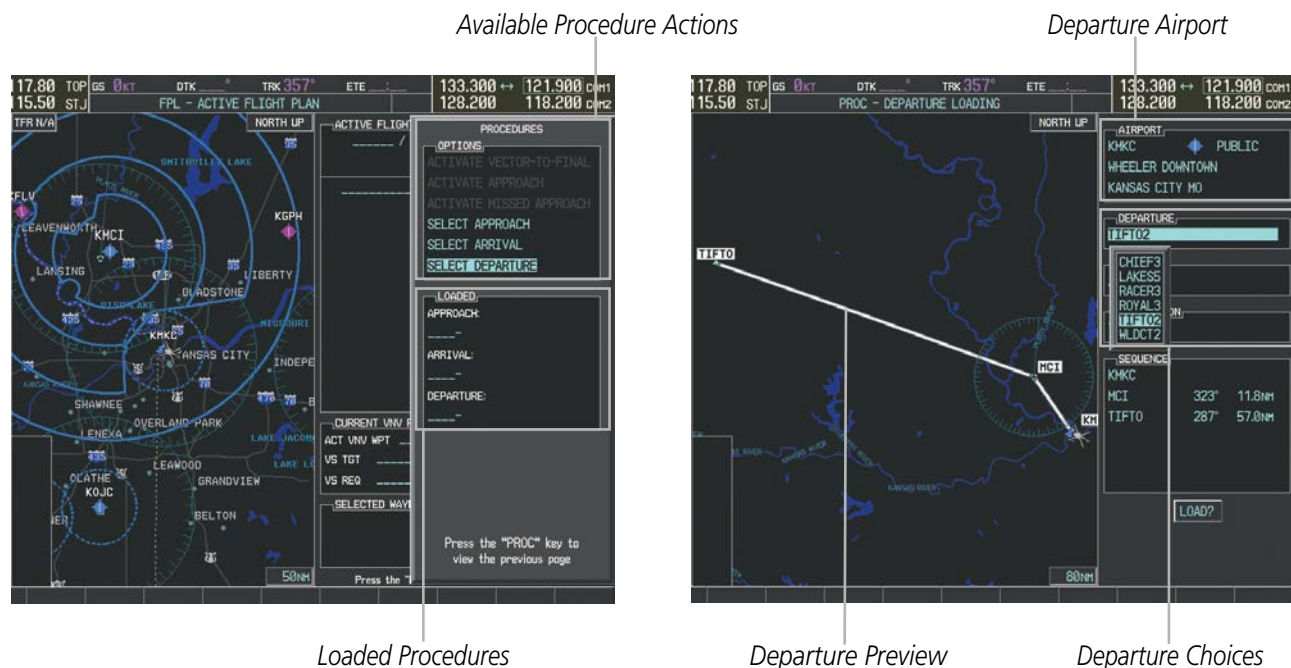
Figure 5-94 Departure Selection

Selected Departure   *Loaded Departure*

Procedure Loading Page Selection Softkeys
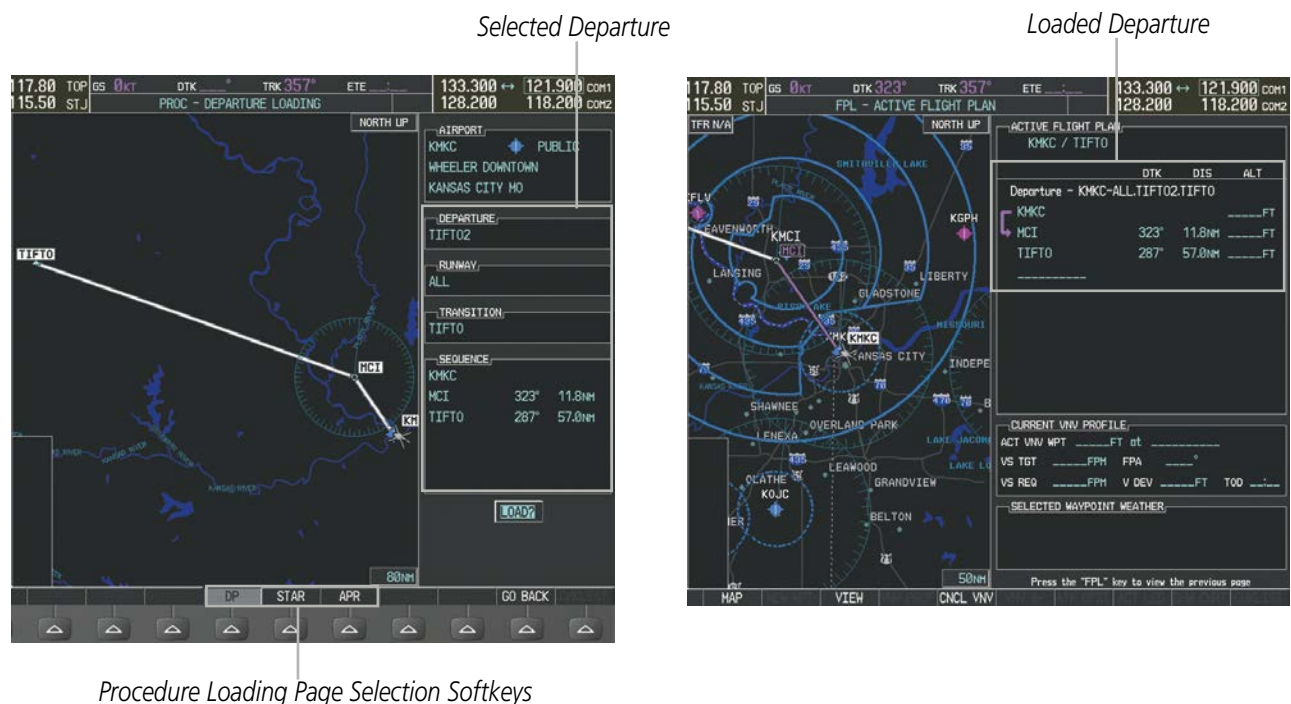
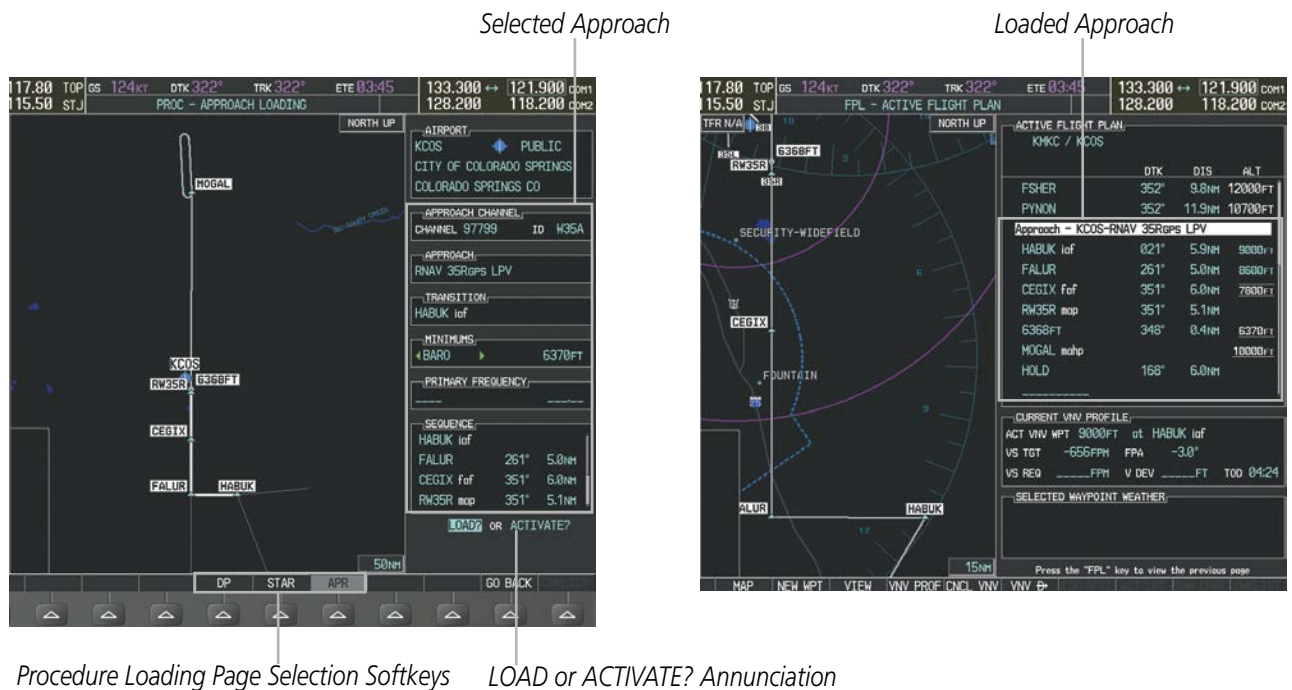**Figure 5-95 Departure Loading**

Viewing available departures at an airport:

1) From the Airport Information Page (first page in the WPT group), select 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) Select the **INFO-x** 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.

Available Procedure Actions *Destination Airport*

Loaded Procedures *Arrival Preview* *Arrival Choices*
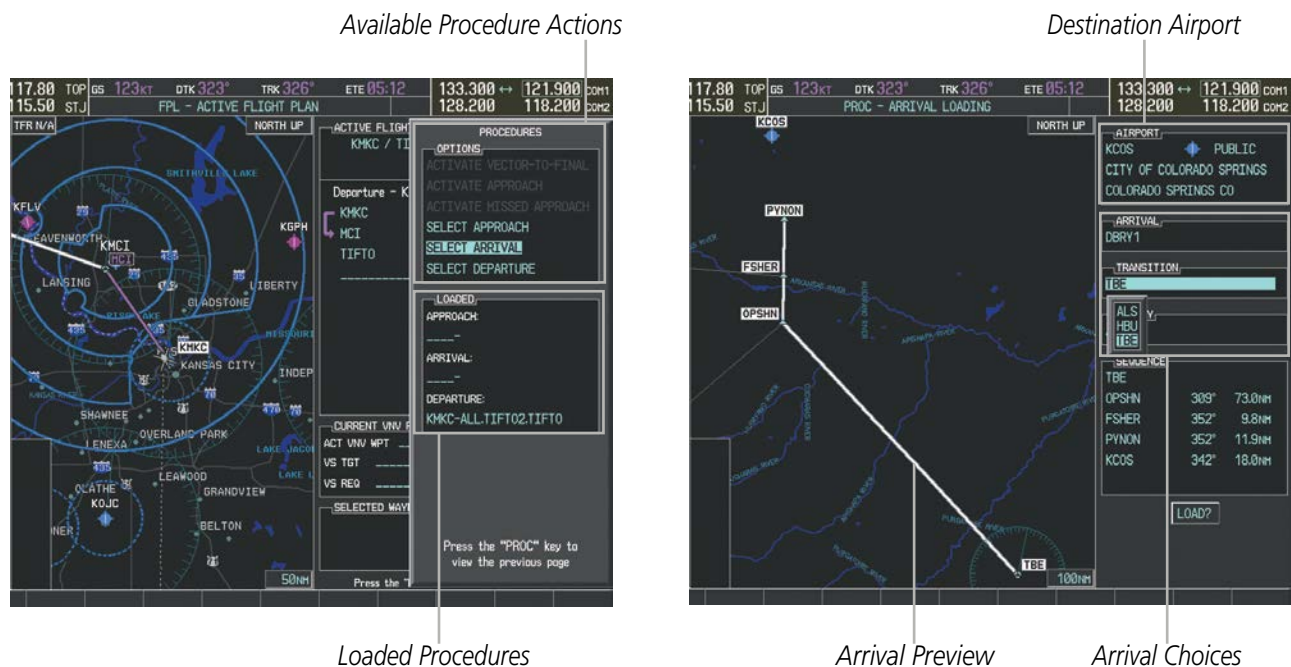
Figure 5-96 Arrival Selection

Selected Arrival   *Loaded Arrival*

Procedure Loading Page Selection Softkeys
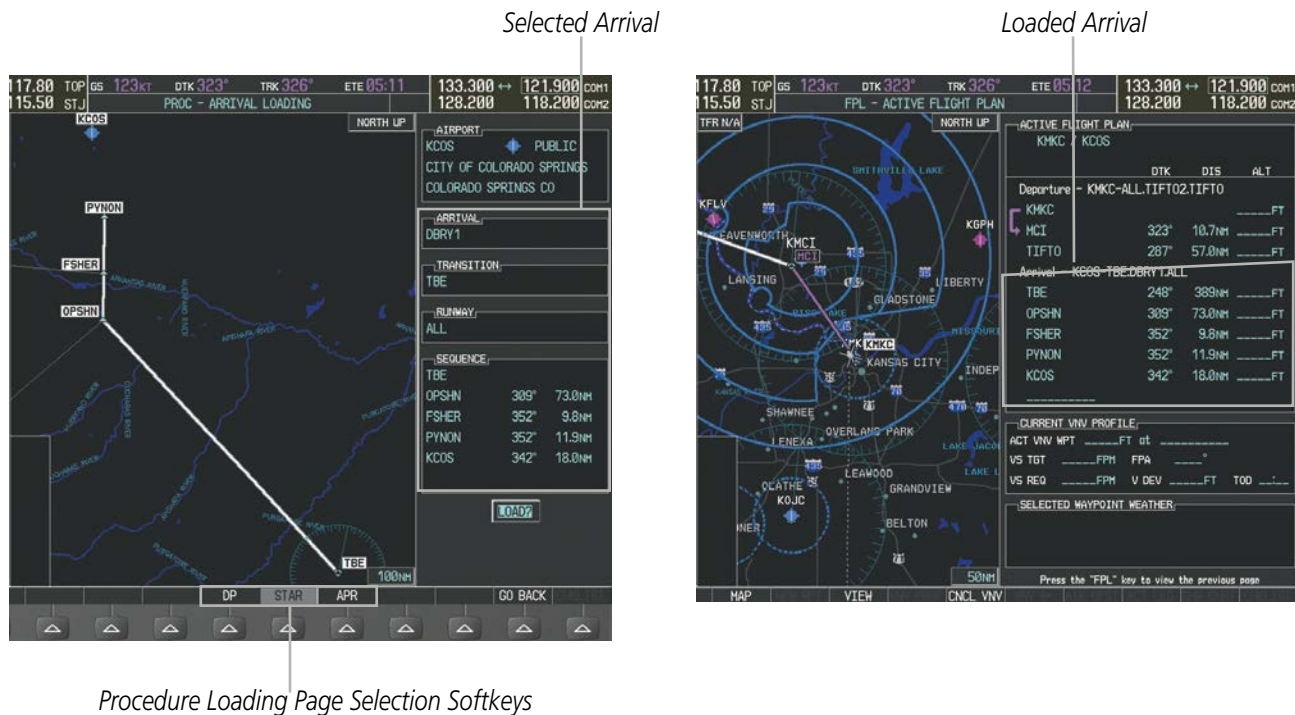
Figure 5-97 Arrival Loading

Viewing available arrivals at an airport:

1) From the Airport Information Page (first page in the WPT group), select 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) Select the **INFO-x** 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 SBAS GPS allows for flying LNAV, LNAV/VNAV, LP, and LPV approaches according to the published chart. LNAV+V is a standard LNAV approach with advisory vertical guidance provided for assistance in maintaining a constant vertical glidepath similar to an ILS glideslope on approach. This guidance is displayed on the system 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 type is annunciated on the HSI as shown in the following table:

HSI Annunciation	Description	Example on HSI
LNAV	GPS approach using published LNAV minima	
LNAV+V	GPS approach using published LNAV minima. Advisory vertical guidance is provided	
L/VNAV (available only if SBAS available)	GPS approach using published LNAV/VNAV minima (downgrades to Baro VNAV if SBAS unavailable)	
LP (available only if SBAS available)	GPS approach using published LP minima (downgrades to LNAV if SBAS unavailable)	
LPV (available only if SBAS available)	GPS approach using published LPV minima	

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) Use the **FMS** Knob to select an airport and press the **ENT** Key.

4) Select an approach from the list and press the **ENT** Key.

5) Select a transition (if required) and press the **ENT** Key.

6) Barometric Minimums

  a) 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:

  b) To skip setting minimums, press the **ENT** Key.

7) 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.

Available Procedure Actions

Destination Airport

Loaded Procedures

Approach Preview

Approach Choices
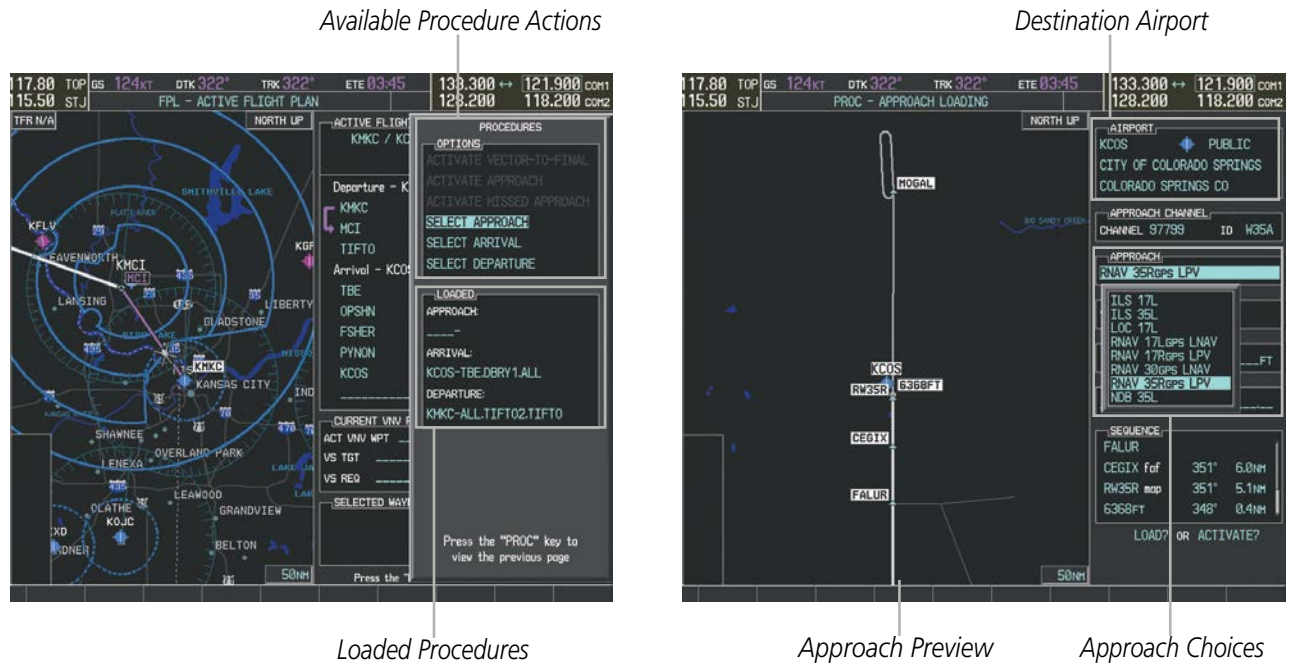
Figure 5-98 Approach Selection

Selected Approach

Loaded Approach

Procedure Loading Page Selection Softkeys

LOAD or ACTIVATE? Annunciation

Figure 5-99 Approach Loading

Viewing available approaches at an airport:

1) From the Airport Information Page (first page in the WPT group), select 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 BARO 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. The cursor moves to the Sequence box. The approach is previewed on the map.

   Or:

  b) When minimums are selected off, the cursor moves to the Sequence box. The approach is previewed on the map.

7) Press the INFO-x 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) Barometric Minimums

  a) 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. The 'LOAD?' field is highlighted.

   Or:

  b) 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:

Press the Go Around Button.

Or:

Fly past the MAP, and press the **SUSP** Softkey on the PFD.

Or:

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.

TEMPERATURE COMPENSATED ALTITUDE

A temperature compensated altitude can be computed and used at the FAF of a loaded approach. A temperature compensated altitude is displayed in slanted text.

Enabling 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.

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.
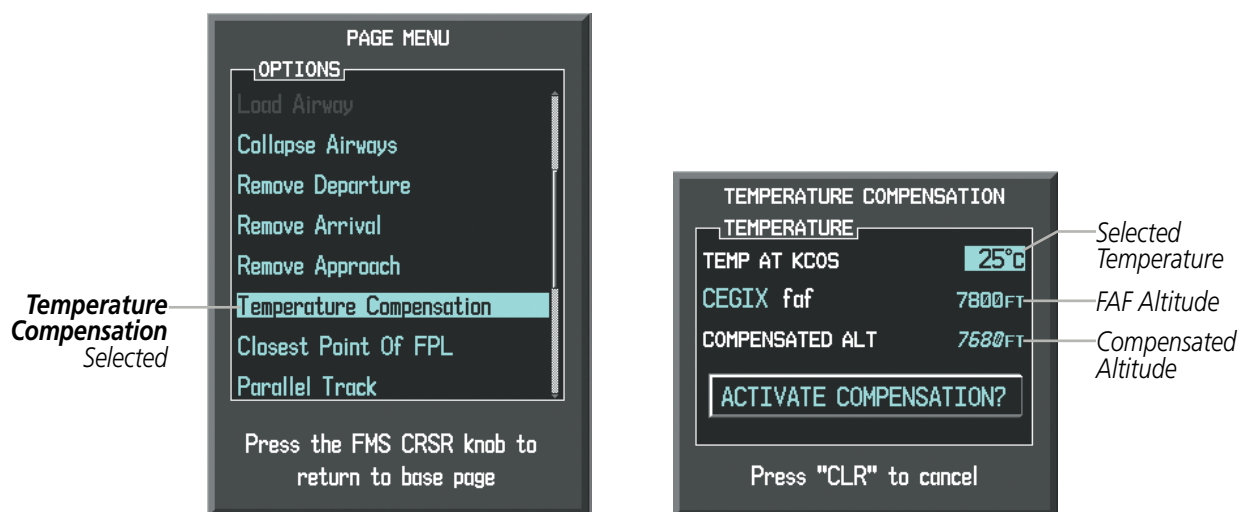
Figure 5-100 Temperature Compensation
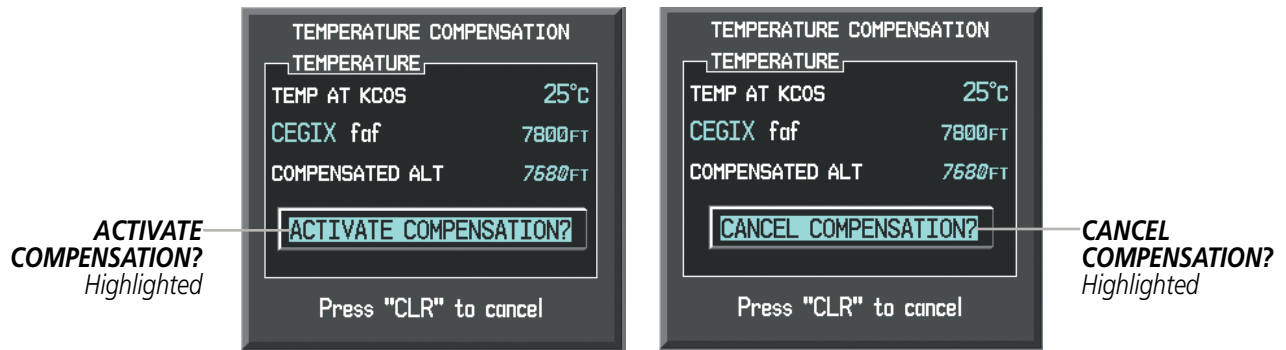
Figure 5-101 Activating/Cancelling Temperature Compensation

Figure 5-102 Temperature Compensation in the Active Flight Plan

Disabling 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.

COURSE TO ALTITUDE

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.

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.

Figure 5-103 Course to Altitude

5.9 TRIP PLANNING

The system 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 manually entered 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.
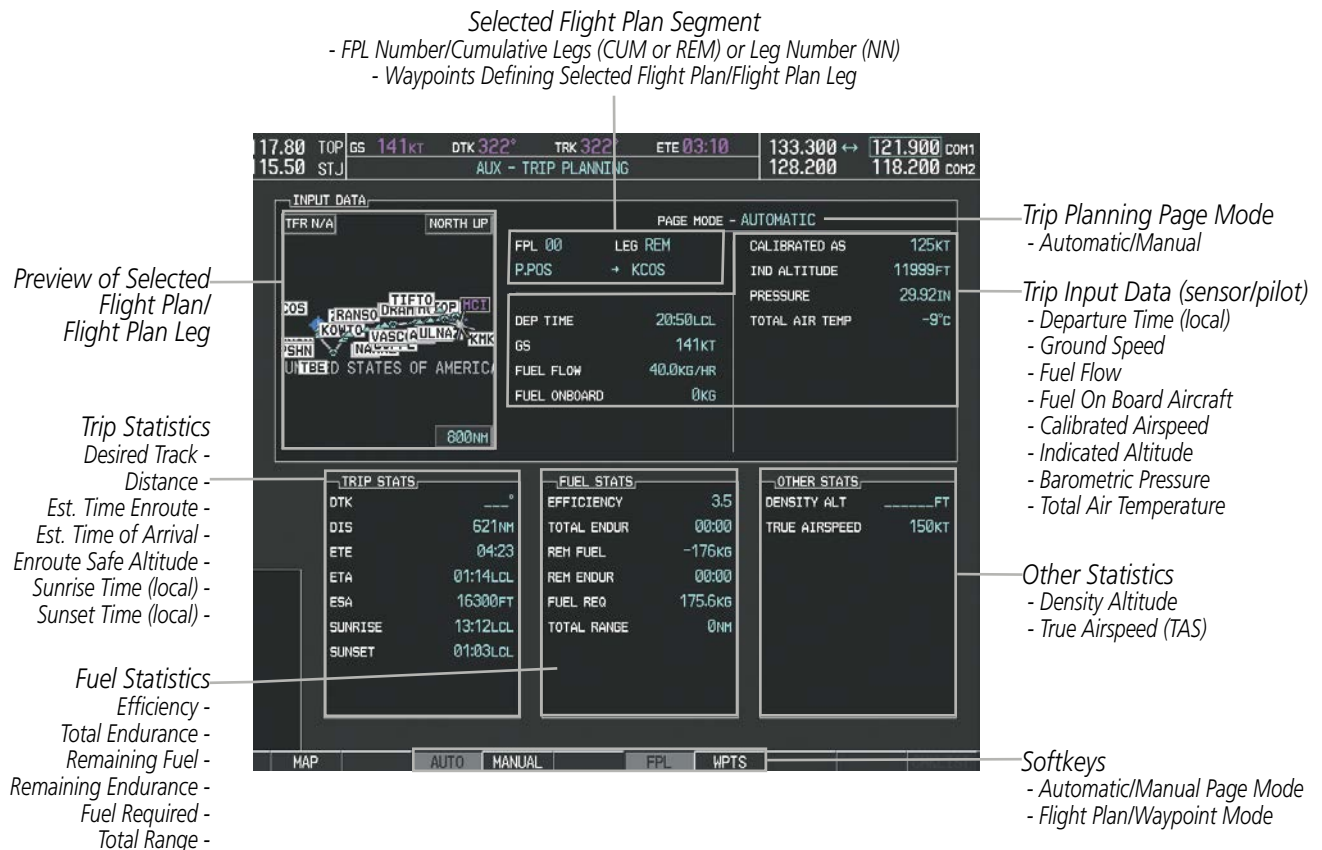
Figure 5-104 Trip Planning Page

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 and including 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 and including 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).

Selected Flight Plan NN -
00 is Active FPL
01-99 are Stored FPLs

FPL 00   LEG REM
P.POS   → KCOS

Starting and Ending Waypoint of
Selected Flight Plan Segment

Selected Leg(s)
Stored Flight Plan
 - CUM: Beginning to End of FPL
 - NN: Beginning to End of Selected Leg
Active Flight Plan
 - REM: Pres. Pos. to End of FPL
 - NN: Pres. Pos. to End of Selected Leg
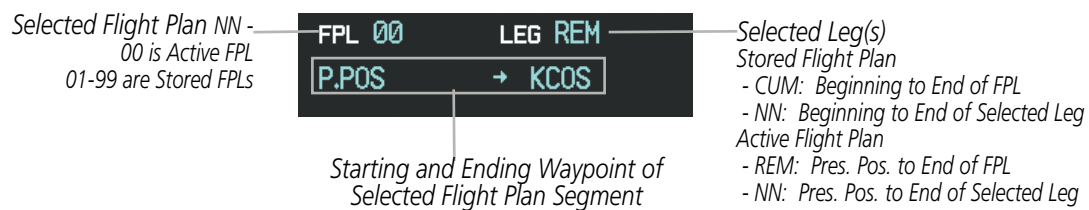
Figure 5-105 Trip Planning Page - Flight Plan Mode

Selected Flight Plan
Not Available

FPL 05   LEG CUM
TOP   → HYS

Selected Starting and Ending Waypoints

Selected Leg(s)
Not Available
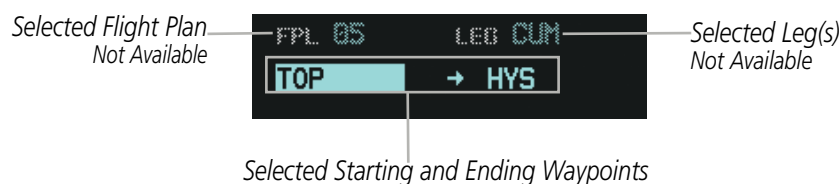
Figure 5-106 Trip Planning Page - Waypoint Mode

Selecting automatic or manual page mode:

Select 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:

Select 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) Select 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) Select 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.

RAIM PREDICTION Box
- *Prediction Waypoint*
- *Arrival Time*
- *Arrival Date*
- *RAIM Status*

RAIM *Softkey*
(displays RAIM PREDICTION)

SBAS *Softkey*
(displays SBAS Selection)

Figure 5-107 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 5-108 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.

SBAS Status

SBAS SELECTION Box
 - EGNOS Enable/Disable
 - MSAS Enable/Disable
 - WAAS Enable/Disable

RAIM *Softkey*
 (displays RAIM
 PREDICTION)

SBAS *Softkey*
 (displays SBAS Selection)

Figure 5-109 SBAS Display - Disabled

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 system 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 5-110 indicating the active departure leg.

   After takeoff, ATC assigns a heading of 240°.

2) Figure 5-110 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.
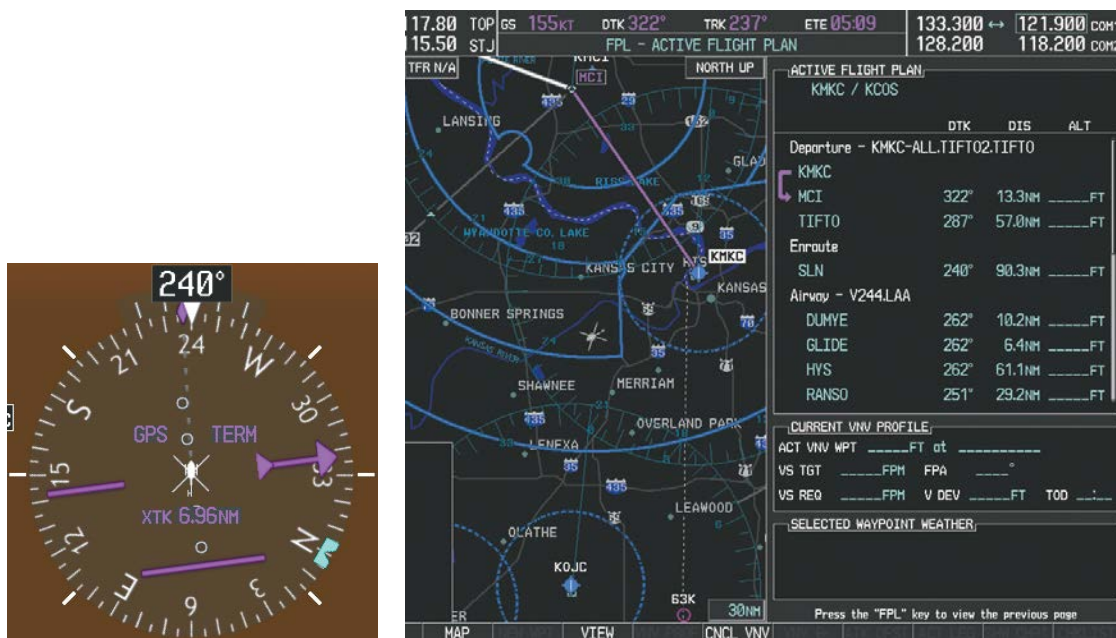
Figure 5-110 Assigned Heading of 240°

3) ATC now assigns routing to join V4. A heading of 290º is assigned to intercept V4. The aircraft turns to heading 290° as seen in Figure 5-111.
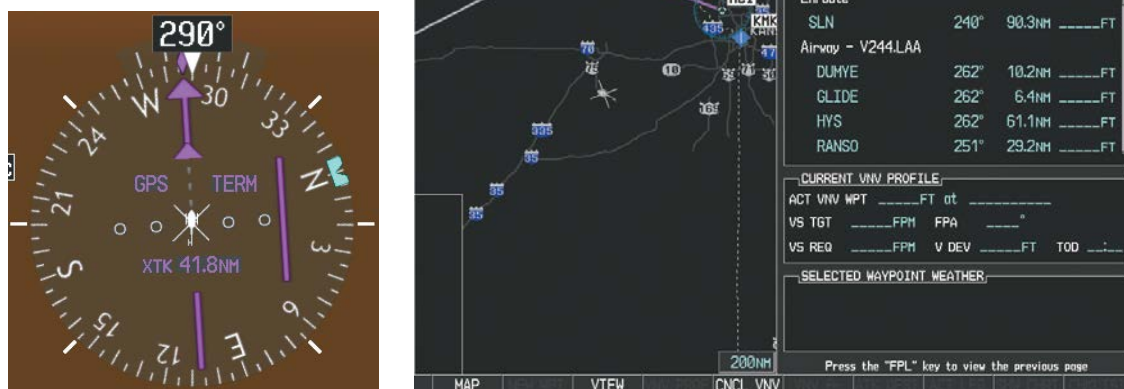
Figure 5-111 Assigned Heading of 290º

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 5-112. When the V4 entry point (TOP) is inserted, it is placed immediately above the highlighted waypoint (SLN).
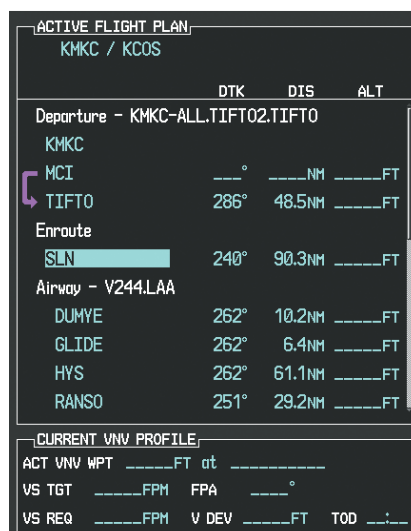
Figure 5-112 Begin Adding V4 to the Flight Plan

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 5-113.
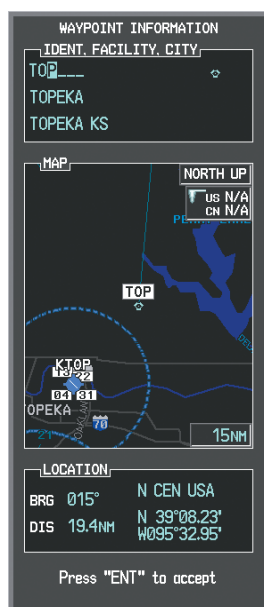
Figure 5-113 Entering V4 Entry Point

d) Press the **ENT** Key. TOP is inserted into the flight plan as in Figure 5-114.

Figure 5-114 TOP Inserted into the Flight Plan

e) With SLN still highlighted as in Figure 5-114, turn the small **FMS** Knob clockwise. The Waypoint Information Page is displayed and the **LD AIRWY** Softkey is now available.

f) Select the **LD AIRWY** Softkey to display the list of available airways for TOP as seen in Figure 5-115.

Figure 5-115 List of Available Airways for TOP

g) Turn either **FMS** Knob to highlight V4 in the list as seen in Figure 5-115.

h) Press the **ENT** Key. The list of available exits for V4 is now displayed as in Figure 5-116.
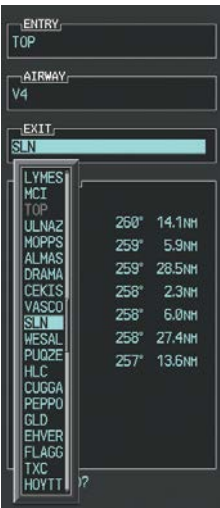
Figure 5-116 List of Available Exits for V4

i) If necessary, turn either **FMS** Knob to select the desired exit. In this case Salina VOR (SLN) is selected as in Figure 5-116.

j) Press the **ENT** Key. The selected airway and exit are displayed, and the prompt "LOAD?" highlighted as in Figure 5-117.
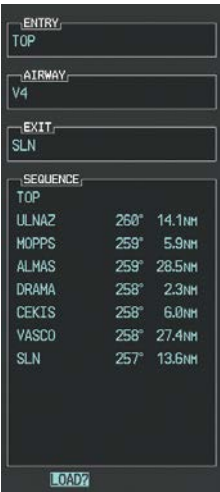
Figure 5-117 Ready to Load V4

k) Press the **ENT** Key.

l) V4 is now loaded into the flight plan as shown in Figure 5-118.

Figure 5-118 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) Select the **ACT LEG** Softkey. The confirmation window is now displayed as in Figure 5-119. Note the TOP to SLN leg is actually part of V4.
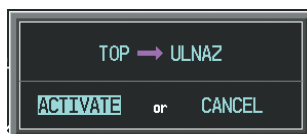
Figure 5-119 Comfirm Active Leg

d) Verify the displayed leg is the desired leg and press the **ENT** Key. Note in Figure 5-120, 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.
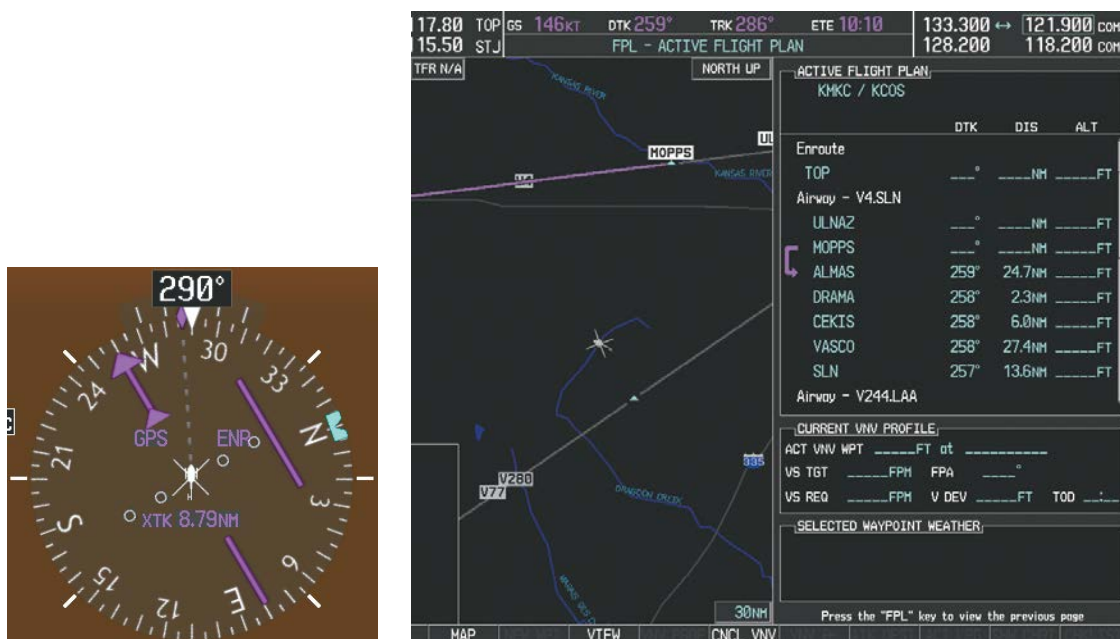
Figure 5-120 V4 Now Active Leg

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 5-121.

Figure 5-121 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 5-122.
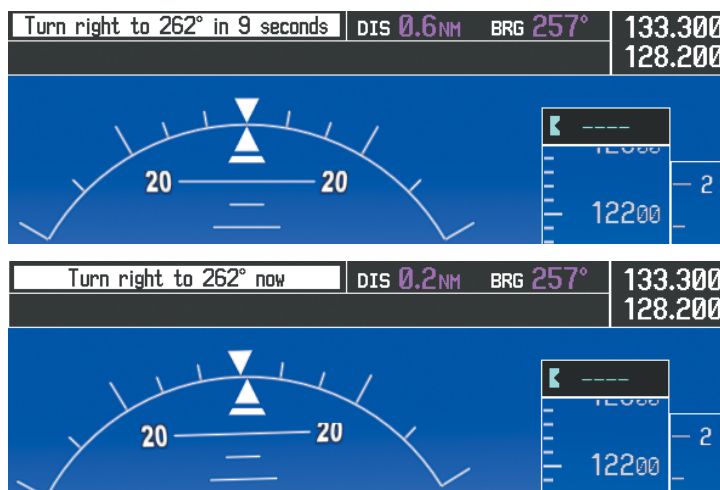
Figure 5-122 Turn to Intercept V244

9) As seen in Figure 5-123, V244 is now the active flight plan leg.

Figure 5-123 V244 Now Active Leg

10) At Lamar VOR (LAA) V263 is intercepted. See Figure 5-124.

Figure 5-124 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]) Key. The Direct-to Window is now displayed as shown in Figure 5-125.

Figure 5-125 Direct To OPSHN

d) Turn the large **FMS** Knob to place the cursor in the VNV altitude field as shown in Figure 5-126.

Figure 5-126 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 5-127.

Figure 5-127 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 system 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 5-128, 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 to 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 light blue meaning it is used by the system to determine vertical speed and deviation guidance.*

Figure 5-128 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 5-129.
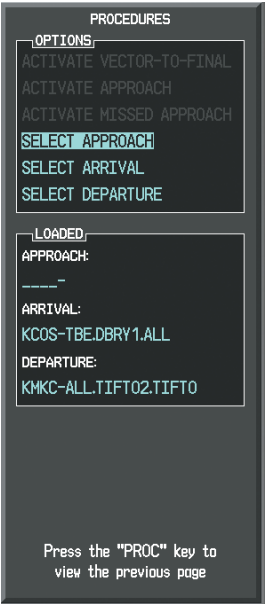
Figure 5-129 Procedures Window

c) Press the **ENT** Key. A list of available approaches for the destination airport is displayed as in Figure 5-130.

Figure 5-130 List of Available Approaches

d) Turn either **FMS** Knob to select the LPV approach for 35R as shown in Figure 5-130.

e) Press the **ENT** Key. A list of available transitions for the selected approach is displayed as in Figure 5-131.

Figure 5-131 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

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.
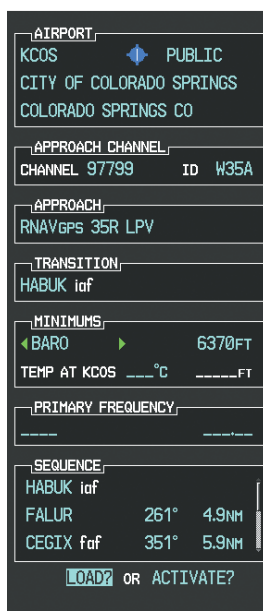
Figure 5-132 Barometric Minimums Set

i) With 'LOAD?' highlighted, again press the **ENT** Key. The selected approach is added to the flight plan as seen in Figure 5-133.

Figure 5-133 Loaded Approach

13) Note the altitude constraints associated with each of the approach waypoints as seen in Figure 5-134. These altitudes are loaded from the database and are displayed as white text, indicating these values are "not designated" for use in computing vertical deviation guidance.

Note: To 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 **ENT** Key.

   d) Press the **FMS** Knob to deactivate the cursor.

   After making the altitude "designated", it is displayed as light blue 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 5-134. Vertical guidance from the FAF and on to the Missed Approach Point (MAP) is given using the SBAS GPS altitude source, therefore, the displayed altitude values are for reference only.

Figure 5-134 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) Select the **VNV PROF** Softkey to place the cursor in the target vertical speed field (VS TGT) as shown in Figure 5-135.

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 5-135 Adjusting the Descent

c) Press the **ENT** Key.

15) As seen in Figure 5-136, 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 5-137. When the aircraft is within one minute of the TOD, it is annunciated as shown in Figure 5-137, and an aural alert 'Vertical track' will be heard.

Figure 5-136 Approaching Top of Descent (TOD)
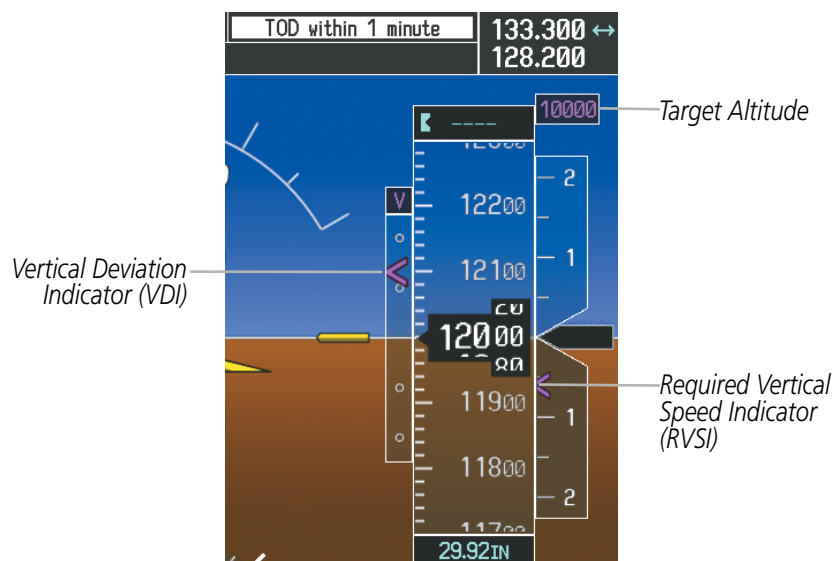
Figure 5-137 VDI & RVSI Upon Reaching Top of Descent (TOD)

16) Upon reaching TOD, a descent vertical speed is established by placing the VSI pointer in line with the RVSI as shown in Figure 5-138.

Keep Vertical Deviation Indicator Centered

Align Actual Vertical Speed with Required Vertical Speed
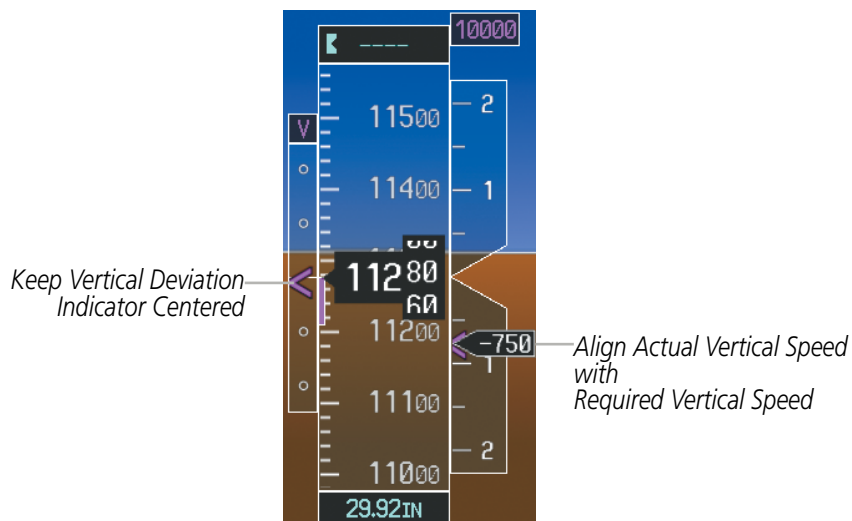
Figure 5-138 VDI & RVSI Showing Correctly Established Descent

17) When the aircraft is one minute from the bottom of descent (BOD) it is annunciated as shown in Figure 5-139. Upon reaching the offset waypoint for OPSHN, the aircraft is at 10,000 feet.
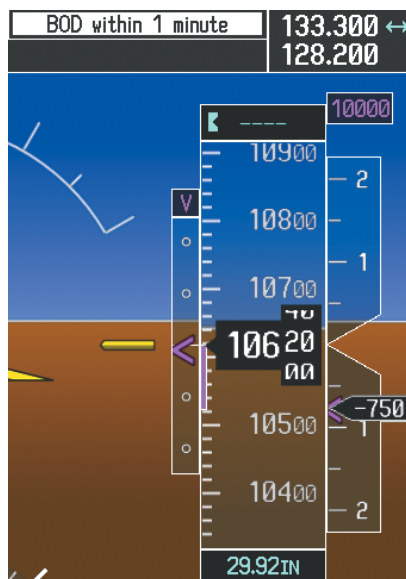
Figure 5-139 Approaching Bottom of Descent (BOD) at OPSHN Offset Waypoint

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 5-140. 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.
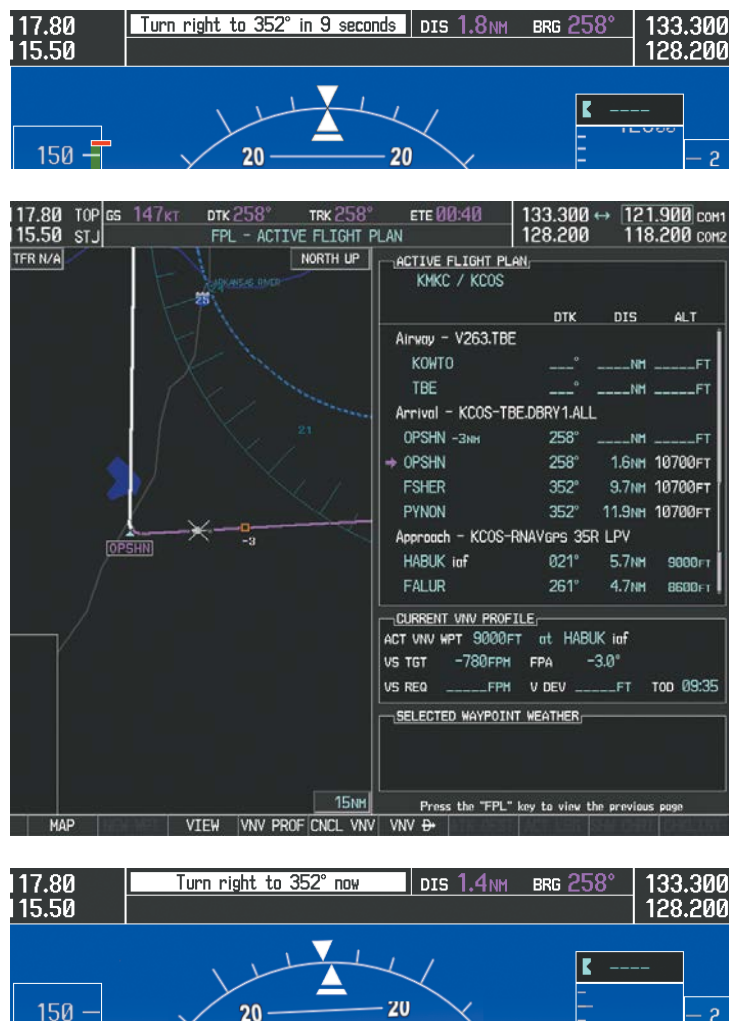
Figure 5-140 Turn to intercept OPSHN to FSHER Leg

19) After passing OPSHN, the next leg of the arrival turns magenta as shown in Figure 5-141. The magenta arrow in the flight plan list now indicates the OPSHN to FSHER leg of the arrival procedure is now active.

Figure 5-141 Tracking the OPSHN to FSHER Leg

20) The flight continues through the arrival procedure to PYNON (see Figure 5-142). 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.

A descent to HABUK is in the next leg. Note the TOD point on the map. Annunciations for the upcoming turn and descent, as well as the VDI and RVSI, appear on the PFD as the flight progresses.
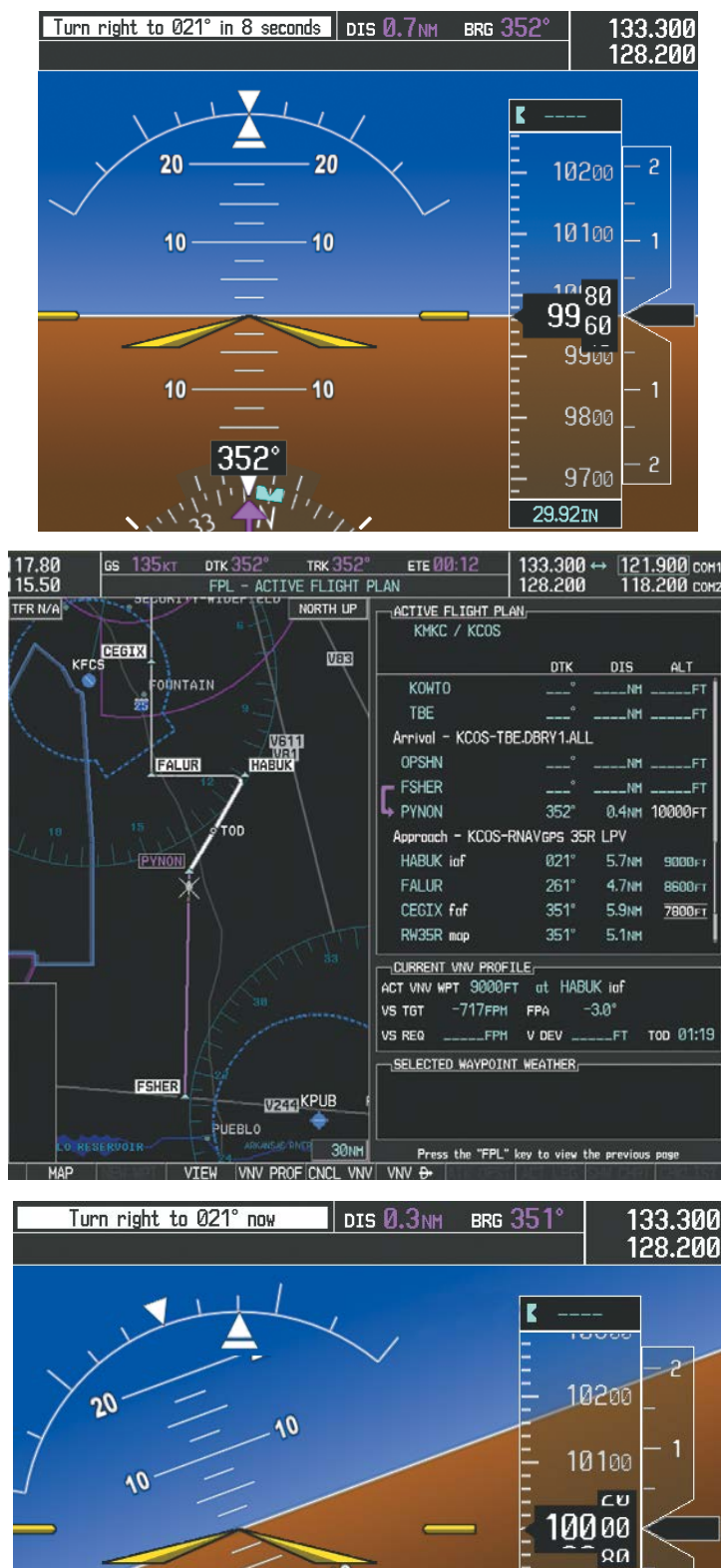
Figure 5-142 Approaching PYNON

21) Upon passing PYNON the approach procedure automatically becomes active. The approach may be activated at any point to proceed directly to the IAF. In this example, the aircraft has progressed through the final waypoint of the arrival and the flight plan has automatically sequenced to the IAF as the active leg, activating the approach procedure (see Figure 5-143).

Figure 5-143 Approach is Now Active

Note: To manually activate the approach procedure, perform the following steps:

a) Press the **PROC** Key.

b) Turn the large **FMS** Knob to highlight 'ACTIVATE APPROACH' as shown in Figure 5-144.

c) Press the **ENT** Key to activate the approach.
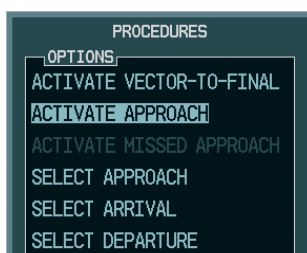
Figure 5-144 Manually Activate Approach

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 9,000 feet upon reaching HABUK.

Figure 5-145 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 5-146) when the final approach course becomes active.
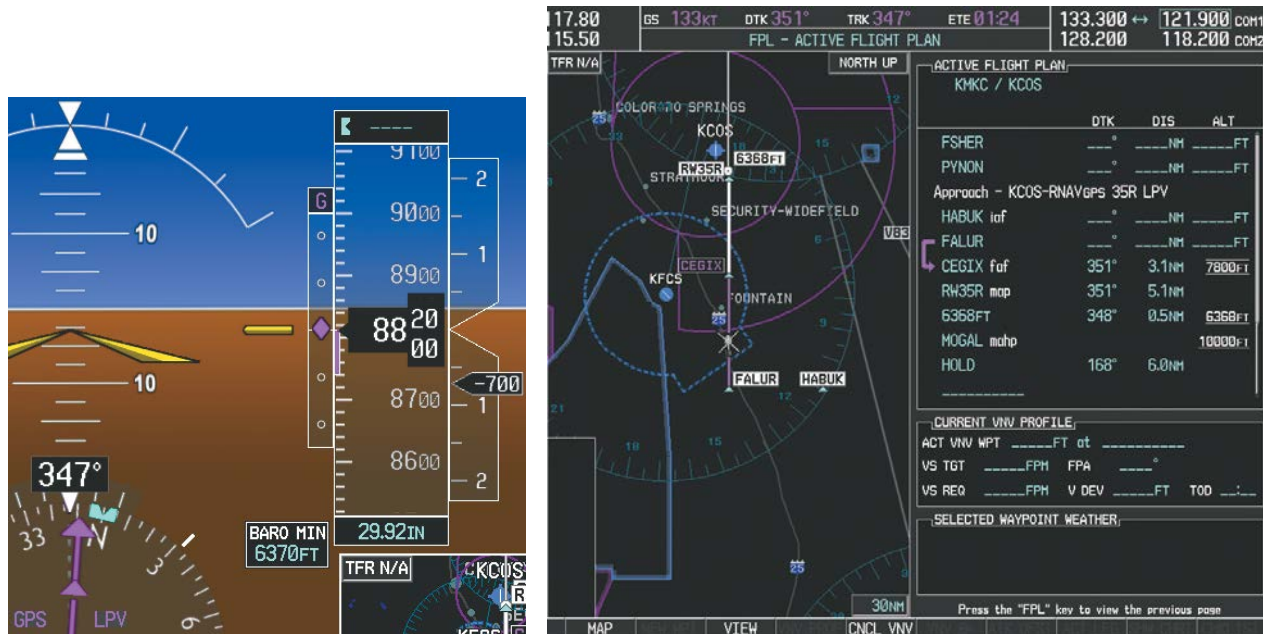
Figure 5-146 Descending to the FAF

The descent continues through the FAF (CEGIX) using the Glidepath Indicator, as one would use a glideslope indicator, to obtain an altitude "AT" 7,800 feet at the FAF. Note the altitude restriction lines over and under (At) the altitude in the 'ALT' field in Figure 5-146.

24) After crossing CEGIX, the aircraft continues following the glidepath to maintain the descent to "AT or ABOVE" 6,370 feet at the Missed Approach Point (MAP) (RW35R) as seen in Figure 5-147.

Figure 5-147 Descending to the Missed Approach Point

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.

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.

25) Upon reaching the MAP, it is decided to execute a missed approach. Automatic waypoint sequencing is suspended past the MAP. Press the Go Around Button, or press the **SUSP** Softkey on the PFD, to resume automatic waypoint sequencing through the missed approach procedure.

A direct-to is initiated to MOGAL, which is the Missed Approach Hold Point (MAHP) as seen in Figure 5-148. The aircraft is climbing to 10,000 feet. The CDI flight phase now changes from LPV to MAPR as seen on the HSI.
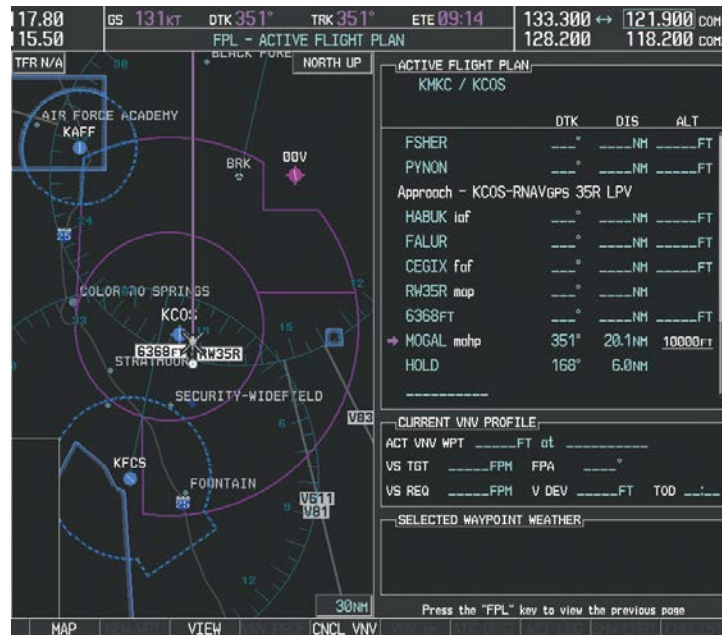
Figure 5-148 Missed Approach Active

26) The aircraft continues climbing to "AT or ABOVE" 10,000 feet at MOGAL. A holding pattern is established at the MAHP (MOGAL) as shown in Figure 5-149.

Figure 5-149 Establishing the Holding Pattern

27) The aircraft maintains 10,000 feet while following the magenta line through the hold as in Figure 5-150.
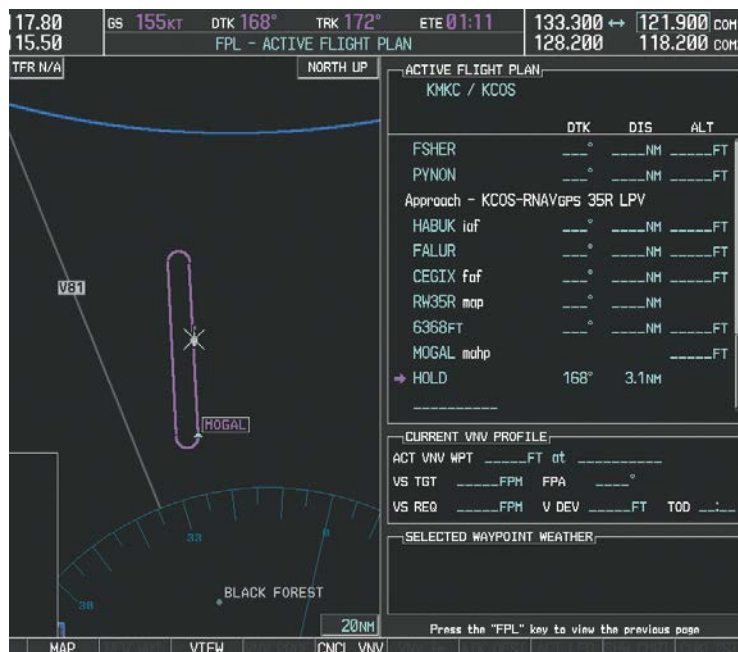
Figure 5-150 Hold Established

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 system stops using GPS.*

While in Enroute or Oceanic phase of flight, if the system 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 system 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 system 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 system 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 compounds 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 system by the appearance of the letters 'DR' superimposed in yellow over the 'own aircraft' symbol as shown in Figure 5-151. In addition, 'DR' is prominently displayed in yellow on the HSI slightly above and to the right of the aircraft symbol on the CDI as shown in Figure 5-151. The CDI deviation bar remains, but is removed from the display after 20 minutes in DR Mode. 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 yellow text on the display to denote degraded navigation source information as shown in Figure 5-151.

Also, while the system is in DR Mode, some terrain functions 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.

Distance & Bearing

Current Track Indicator)

Ground Speed

Dead Reckoning Annunciaion

GPS Navigation Lost Message

Bearing Pointer/ Distance

Nav Data Bar All data except Active Leg, TAS, and DTK are in yellow

Dead Reckoning Annunciation

Subdued Rotorcraft Symbol

Figure 5-151 Dead Reckoning Mode - GPS Derived Data Shown in Yellow
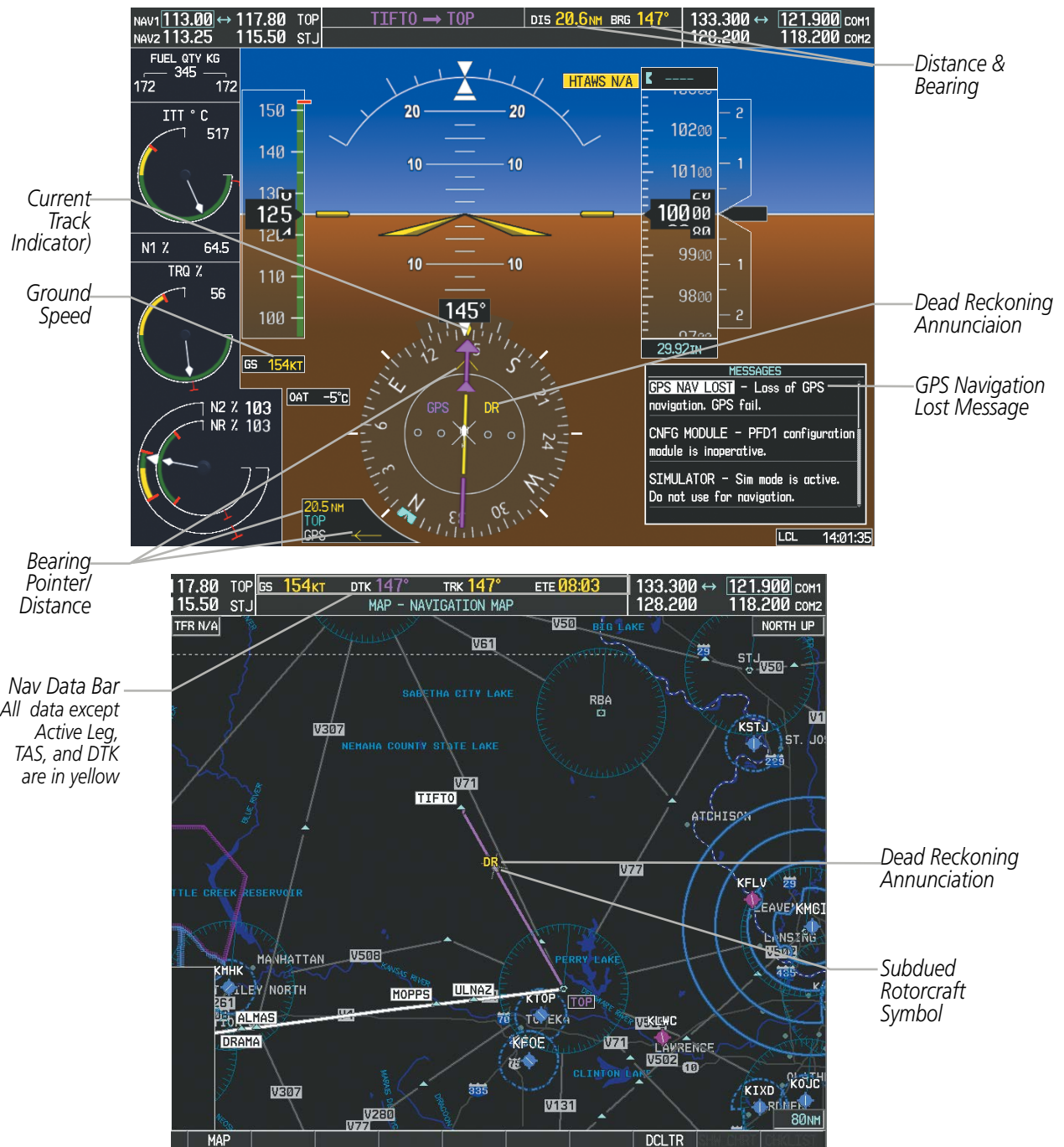
> **NOTE:** *The Inset Map is removed from the PFD any time aircraft pitch is greater than +30° or less than −20°, or when a 65° bank angle is reached.*

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SECTION 6 HAZARD AVOIDANCE

The G1000H hazard avoidance features are designed to provide advisory information of potential hazards to flight safety associated with weather, terrain, and air traffic.

This section is divided into the following groups:

Weather

• GDL 69AH SiriusXM Weather (Optional)

Terrain Avoidance

• HTerrain Proximity

• HTerrain with Synthetic Vision System (HTerrain-SVS) (included with SVT option)

• Profile View Terrain

• HTerrain Awareness and Warning System (HTAWS) (optional)

Traffic

• TIS (Traffic Information Service)

• Garmin GTS 800 Traffic Advisory System (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 GDL 69AH is a remote-mounted data link satellite receiver. It provides SiriusXM Weather information to the system. Received graphical weather information and associated text is displayed on the Multi Function Display (MFD). The GDL 69AH operates 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 can be used, the service must be activated. Service is activated by providing SiriusXM with the Data Radio ID unique to the installed GDL 69AH. The Data Radio ID is 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 Data Radio ID cannot be located.

SiriusXM uses the coded ID to send an activation signal that allows the system to display weather information provided through the GDL 69AH.

Activating SiriusXM Weather services:

1) Contact SiriusXM customer service, and follow the instructions provided.

2) Select the XM Radio page in the Auxiliary Page Group.

3) Select the **INFO** Softkey to display the XM Information Page.

4) Verify that the desired services are activated.

5) Select the **LOCK** Softkey.

6) Turn the large **FMS** Knob to highlight 'YES'.

7) To complete activation, press the **ENT** Key.
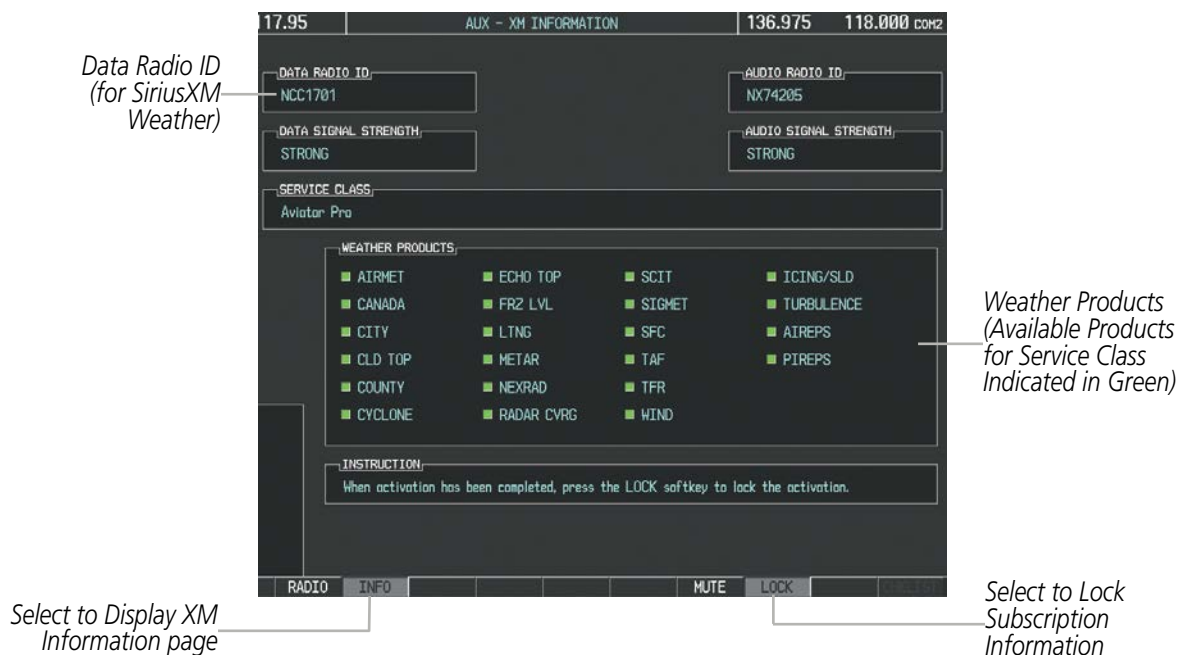
Figure 6-1 XM Information Page

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) Page.

NEXRAD Weather Product Icon

NEXRAD Weather Product Ages (US & Canada)

NEXRAD Weather Product Selected for Display
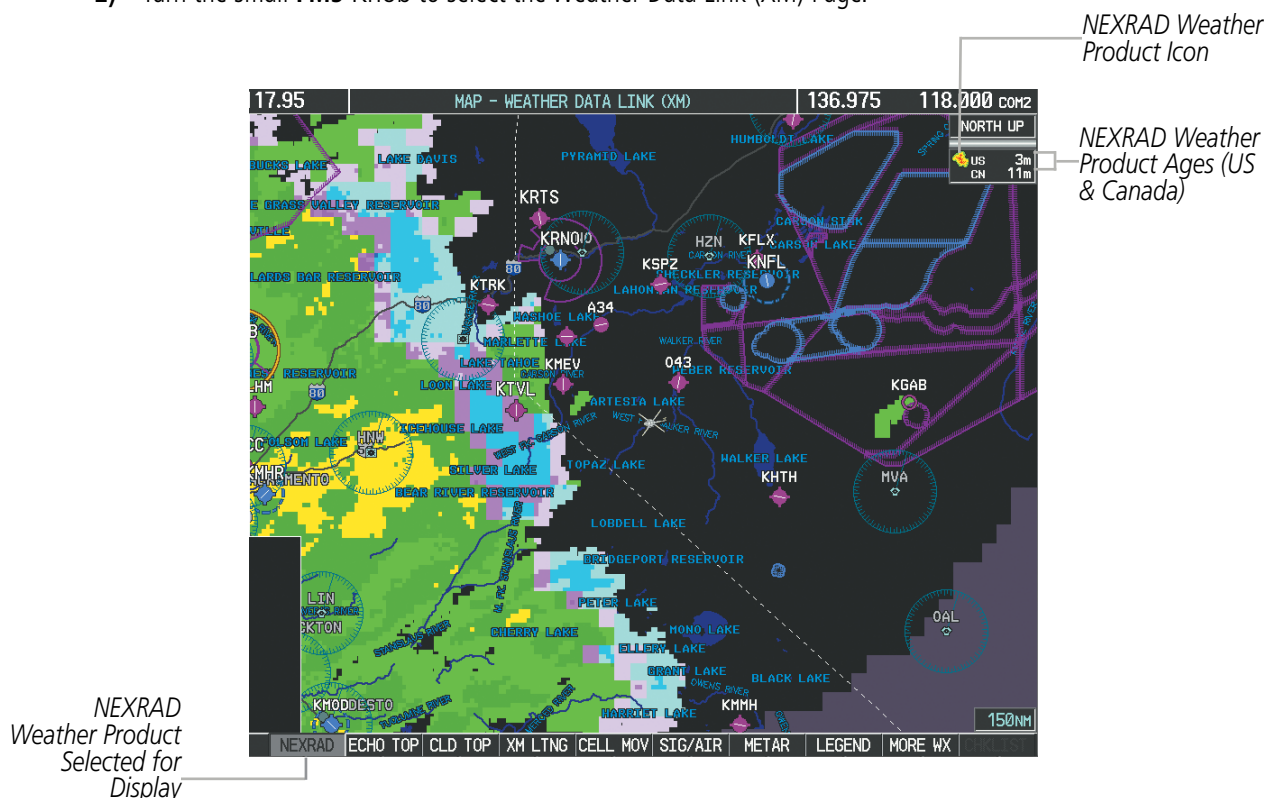
Figure 6-2 Weather Data Link (XM) Page

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 yellow. If data for a weather product is not available, 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
Echo Top (ECHO TOP)		30	7.5
XM 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)		60	12
Surface Analysis (SFC)		60	12
Freezing Levels (FRZ LVL)		60	12
Winds Aloft (WIND)		60	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
No 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.

Weather Product	Navigation Map Page	Weather Data Link (XM) Page	Weather Information Page	AUX - Trip Planning Page	Nearest Page Group	Flight Plan Pages
NEXRAD	+	+		+	+	+
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		+	+			

Table 6-2 Weather Product Display Maps

Softkeys control the display of weather information on most MFD pages (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.
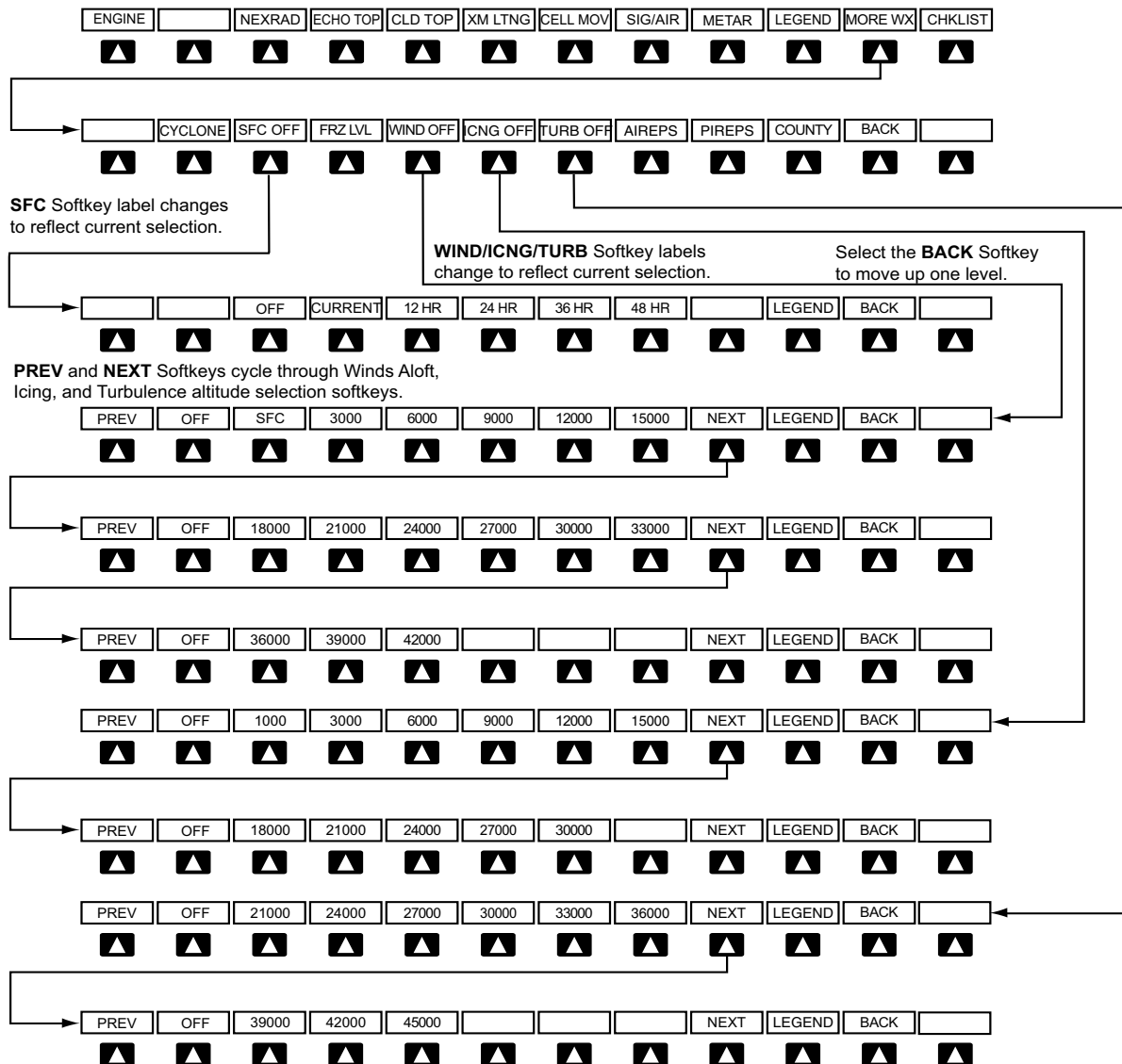
Figure 6-3 Weather Data Link (XM) Page Weather Product Softkeys

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 page 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.
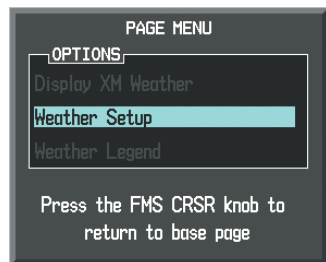
Figure 6-4 Weather Data Link (XM) Page Menu
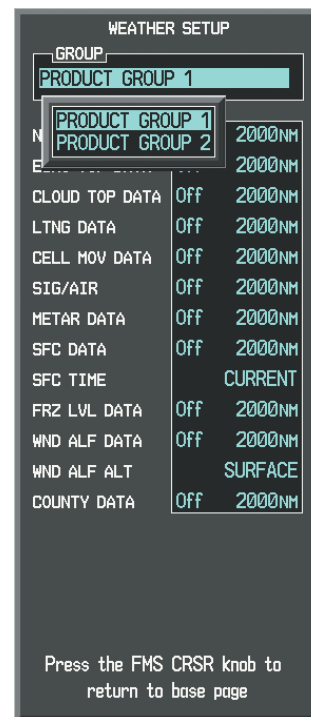
Figure 6-5 Weather Data Link (XM) Page Setup Menu

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) Turn the small **FMS** Knob to select 'PRODUCT GROUP 1' or 'PRODUCT GROUP 2', and press the **ENT** Key (Figure 6-5).

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.

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.
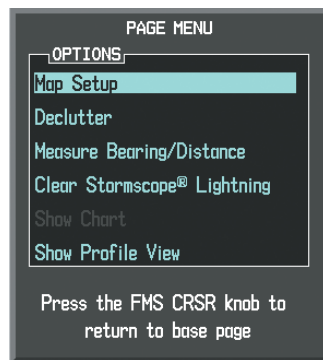
Figure 6-6 Navigation Map Page Menu

Figure 6-7 Navigation Map Page Setup Menu
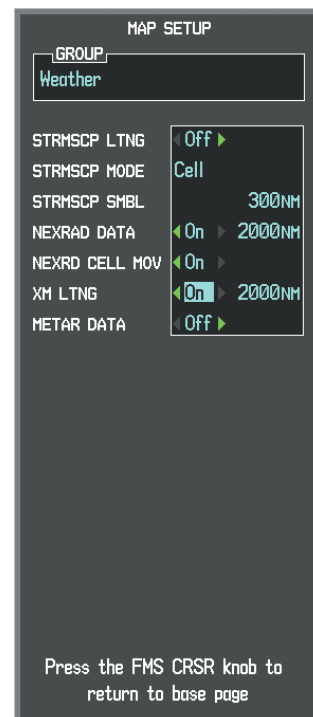
Figure 6-8 Navigation Map Page Setup Menu, Weather Group

The Weather Data Link (XM) Page and the Navigation Map Page can display legends for weather products shown on those pages.

Viewing legends for displayed weather products:

1) Select the Weather Data Link (XM) Page or Navigation Map Page.

2) If viewing the Navigation Map Page, select the **Map** Softkey.

3) Select 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.

4) Turn the **FMS** Knob to scroll through the legends if more are available than fit in the window.

5) To remove the XM Weather Legends Window, select the **LEGEND** Softkey, or press the **ENT** Key, the **CLR** Key, or **FMS** Knob.

Additional information about the following weather products can be displayed by panning over the weather product on the map:

- Echo Tops
- Cell Movement
- SIGMETs
- AIRMETs
- METARs
- County Warnings
- TFRs
- AIREPs
- PIREPs

The map panning feature is enabled by pressing the **RANGE** Knob. The map range is adjusted by turning the **RANGE** Knob. If the map range is adjusted while panning is enabled, the map is re-centered on the Map Pointer.
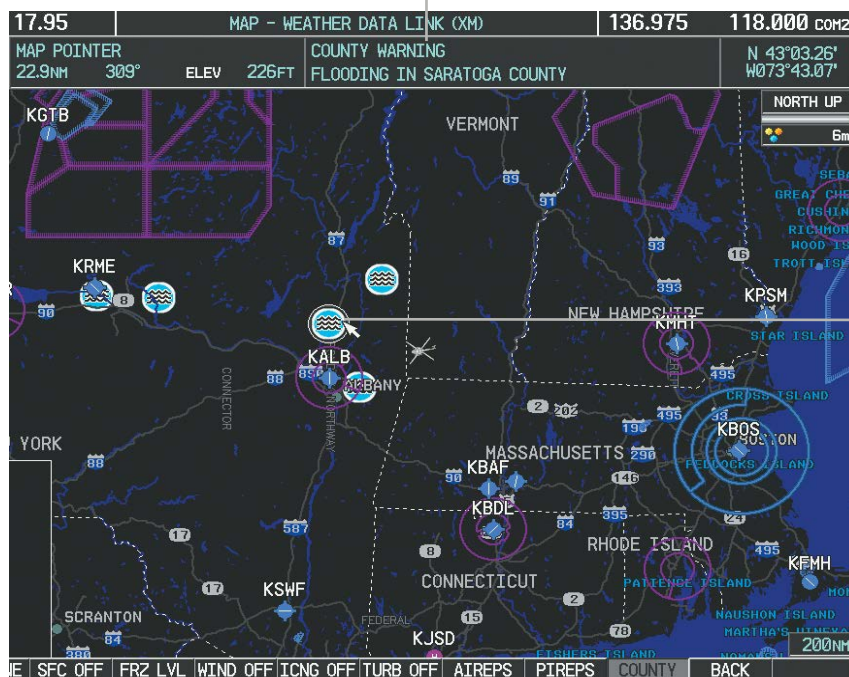
Additional Information on Weather Feature Selected with Map Pointer

Flash Flood Warning Selected with Map Pointer

Figure 6-9 Panning on the Weather Data Link (XM) Page

NEXRAD

> **NOTE:** NEXRAD data cannot be displayed at the same time as turbulence, icing, or 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. 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 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. The NEXRAD weather product should never be used

as a basis for making decisions to maneuver in, near, or around areas of hazardous weather regardless of the information it contains.
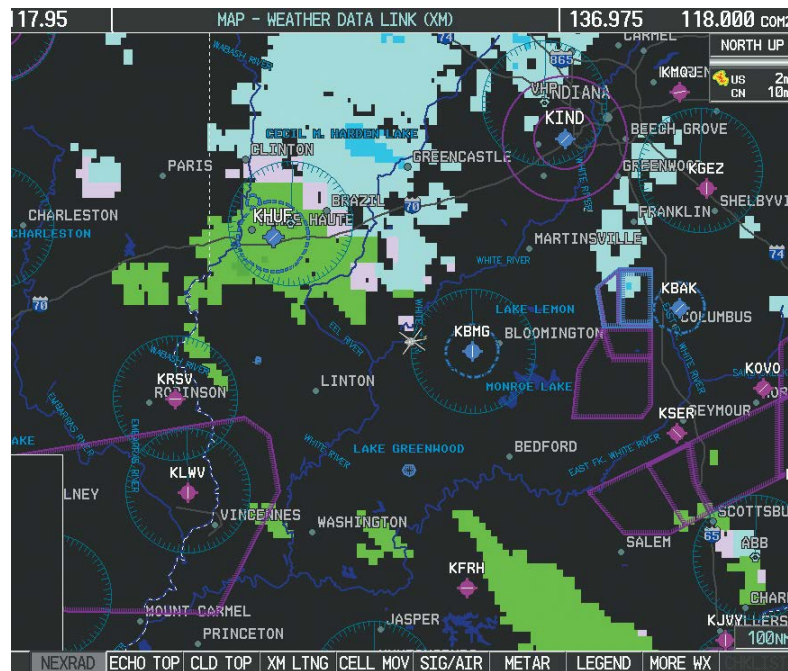
Figure 6-10 NEXRAD Data on the Weather Data Link (XM) Page

NEXRAD data can be displayed on the following maps:

- Navigation Map Page
- Weather Data Link (XM) Page
- Airport Information Page

- Trip Planning Page
- Nearest Pages
- Flight Plan Pages

Displaying NEXRAD weather information:

1) Select the **MAP** Softkey. This step is not necessary on the Weather Data Link (XM) Page.

2) Select the **NEXRAD** Softkey.

Composite data from all the NEXRAD radar sites in the United States 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), select the **LEGEND** Softkey when NEXRAD is selected for display.
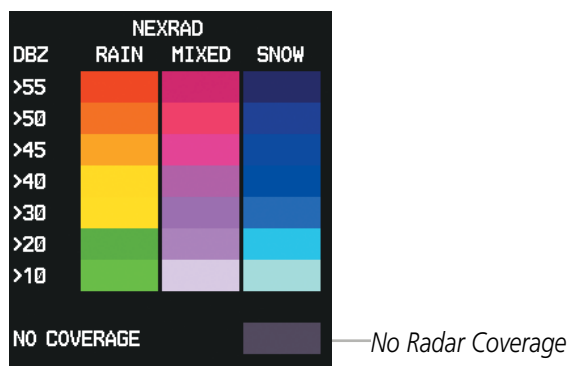
Figure 6-11 NEXRAD Data with Legend

The display of No Radar Coverage is always active when either NEXRAD the Echo Tops weather product 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.

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:

- NEXRAD base reflectivity does not provide sufficient information to determine cloud layers or precipitation characteristics (wet hail vs. rain). For example, it is not possible to distinguish between wet snow, wet hail, and rain.

- NEXRAD base reflectivity is sampled at the minimum antenna elevation angle. An individual NEXRAD 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 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.

Block Area is 4 km²
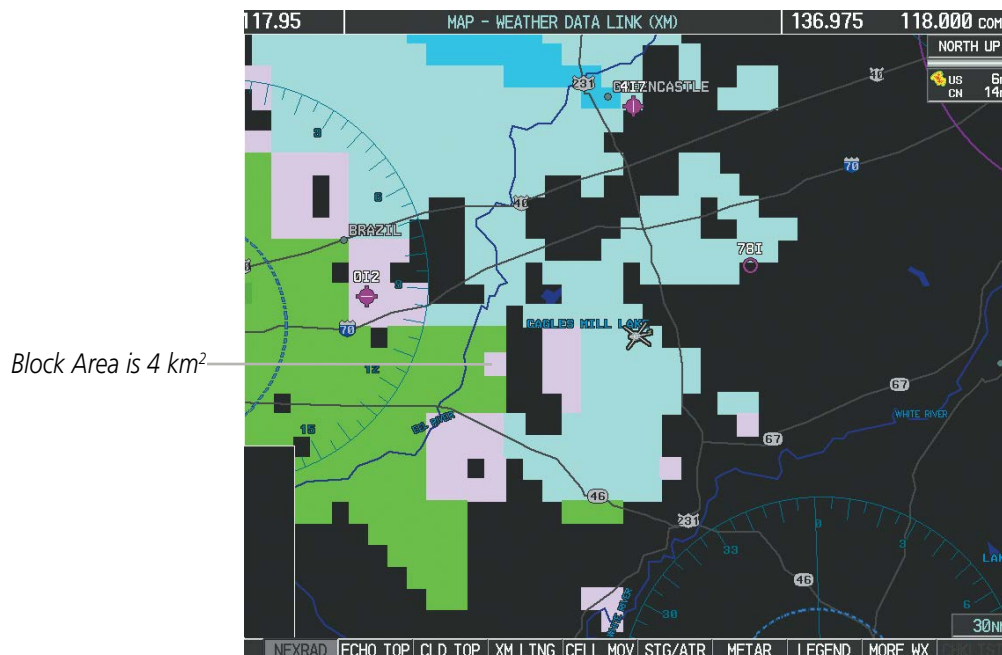
Figure 6-12 NEXRAD Data - Zoomed

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 from military aircraft, which can cause alterations in radar scans

NEXRAD Limitations (Canada)

• Radar coverage extends to 55ºN.

• Any precipitation displayed between 52ºN and 55ºN is displayed as mixed regardless of actual precipitation type.

No Coverage Above 55ºN

Precipitation Above 52ºN Displays as Mixed
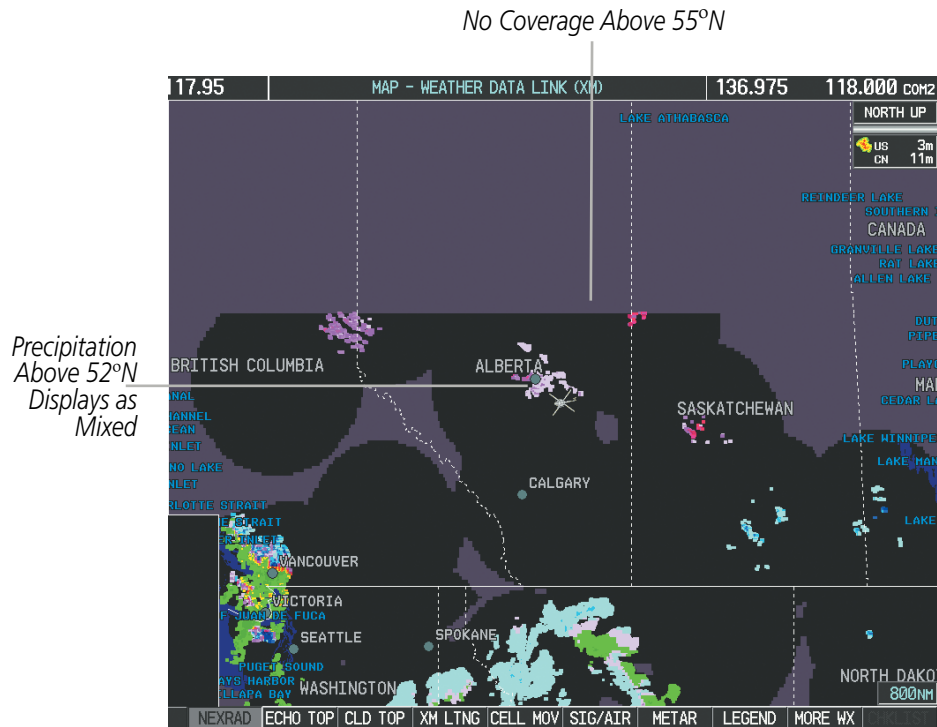
Figure 6-13 NEXRAD Data - Canada

ECHO TOPS

✓ **NOTE:** *Echo Tops cannot be displayed at the same time as Cloud Tops and NEXRAD.*

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.
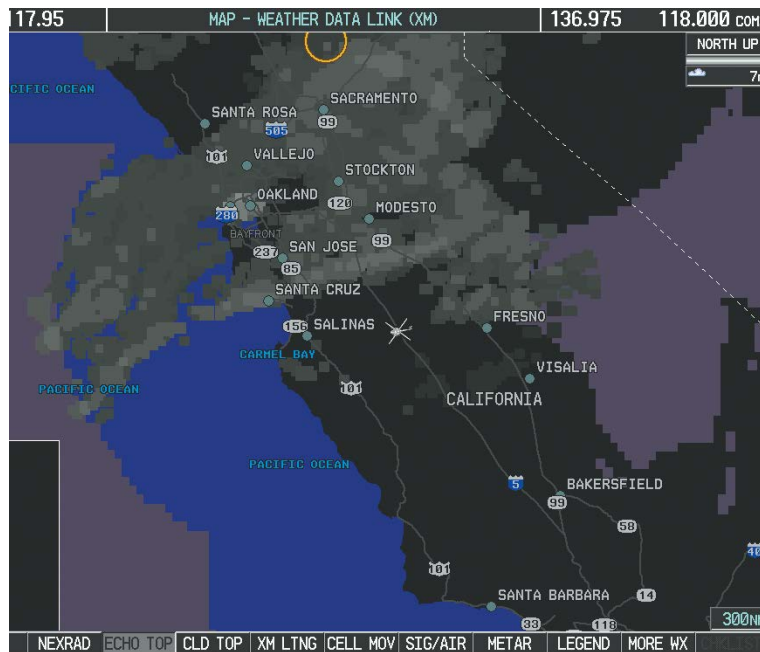
Figure 6-14 Echo Tops Data

Displaying Echo Tops information:

1) Select the Weather Data Link (XM) Page.

2) Select the **ECHO TOP** Softkey.

To display the Echo Tops legend (Figure 6-15), select 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.
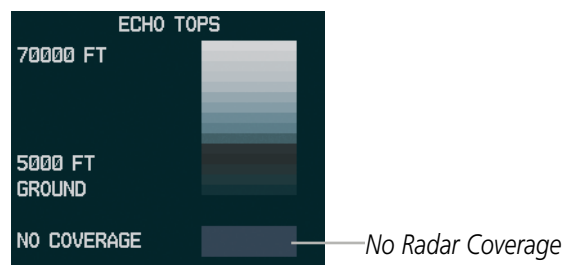
Figure 6-15 Echo Tops Legend

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.
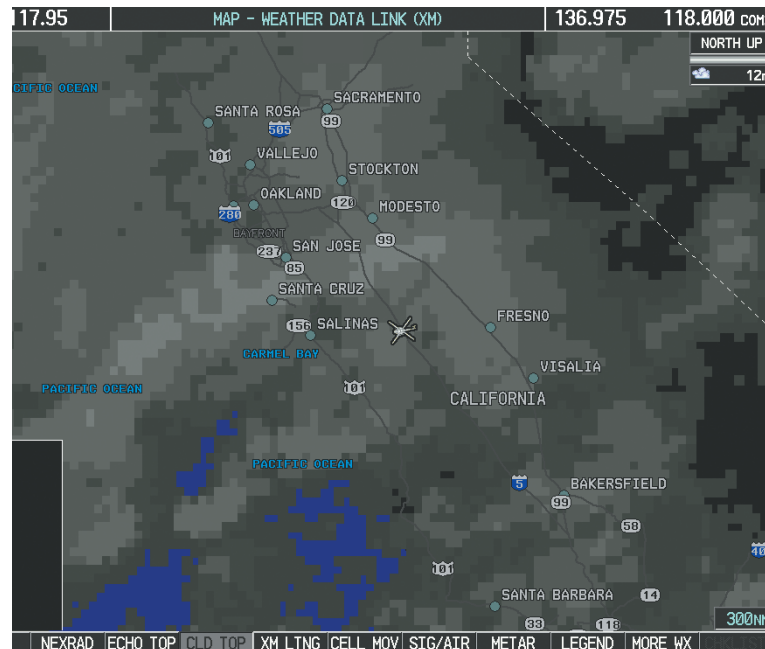
Figure 6-16 Cloud Tops Data

Displaying Cloud Tops information:

1)   Select the Weather Data Link (XM) Page.

2)   Select the **CLD TOP** Softkey.

To display the Cloud Tops legend (Figure 6-17), select 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, the Echo Tops weather product is removed.
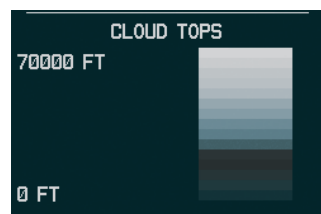
Figure 6-17 Cloud Tops Legend

SIRIUSXM LIGHTNING

NOTE: *SiriusXM Lightning and optional Stormscope lightning cannot be displayed simultaneously 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.
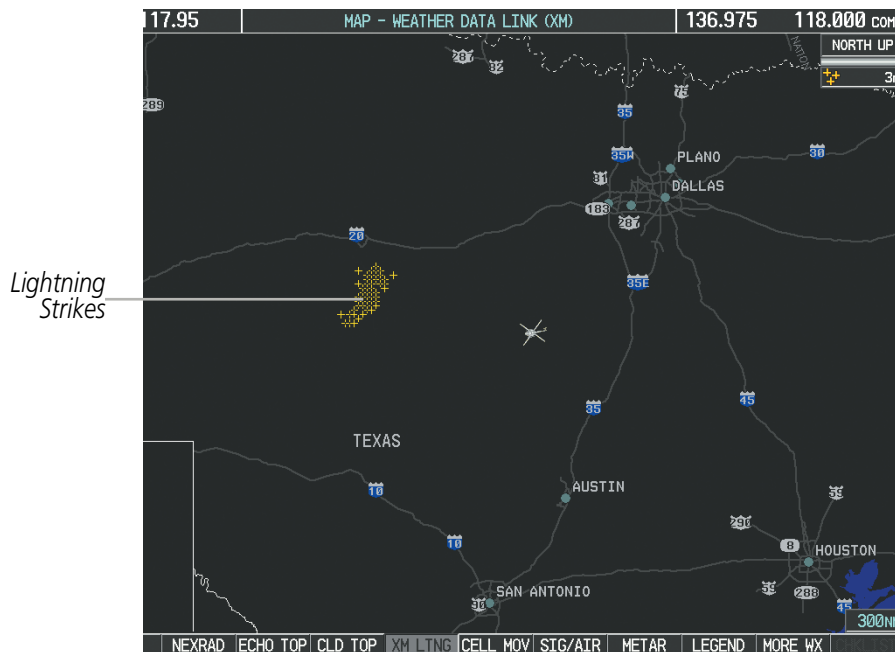
Figure 6-18 SiriusXM Lightning Weather Product

The SiriusXM Lightning weather product displays on the following maps:

- Navigation Map Page
- Weather Data Link (XM) Page
- Trip Planning Page

- Nearest Pages
- Flight Plan Pages

Displaying SiriusXM Lightning information:

1) Select the **MAP** Softkey. This step is not necessary on the Weather Data Link (XM) Page.

2) Select the **XM LTNG** Softkey.

To display the SiriusXM Lightning legend on the Weather Data Link (XM) Page (Figure 6-19), select the **LEGEND** Softkey when SiriusXM Lightning is selected for display.
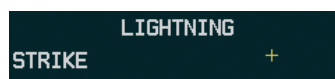
Figure 6-19 Lightning Legend

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.
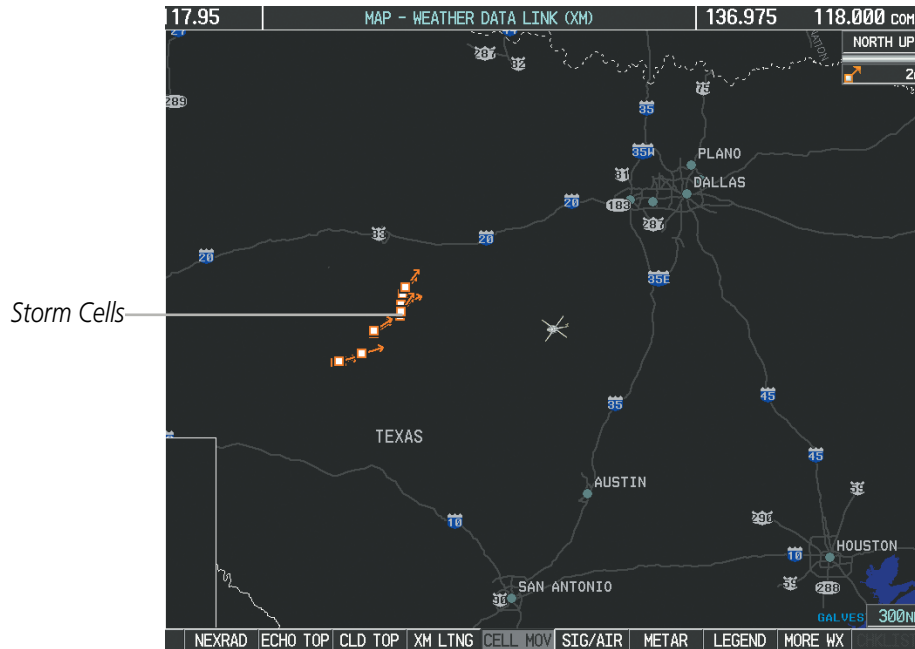
Figure 6-20 Cell Movement Weather Product

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 information can be selected independently. The Cell Movement weather product can be displayed on the following maps:

- Navigation Map Page
- Weather Data Link (XM) Page
- Airport Information Page
- Trip Planning Page
- Nearest Pages
- Flight Plan Pages

Displaying Cell Movement information:

1) Select the **MAP** Softkey. This step is not necessary on the Weather Data Link (XM) Page.

2) Select 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), select the **LEGEND** Softkey when Cell Movement is selected for display.
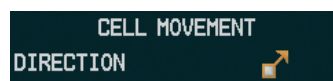
Figure 6-21 Cell Movement Legend

SIGMETS AND AIRMETS

SIGMET (SIGnificant METeorological Information) and AIRMET (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.
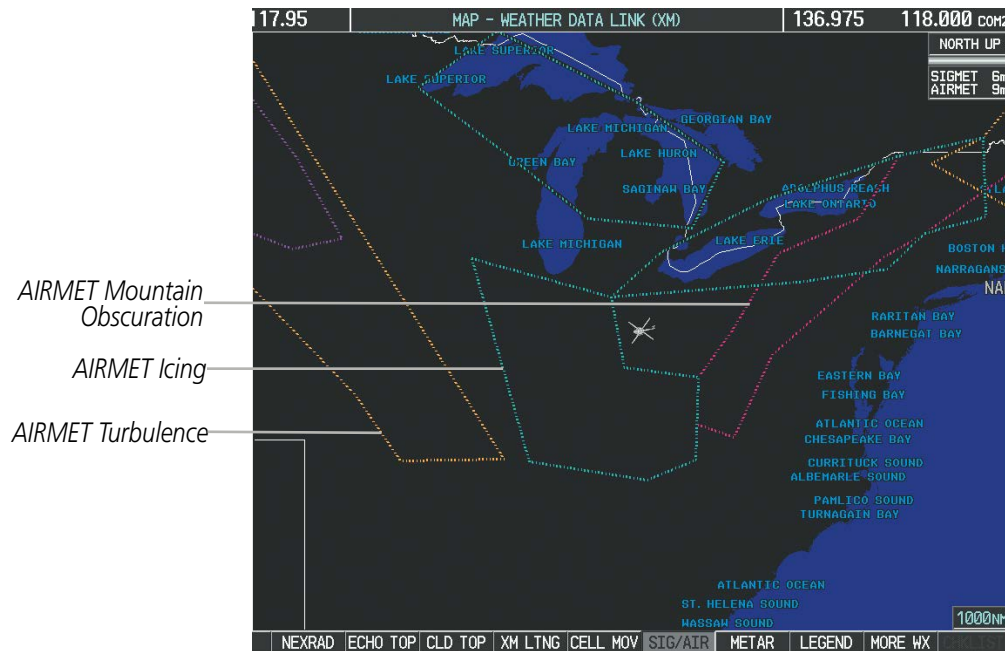
Figure 6-22 SIGMET/AIRMET Weather Product

Displaying SIGMETs and AIRMETs:

1) Select the Weather Data Link (XM) Page.

2) Select the **SIG/AIR** Softkey.

3) To view the text of the SIGMET or AIRMET, press the **RANGE** Knob 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), select the **LEGEND** Softkey when SIGMETs and AIRMETs are selected for display.
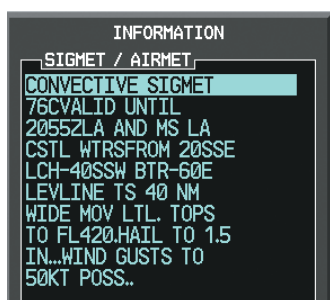
Figure 6-23 Sample SIGMET Text

Figure 6-24 SIGMET/AIRMET Legend

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 hourly observations; non-routine updates include the code "SPECI" in the report. METARs are shown as colored flags at airports that provide them.
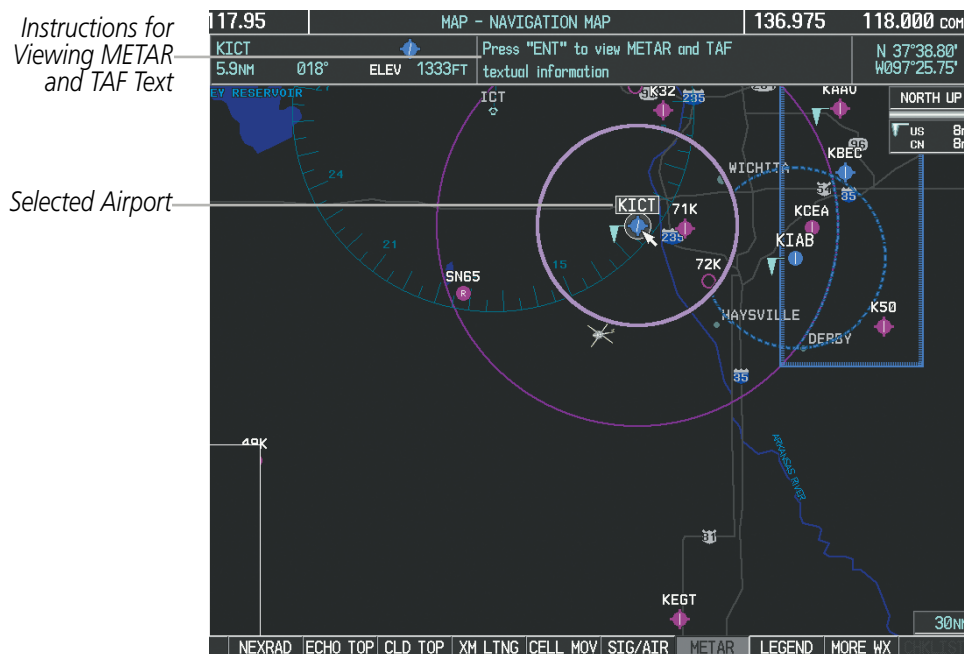
Figure 6-25 METAR Flags on the Weather Data Link (XM) Page

TAFs (Terminal Aerodrome Forecasts) are weather predictions for specific airports within a 24- hour period, and may span up to 36 hours. TAFs typically 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, then in its original text. Note the original text may contain additional information not found in the decoded version. TAF information is displayed only in its original form when it is available

Displaying METAR and TAF text:

1) On the Weather Data Link (XM) Page, select the **METAR** Softkey.

2) Press the **RANGE** Knob and pan to the desired airport.

3) Press the **ENT** Key. The Weather Information Page is shown with METAR and TAF text.

4) Turn 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) Select 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. A solid METAR flag next to an enroute waypoint indicates METAR observations are available for that specific waypoint. A hollow METAR flag indicates METAR observations are available near the enroute waypoint. When displaying METAR text for an off-route waypoint, the system shows the identifier and location of the reporting facility.

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 a waypoint with an associated METAR. The METAR text appears in the SELECTED WAYPOINT WEATHER window below.

4) When finished, press the **FMS** Knob to remove the cursor or press the **FPL** Key to remove the Active Flight Plan Page.

To display the METAR legend on the Weather Data Link (XM) Page (Figure 6-27), select 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 indicates the METAR text does not contain adequate information to fully determine the METAR category.

Figure 6-27 METAR Legend

SURFACE ANALYSIS AND CITY FORECAST

> **NOTE:** *Surface Analysis and City Forecast data are displayed only within the installed navigation 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.
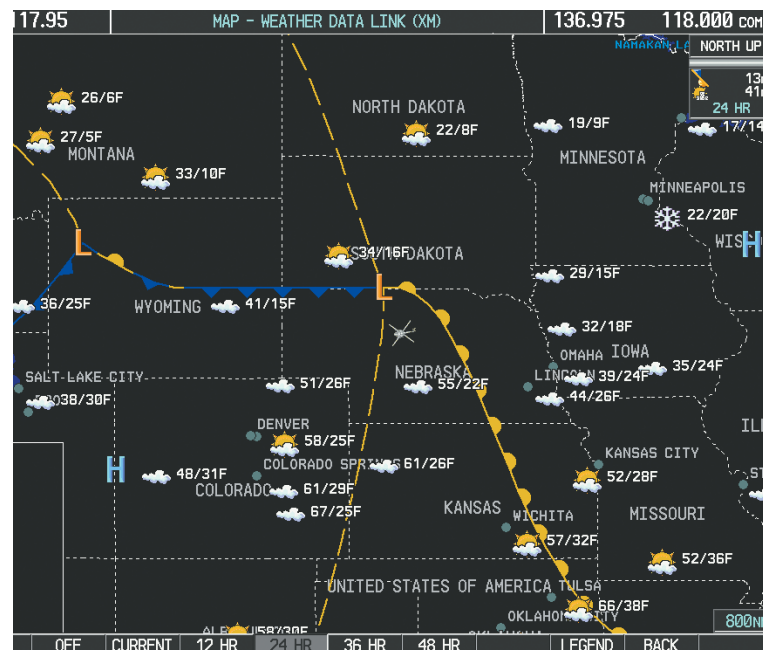
Figure 6-28 24-Hour Surface Analysis and City Forecast Data

Displaying Surface Analysis and City Forecast information:

1) Select the Weather Data Link (XM) Page.

2) Select the **MORE WX** Softkey.

3) Select 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), select the **LEGEND** Softkey when Surface Analysis and City Forecast are selected to be displayed.
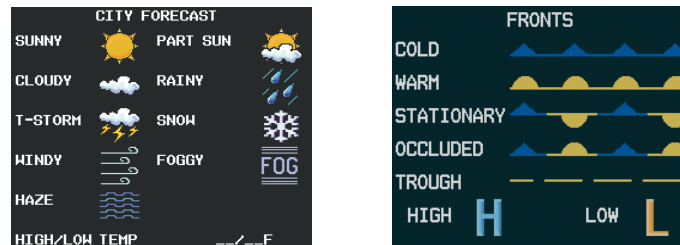
Figure 6-29 Surface Analysis Legend

FREEZING LEVELS

The Freezing Level weather product 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 when it becomes available.
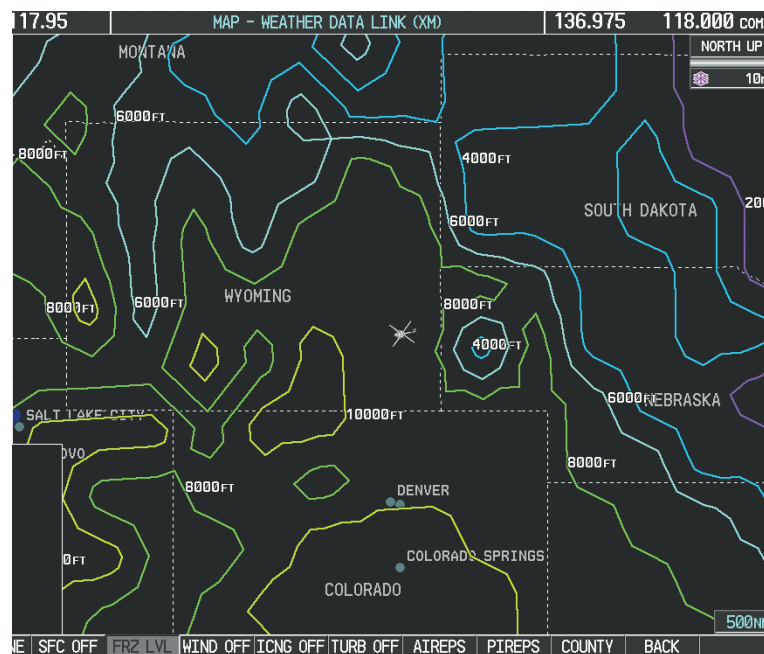
Figure 6-30 Freezing Level Data

Displaying Freezing Level information:

1) Select the Weather Data Link (XM) Page.

2) Select the **MORE WX** Softkey.

3) Select the **FRZ LVL** Softkey.

To display the Freezing Level legend (Figure 6-31), select the **LEGEND** Softkey when Freezing Level data is selected to be displayed.

Figure 6-31 Freezing Level Legend

WINDS ALOFT

The Winds Aloft weather product (Figure 6-32) 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 (XM) Page.

2) Select the **MORE WX** Softkey.

3) Select the **WIND** Softkey.

4) Select the desired altitude level: SFC (surface) up to 42,000 feet. Select the **NEXT** or **PREV** Softkey to cycle through the altitude softkeys. The **WIND** Softkey label changes to reflect the altitude selected.

GARMIN.
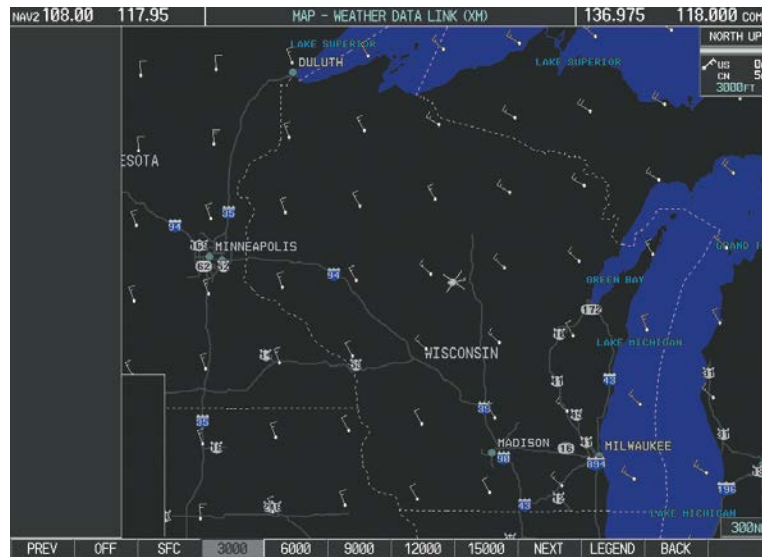
Figure 6-32 Winds Aloft Data at 3,000 Feet

To display the Winds Aloft legend (Figure 6-33), select the **LEGEND** Softkey when Winds Aloft is selected for display.
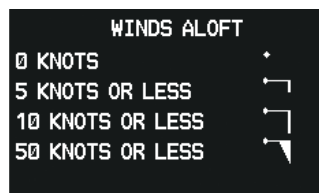
Figure 6-33 Winds Aloft Data with Legend

> **NOTE:** *The Profile View feature is not available in HTAWS installations.*

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

Enabling/disabling profile view (containing winds aloft data)

1) Select the Navigation Map Page.

2) Press the **MAP** Softkey/

3) 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 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.
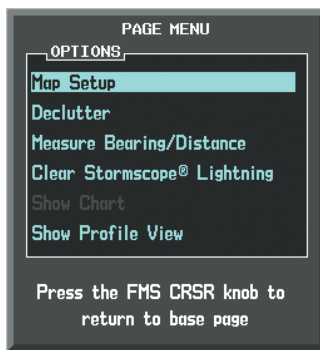
Figure 6-35 Navigation Map Page Menu

Figure 6-36 Navigation Map Page Setup Menu

Figure 6-37 Navigation Map Page Setup Menu, Weather Group

COUNTY WARNINGS

The County Warning weather product (Figure 6-38) provides specific public awareness and protection weather warnings from the National Weather Service (NWS). This can include information on tornadoes, severe thunderstorms, and flood conditions.

Additional Information on Flood Warning Selected with Map Pointer
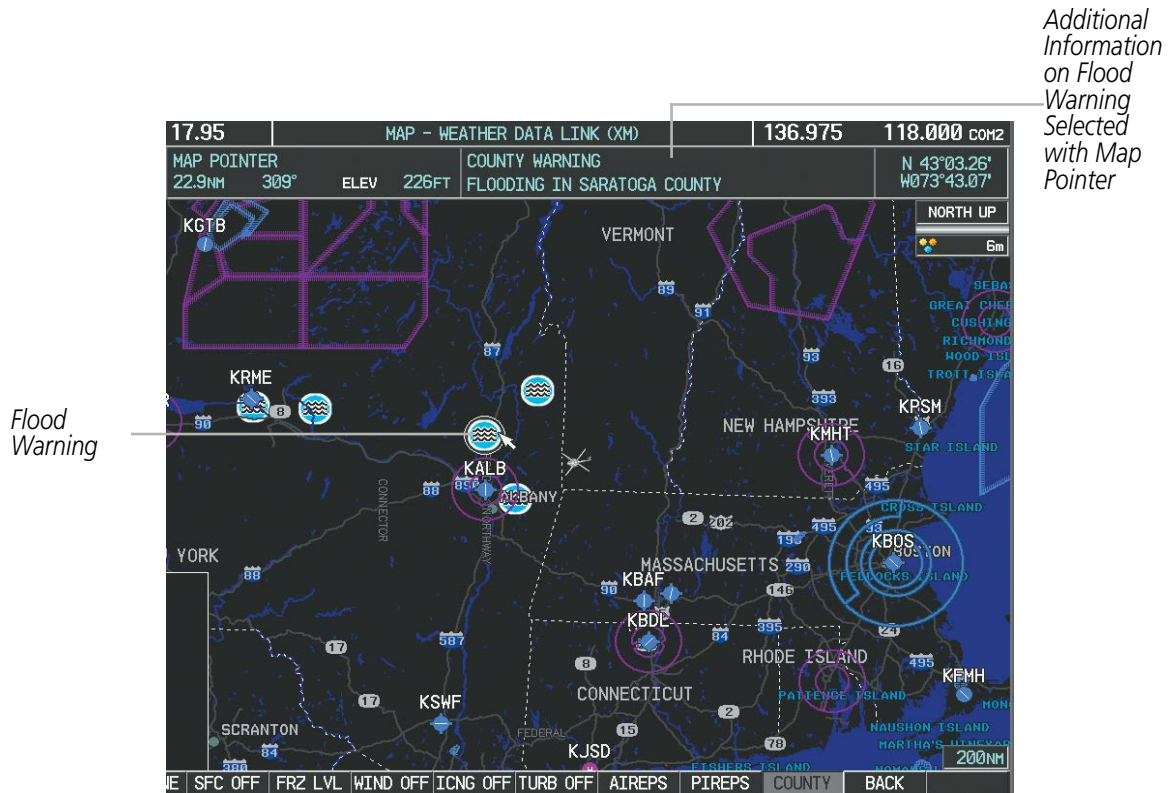
Flood Warning

Figure 6-38 County Flood Warning

Displaying County Warning information:

1) Select the Weather Data Link (XM) Page.

2) Select the **MORE WX** Softkey.

3) Select the **COUNTY** Softkey.

To display the County Warnings legend (Figure 6-39), select the **LEGEND** Softkey when County Warnings are selected to be displayed.
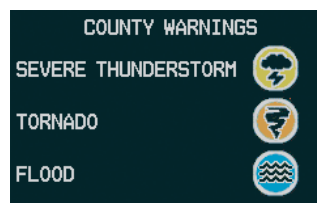
Figure 6-39 County Warnings Legend

CYCLONE

The Cyclone weather product (Figure 6-40) shows the current location of cyclones (hurricanes), tropical storms, and their projected track date and time (DD/HH:MM).
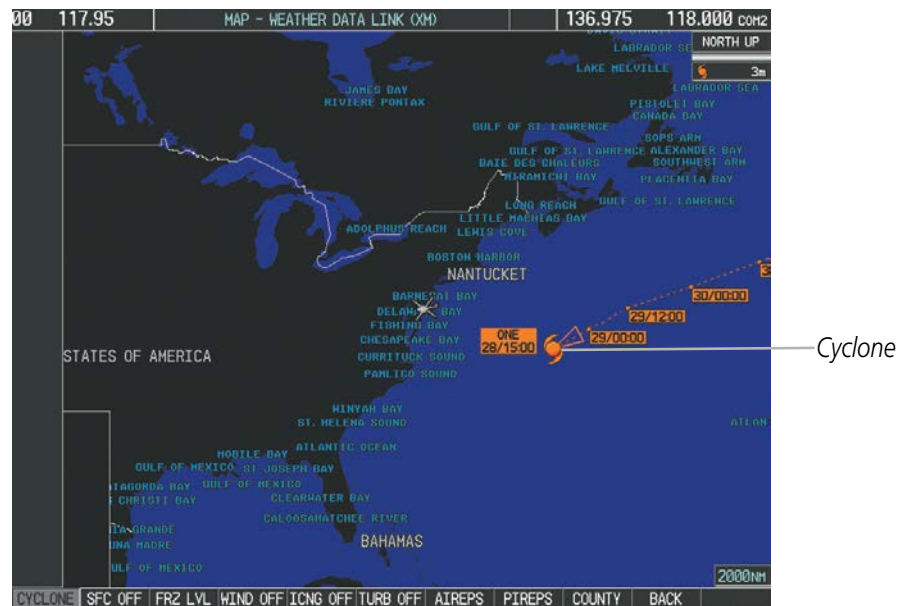
Figure 6-40 Cyclone Weather Product

Displaying cyclone (hurricane) track information:

1) Select the Weather Data Link (XM) Page.

2) Select the **MORE WX** Softkey.

3) Select the **CYCLONE** Softkey.

To display the Cyclone legend (Figure 6-41), select the **LEGEND** Softkey when Cyclones are selected to be displayed.
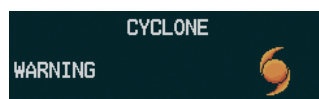
Figure 6-41 Cyclone Legend

ICING (CIP & SLD)

> **NOTE:** *Icing data cannot be displayed at the same time as NEXRAD data.*

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.
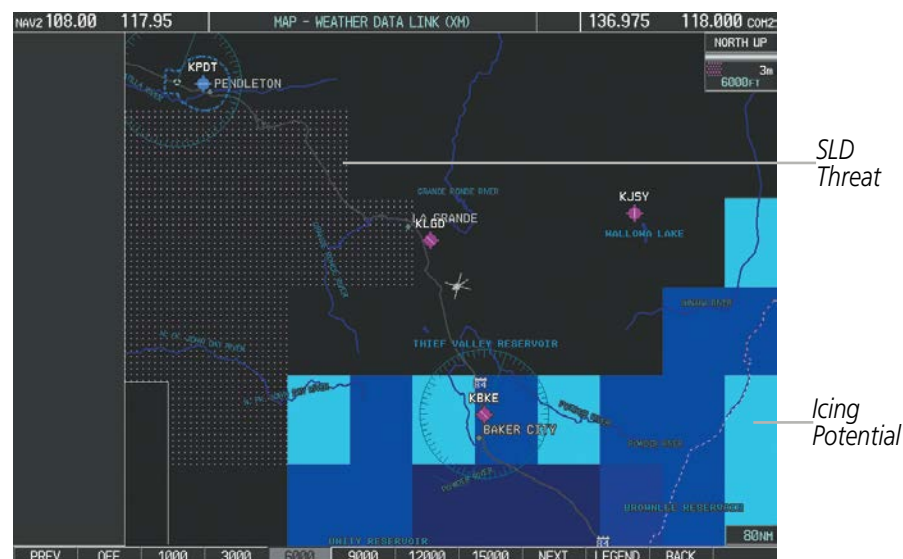
Figure 6-42 Icing Data at 6,000 Feet

To display the Icing Potential legend (Figure 6-43), press the **LEGEND** Softkey when Icing is selected for display.
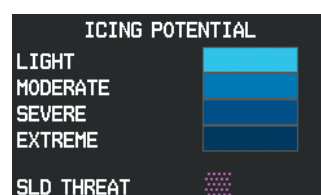
Figure 6-43 Icing Potential Legend

TURBULENCE

> **NOTE:** *Turbulence data cannot be displayed at the same time as NEXRAD data.*

The Turbulence weather product (Figure 6-44) identifies the potential for erratic movement of high-altitude air mass associated winds. Turbulence is classified as light, moderate, severe or extreme (not specific to aircraft type), 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.
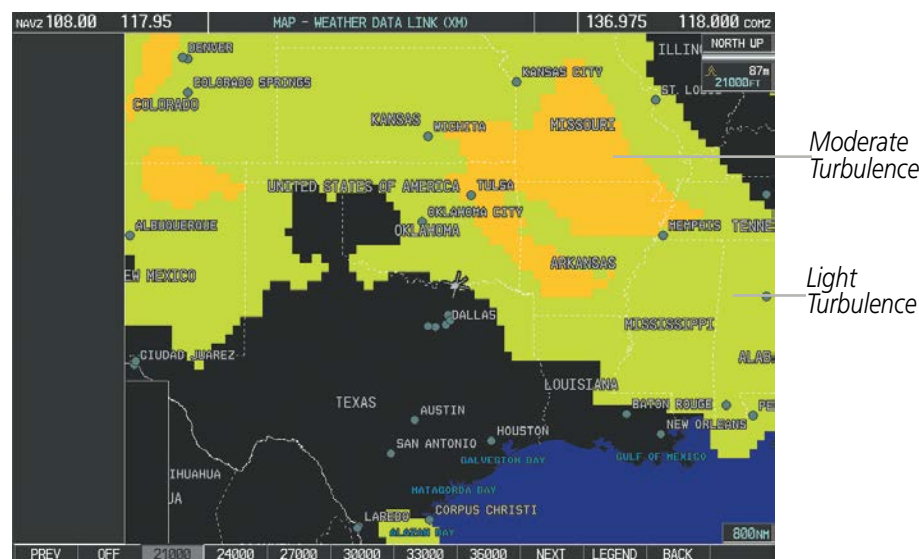
Figure 6-44 Turbulence Weather Product at 21,000 Feet

To display the Turbulence legend (Figure 6-45), press the **LEGEND** Softkey when Turbulence is selected for display.
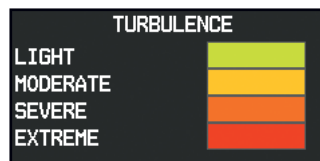
Figure 6-45 Turbulence Legend

PIREPS AND AIREPS

Pilot Weather Reports (PIREPs) are in-flight 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, or turbulence. The report may also include pilot remarks and type of aircraft flown. PIREPs are issued as either Routine (UA) or Urgent (UUA).

Another type of PIREP is an Air Report (AIREP). Commercial airlines typically generate AIREPs.
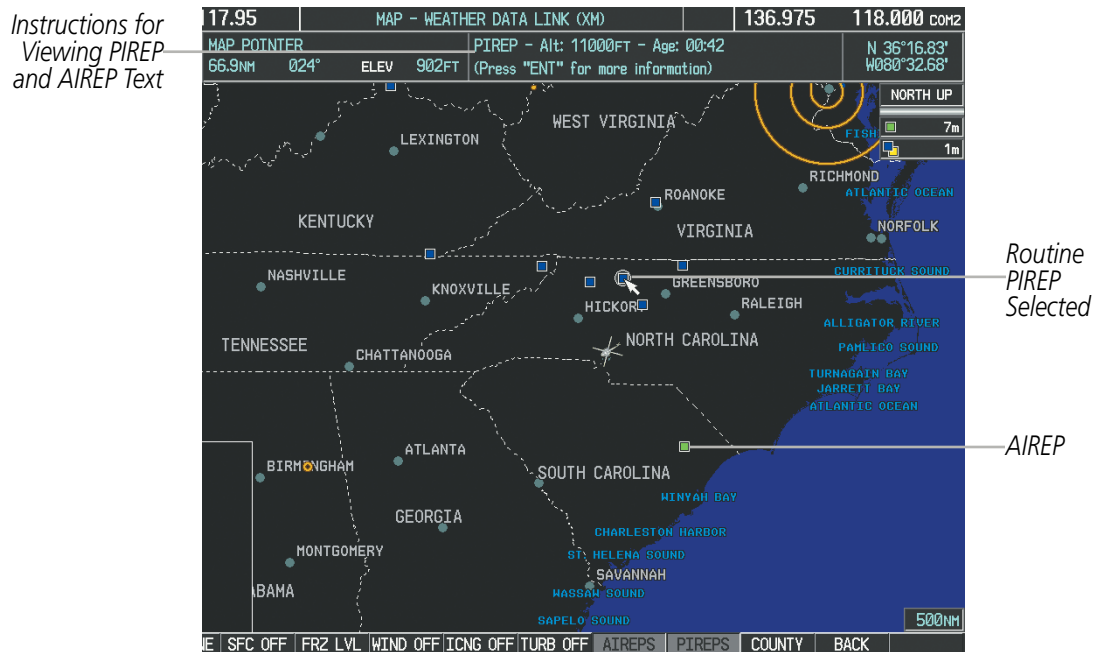
Figure 6-46 AIREPs and PIREPs on the Weather Data Link (XM) Page

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 **RANGE** Knob 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 its 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.

GARMIN
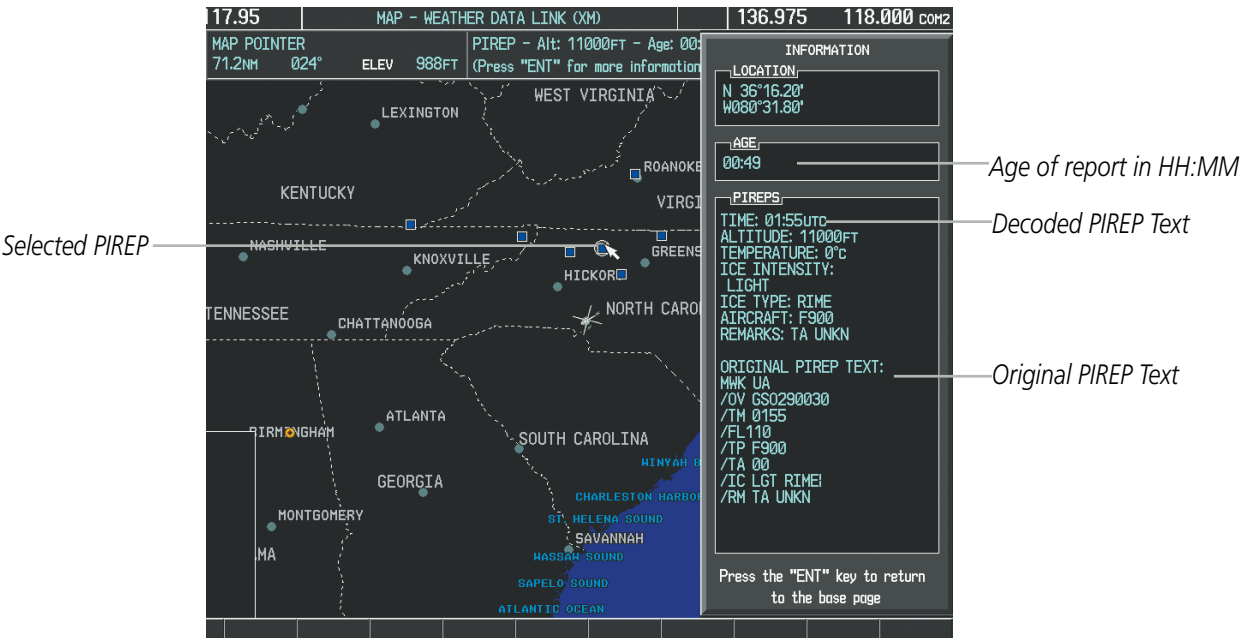
Figure 6-47 PIREP Text on the Weather Data Link (XM) Page

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

6.2 HTERRAIN PROXIMITY

⚠️ **WARNING:** *Do not use HTerrain Proximity information for primary terrain avoidance. HTerrain Proximity is intended only to enhance situational awareness.*

✓ **NOTE:** *Terrain data is not displayed when the aircraft is outside of the installed terrain database coverage area.*

✓ **NOTE:** *The HTerrain Proximity system is only available when the Synthetic Vision Technology option and the HTAWS option are not installed.*

HTerrain 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 HTerrain Proximity with the optional Helicopter Terrain Awareness and Warning System (HTAWS). HTAWS is more sophisticated and robust, and it is TSO-C151b certified. HTerrain 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, HTAWS uses more sophisticated algorithms to assess aircraft distance from terrain and obstacles.

HTerrain Proximity requires the following components to operate properly:

• Valid 3-D GPS position

• Valid terrain/obstacle database

HTerrain 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, and may not be displayed. No terrain and obstacle information is shown without a valid 3-D GPS position.

The system's 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 HTerrain 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 HTERRAIN PROXIMITY DATA

The symbols and colors in Figure 6-49 and Table 6-4 are used to represent obstacles and aircraft altitude when the HTerrain Proximity Page is selected for display. HTerrain 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.
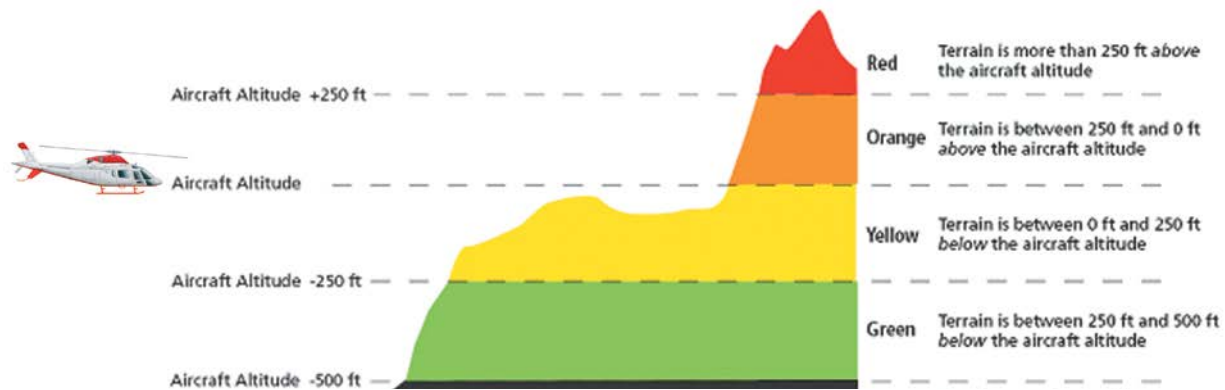
Figure 6-49 Terrain Altitude/Color Correlation for HTerrain Proximity

Unlighted Obstacle		Lighted Obstacle		Obstacle Location
< 1000' AGL	> 1000' AGL	< 1000' AGL	> 1000' AGL	
				Red obstacle is at or above current aircraft altitude
				Yellow obstacle is between 0' and 250' below current aircraft altitude
				Gray obstacle is 250' or more below current aircraft altitude

Table 6-4 HTerrain Proximity Obstacle Colors and Symbology

Terrain and obstacle information can be displayed on the following pages:

- Navigation Map Page
- Flight Plan Page
- Terrain Proximity Page
- Trip Planning Page

Displaying terrain and obstacle information (maps other than the HTerrain Proximity Page):

1) Press the **MAP** Softkey.

2) Press the **TERRAIN** Softkey to display terrain and obstacle data.

When HTerrain Proximity is selected on maps other than the HTerrain Proximity Page, an icon to indicate the feature is enabled for display and a legend for HTerrain Proximity colors is shown (Figure 6-53).

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 information can be selected for display independently of obstacle data; however, obstacles recognized by HTerrain 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 HTerrain 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.

⚠️ **CAUTION:** *Terrain and obstacle data will not be displayed when the Navigation Map range is larger than the MAP SETUP range setting for TERRAIN DATA and OBSTACLE DATA.*

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 6-50).

4) Turn the small **FMS** Knob to select the 'Map' Group and press the **ENT** Key (Figure 6-51).

5) Turn the large **FMS** Knob or press the **ENT** Key to scroll through product selections (Figure 6-52).

   • 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 6-50 Navigation Map Page Menu

Figure 6-52 Navigation Map Page Setup Menu, Map Group

Figure 6-51 Navigation Map Page Setup Menu

Additional information about obstacles can be displayed by panning over the display on the map. The map panning feature is enabled by pressing the **RANGE** Knob. The map range is adjusted by turning the **RANGE** Knob. If the map range is adjusted while panning is enabled, the map is re-centered on the Map Pointer.

Additional Information on Obstacle Selected with Map Pointer

Red Terrain Area (Above or Within 100' Below Aircraft Altitude)

Red Lighted Obstacles (Above or Within 100' Below Aircraft Altitude)

Yellow Terrain Area (Between 100' and 1000' Below Aircraft Altitude)

Lighted Obstacle Selected with Map Pointer

Terrain Display Enabled Icon

Terrain Legend
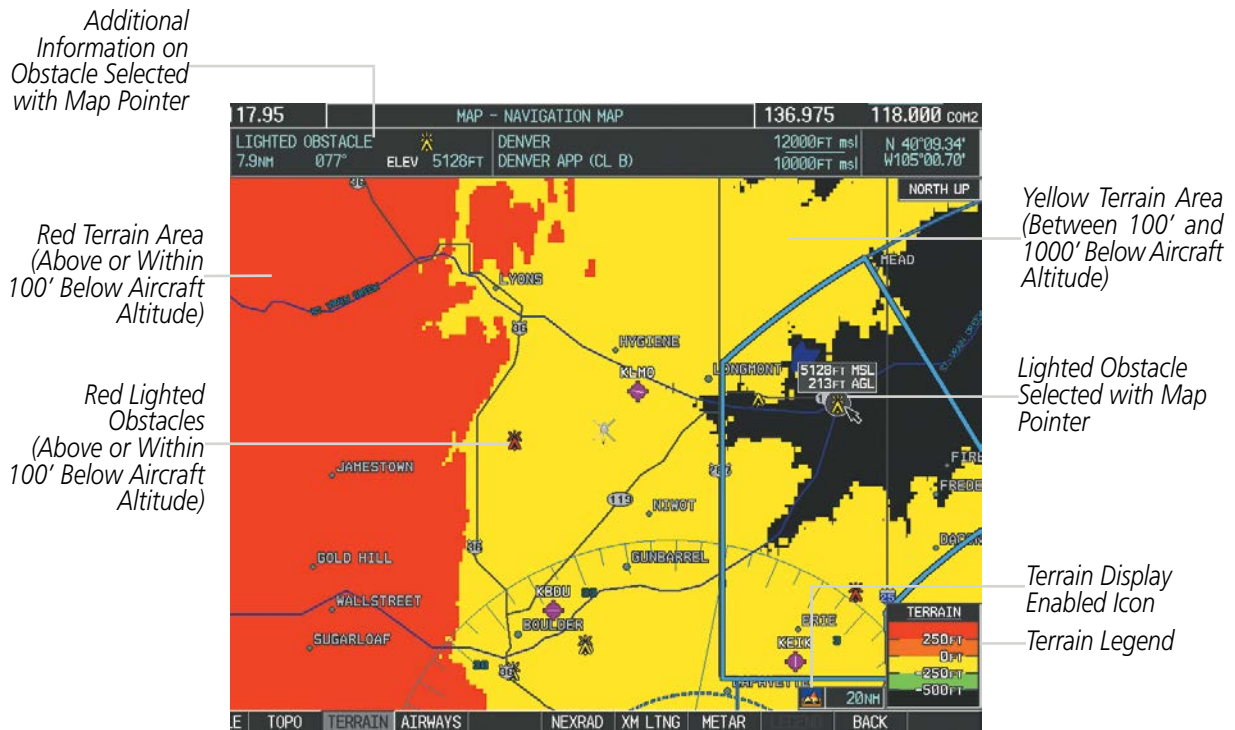
Figure 6-53 Terrain Information on the Navigation Map Page

HTERRAIN PROXIMITY PAGE

The HTerrain Proximity Page (Figure 6-54 and 6-55) shows terrain and obstacle data in relation to the aircraft's current altitude, without clutter from the basemap. Aviation data (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 **RANGE** Knob from 1 to 200 nm, as indicated by the map range rings (or arcs).

> **Displaying the HTerrain Proximity Page:**
>
> **1)** Turn the large **FMS** Knob to select the Map Page Group.
>
> **2)** Turn the small **FMS** Knob to select the HTerrain 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 HTerrain 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.
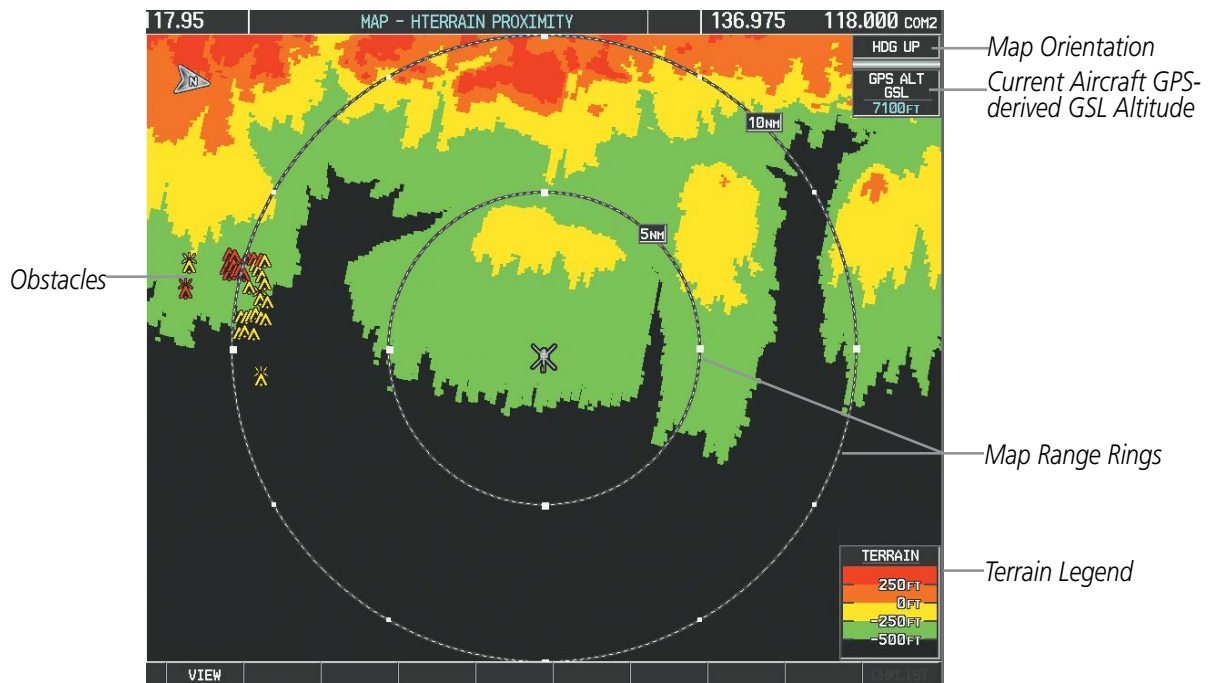
Figure 6-54 HTerrain Proxmity Page (360 View)
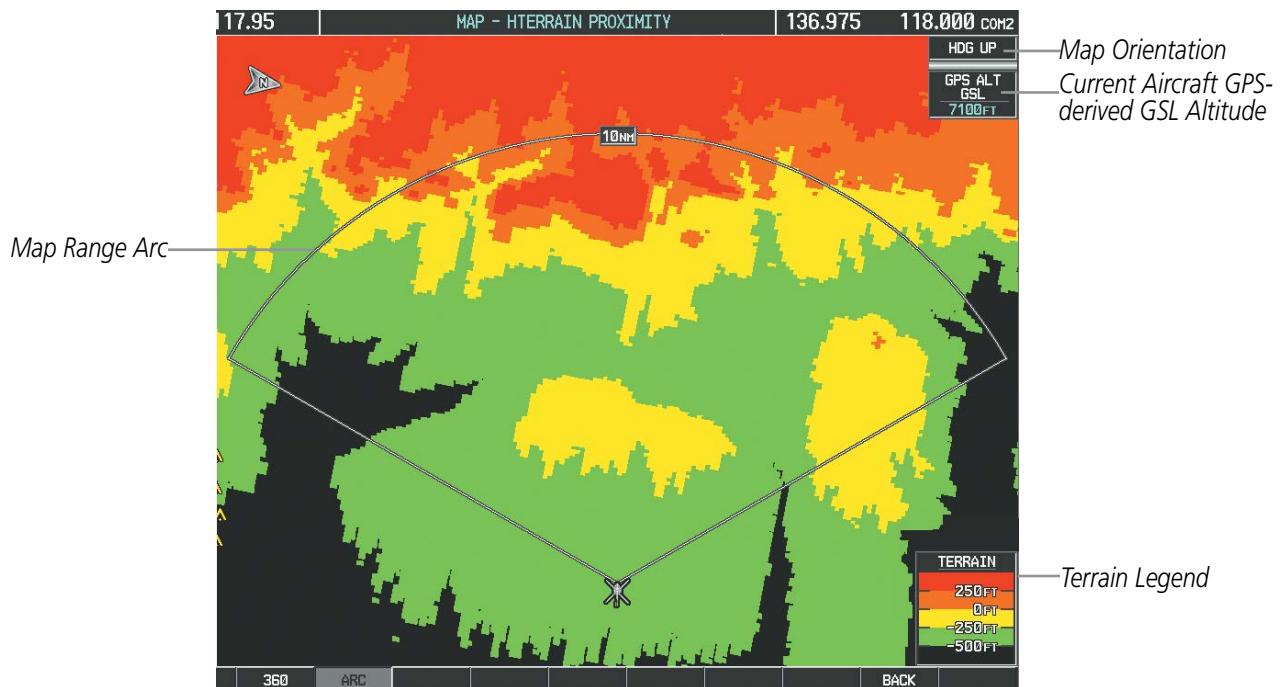
Figure 6-55 HTerrain Proximity Page (ARC View)

6.3 HTERRAIN-SVS

> ⚠ **WARNING:** *Do not use HTerrain-SVS information for primary terrain avoidance. HTerrain-SVS is intended only to enhance situational awareness.*

> ✓ **NOTE:** *Terrain data is not displayed when the aircraft is outside of the installed terrain database coverage area.*

> ✓ **NOTE:** *HTerrain-SVS is standard when the Synthetic Vision Technology (SVT) option is installed. The HTAWS option will take precedence over HTerrain-SVS when HTAWS is also installed.*

HTerrain-SVS is a terrain awareness system integrated within the optional Synthetic Vision Technology (SVT). HTerrain-SVS provides visual and auditory alerts to indicate the presence of threatening terrain relevant to the projected flight path. For detailed information regarding SVT, refer to the Flight Instruments section of this Pilot's Guide.

HTerrain-SVS does not comply with TSO-C151b certification standards. It increases situational awareness and aids in reducing controlled flight into terrain (CFIT) and obstacles. Do not confuse HTerrain-SVS with the optional Helicopter Terrain Awareness and Warning System (HTAWS). HTAWS is more sophisticated and robust, and it is TSO-C151b certified. Although the terrain and obstacle color map displays are the same, HTAWS uses more sophisticated algorithms to assess aircraft distance from terrain and obstacles.

HTerrain-SVS does not provide the following types of alerts:

• Premature Descent Alerting (PDA)

• Excessive Descent Rate (EDR)

• Negative Climb Rate (NCR)

• Altitude Voice Callout (VCO)

HTerrain-SVS requires the following components to operate properly:

• Valid 3-D GPS position

• Valid terrain/obstacle database

HTerrain-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 system's 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 HTerrain-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 HTERRAIN-SVS INFORMATION

HTerrain-SVS uses colors to depict terrain and obstacle alerts relative to aircraft altitude. Colors are adjusted automatically as the aircraft altitude changes. The colors and symbols in Figure 6-56 and Tables 6-4 and 6-5 are used to represent terrain, obstacles, and potential impact points.
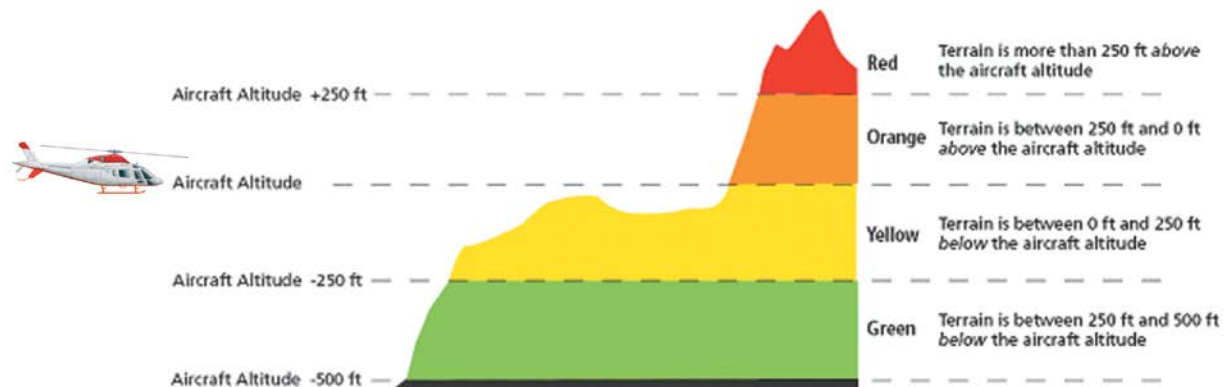
Figure 6-56 Terrain Altitude/Color Correlation for HTerrain-SVS

Unlighted Obstacle		Lighted Obstacle		Obstacle Location
< 1000' AGL	> 1000' AGL	< 1000' AGL	> 1000' AGL	
🔺	🔺	✳	✳	Red obstacle is at or above current aircraft altitude
🔺	🔺	✳	✳	Yellow obstacle is between 0' and 250' below current aircraft altitude
🔺	🔺	✳	✳	Gray obstacle is 250' or more below current aircraft altitude

Table 6-5 HTerrain-SVS Obstacle Colors and Symbology

Potential Impact Point Symbol	Alert Type	Example Annunciation
✗	Warning	TERRAIN
✗	Caution	TERRAIN

Table 6-6 HTerrain-SVS Potential Impact Point Symbols with Alert Types

HTerrain-SVS information can be displayed on the following maps:

- Navigation Map Page
- HTerrain-SVS Page
- Trip Planning Page
- Flight Plan Pages

Displaying terrain and obstacle information (maps other than the HTerrain-SVS Page):

1) Press the **MAP** Softkey.

2) Press the **TERRAIN** Softkey to display terrain and obstacle data.

When HTerrain-SVS is selected on maps other than the HTerrain-SVS Page, a terrain icon is shown to indicate the feature is enabled for display.

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.

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 HTerrain-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.

⚠️ **CAUTION:** *Terrain and obstacle data will not be displayed when the Navigation Map range is larger than the MAP SETUP range setting for TERRAIN DATA and OBSTACLE DATA.*

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 6-57).

4) Turn the small **FMS** Knob to select the 'Map' Group and press the **ENT** Key (Figure 6-58).

5) Turn the large **FMS** Knob or press the **ENT** Key to scroll through product selections (Figure 6-59).

   • 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.
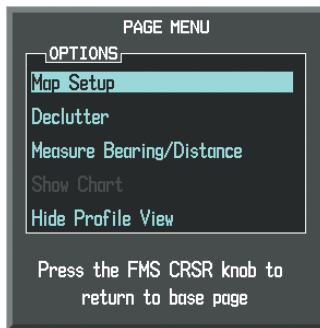
Figure 6-57 Navigation Map Page Menu

Figure 6-58 Navigation Map Page Setup Menu
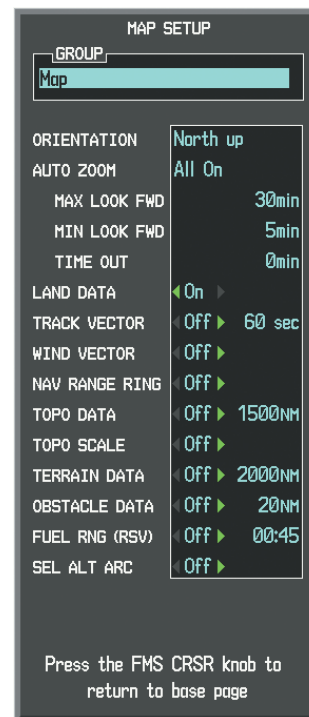
Figure 6-59 Navigation Map Page Setup Menu, Map Group

HTERRAIN-SVS PAGE

The HTerrain-SVS Page (Figure 6-60 and 6-61) depicts terrain, obstacle, and potential impact point data in relation to the aircraft's current altitude, without clutter from the basemap. It is the principal map page for viewing HTerrain-SVS information. Aviation data (airports, VORs, and other NAVAIDs) can also be displayed for reference. If an obstacle and the projected flight path of the aircraft intersect, the system automatically reduces the map range, if necessary, to emphasize the closest potential impact point on the HTerrain-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 **RANGE** Knob from 1 to 200 nm, as indicated by the map range rings (or arcs).

> **Displaying the HTerrain-SVS Page:**
>
> **1)** Turn the large **FMS** Knob to select the Map Page Group.
>
> **2)** Turn the small **FMS** Knob to select the HTerrain-SVS Page.
>
> **Changing the HTerrain-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 360º' (choice dependent on current state) and press the **ENT** Key to change the view

Showing/hiding aviation information on the HTerrain-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.
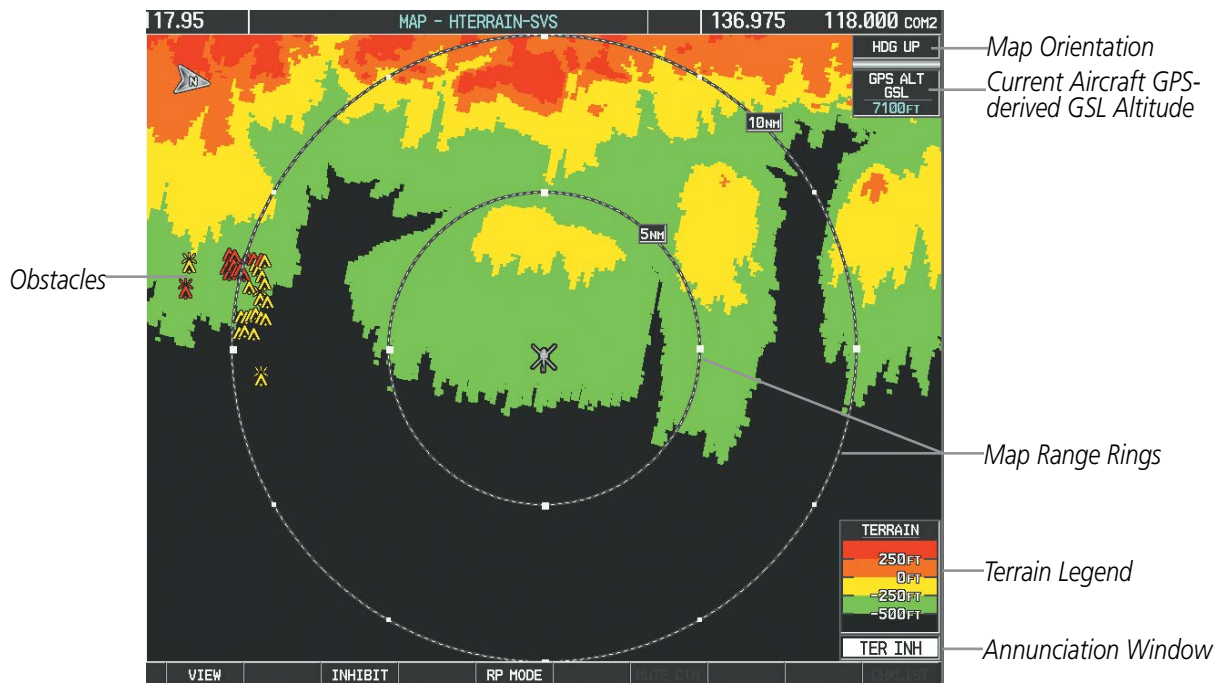
Figure 6-60 HTerrain-SVS Page (360 View)
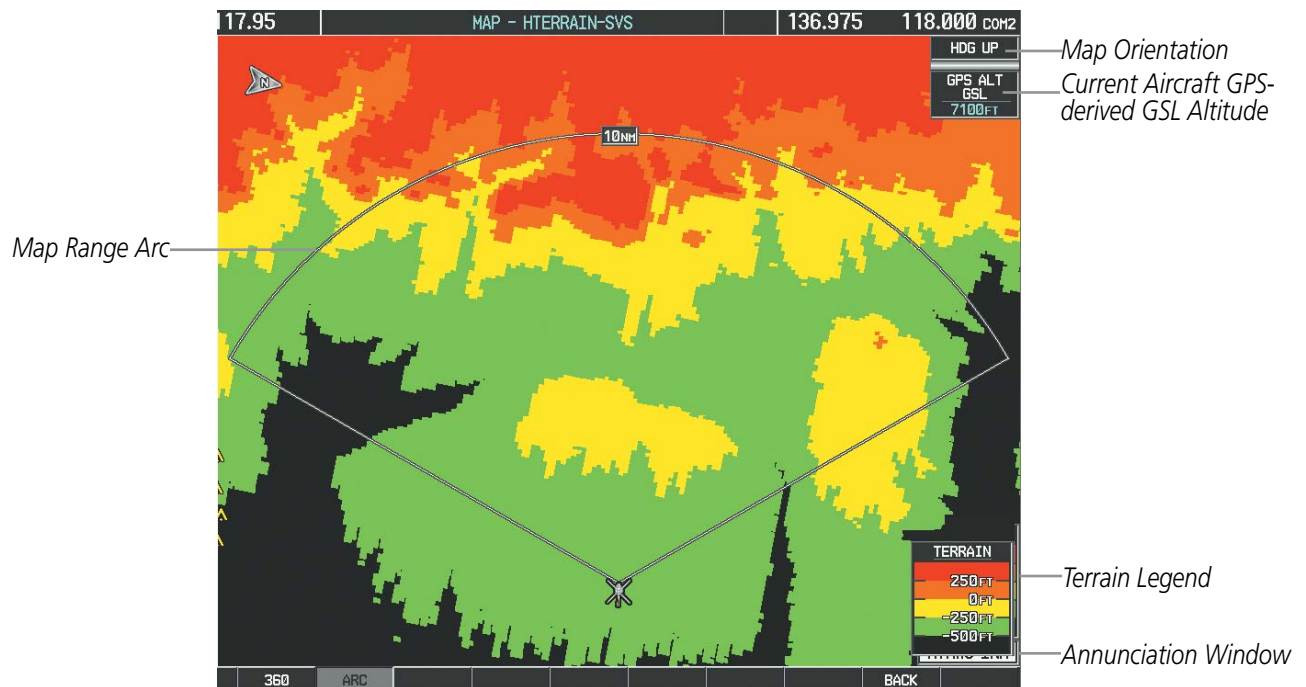
Figure 6-61 HTerrain-SVS Page (ARC View)

HTERRAIN-SVS ALERTS

Alerts are issued when flight conditions meet parameters that are set within HTerrain-SVS software algorithms. HTerrain-SVS alerts typically employ a CAUTION or a WARNING alert severity level, or both. When an alert is issued, visual annunciations are displayed and aural alerts are simultaneously issued. Table 6-7 shows HTerrain-SVS alert types with corresponding annunciations and aural messages.

When an alert is issued, annunciations appear on the PFD and MFD. The HTerrain-SVS Alert Annunciation appears to the left of the Selected Altitude box on the PFD, and below the Terrain Legend on the MFD. If the HTerrain-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 HTerrain-SVS Page)
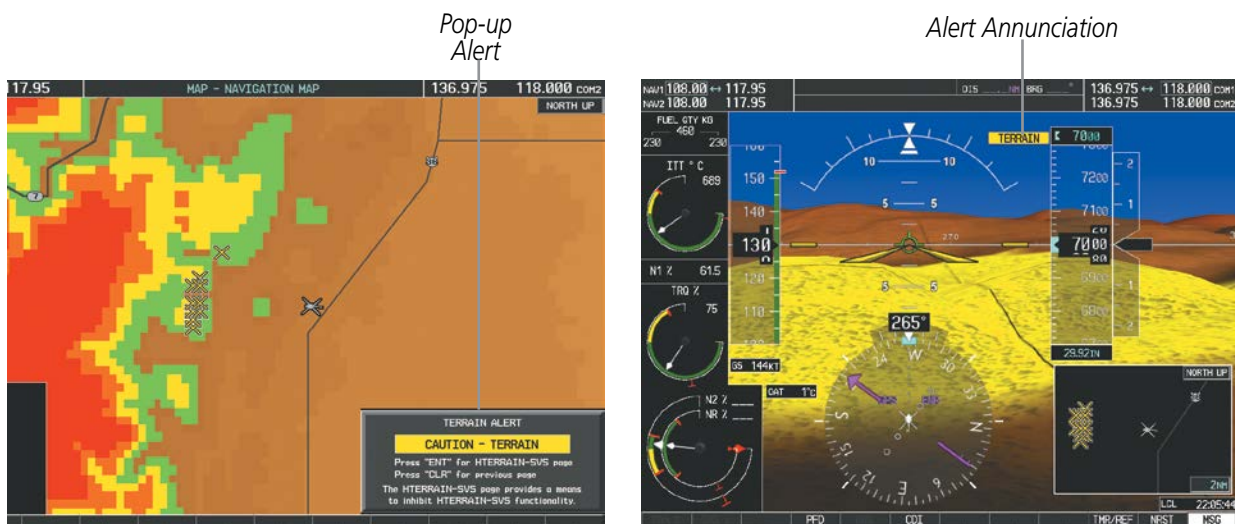
Figure 6-62 HTerrain-SVS Alert Annunciations
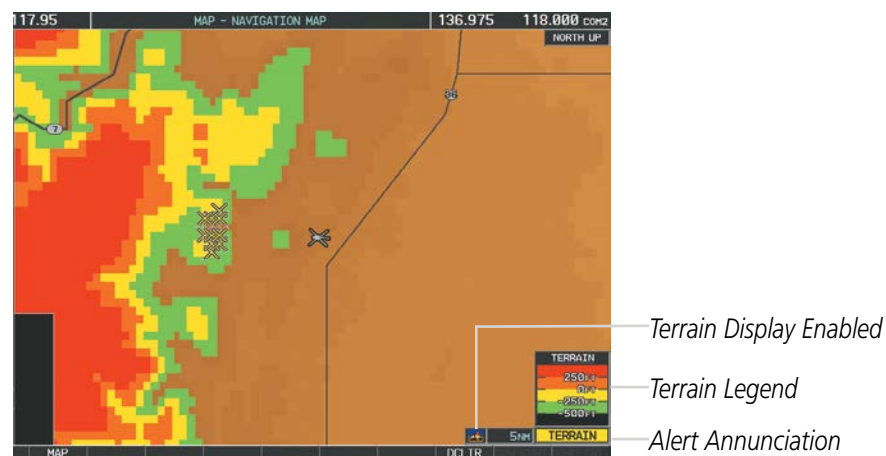
**Figure 6-63 Navigation Map Page
(After HTerrain-SVS Pop-up Alert Acknowledgment)**

Alert Type	PFD/MFD* Alert Annunciation	MFD Pop-Up Alert (except HTerrain-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	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 6-7 HTerrain-SVS Alerts Summary

FORWARD LOOKING TERRAIN AVOIDANCE

The Forward Looking Terrain Avoidance (FLTA) feature of HTerrain-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 aural and visual FLTA 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).
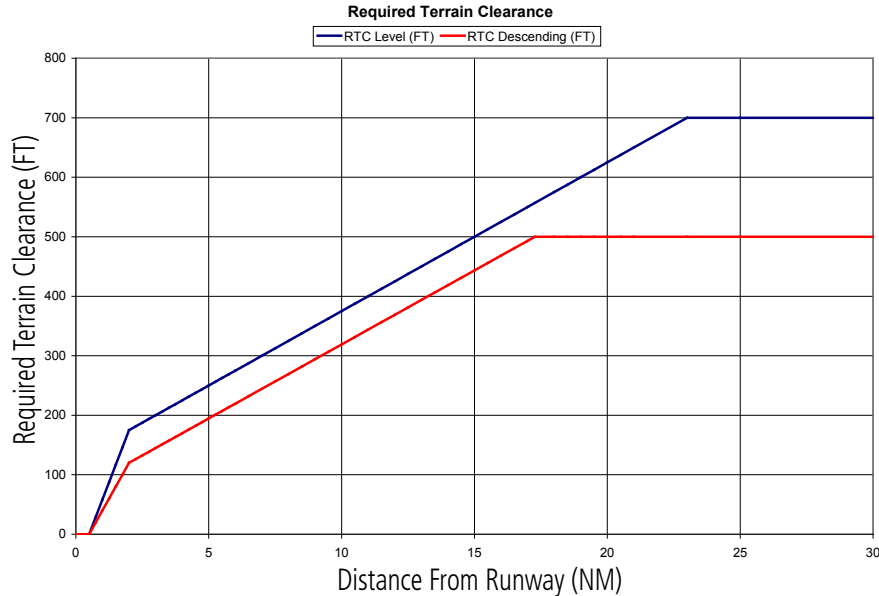
Figure 6-64 FLTA Alert Minimum Terrain and Obstacle Clearance Values

In situations when reduced FLTA alerting sensitivity may be desired, such as in low-level operations or during off-airport landings, HTerrain-SVS offers a Reduced Protection (RP) Mode. When RP Mode is enabled, the following occur:

- RTC is reduced to a maximum of 125 feet when groundspeed is at least 60 knots; RTC is reduced to zero feet at less than 60 knots.

- HTerrain-SVS reduces the distance of the projected flight path used to scan for terrain and obstacles.

- No visual caution alerts or voice alerts will be issued.

When RP Mode is enabled, the system status annunciation 'RP MODE' is shown on the PFD and on the HTerrain-SVS Page of the MFD.

Figure 6-65 Reduced Protection Mode Enabled
System Status Annunciation

Enabling/Disabling RP Mode:

1) Turn the large **FMS** Knob to select the HTerrain-SVS Page.

2) Press the **RP MODE** Softkey to inhibit or enable RP Mode (choice dependent on current state).

  Or:

1) Press the **MENU** Key.

2) Turn the FMS Knob to select 'Reduce Protection' or 'Enable Full Protection' (choice dependent on current state) and press the **ENT** Key.

FLTA caution and warning alerts are automatically disabled in any the following circumstances to reduce nuisance alerts:

- The groundspeed is less than 30 knots.

- The aircraft is operating within a region of a published ILS, LPV, LNAV/VNAV or LNAV+V approach within a defined descent path.

- The aircraft is in the vicinity of runways or a helipad.

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 HTerrain-SVS alerts are inhibited, the system displays the 'TER INH' annunciation on the PFD and in the MFD terrain annunciation window.

$$\boxed{\text{TER INH}}$$

Figure 6-66 HTerrain-SVS Alerting Disabled
(Terrain-SVS Inhibited) Annunciation

Inhibiting/enabling HTerrain-SVS alerting:

1) Select the HTerrain-SVS Page.

2) Press the **INHIBIT** Softkey to inhibit or enable HTerrain-SVS (choice dependent on current state).

   Or:

1) Select the HTerrain-SVS Page.

2) Press the **MENU** Key.

3) Select 'Inhibit Terrain' or 'Enable Terrain' (choice dependent on current state) and press the **ENT** Key.

While HTerrain-SVS alerting is manually inhibited (or the HTerrain-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 GBAS 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, HTerrain-SVS conducts a system test. The system issues a voice alert when the test is completed.

HTerrain-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 system issues a *"Terrain System Failure"* voice alert with the 'TER FAIL' visual alert annunciation.

HTerrain-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 HTerrain-SVS Page. The voice message *"Terrain System Not Available"* is generated. When sufficient GPS signal is returns and the aircraft is within the database coverage area, the voice message "*Terrain System Available*" is generated.

Alert Type	PFD/MFD† Alert Annunciation	HTerrain-SVS 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, and HTerrain-SVS operating with PFD Terrain or Obstacle databases	None	**TERRAIN DATABASE FAILURE**	None

† *Annunciation is shown on HTerrain-SVS Page and the Navigation Map Page when Terrain is enabled.*
* "Terrain System Available" will be heard when sufficient GPS signal is received, or Terrain database coverage area re-entered.

Table 6-8 HTerrain-SVS System Status Annunciations

6.4 PROFILE VIEW TERRAIN

> **NOTE:** *Profile View is available with the HTerrain Proximity or HTerrain-SVS features. If the HTAWS option is installed, it takes precedence over the Profile View feature.*

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 6-67 and Table 6-9 are used to represent terrain and obstacles.
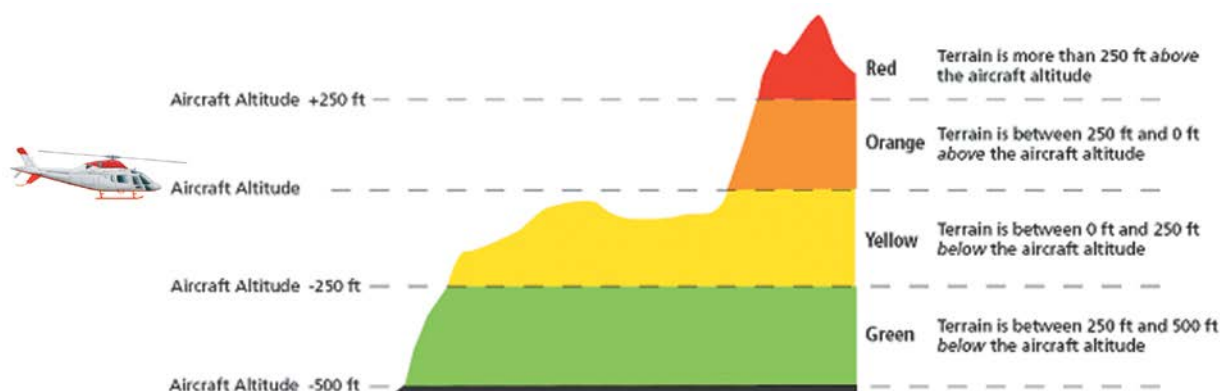
Figure 6-67 Terrain Altitude/Color Correlation for Profile View Terrain

Unlighted Obstacle		Lighted Obstacle		Obstacle Location
< 1000' AGL	> 1000' AGL	< 1000' AGL	> 1000' AGL	
🔺	🔺	✳	✳	Red obstacle is at or above current aircraft altitude
🔺	🔺	✳	✳	Yellow obstacle is between 0' and 250' below current aircraft altitude
🔺	🔺	✳	✳	Gray obstacle is 250' or more below current aircraft altitude

Table 6-9 HTAWS Obstacle Colors and Symbology

Enabling/Disabling Profile View on the Navigation Map Page:

1)   Select the Navigation Map Page.

2)   Press the **MAP** Softkey.

3)   Press the **PROFILE** Softkey to enable or disable Profile View.

Or:

a) Press the **MENU** Key.

b) Select 'Show Profile View' or 'Hide Profile View' (choice dependent on current state) and press the **ENT** Key.

Enabling/Disabling Profile View Terrain on the Navigation Map (when Profile View is enabled):

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 **RANGE** Knob, 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 HTerrain Proximity or HTerrain-SVS discussions for more information about displaying terrain or obstacles on the Navigation Map Page.
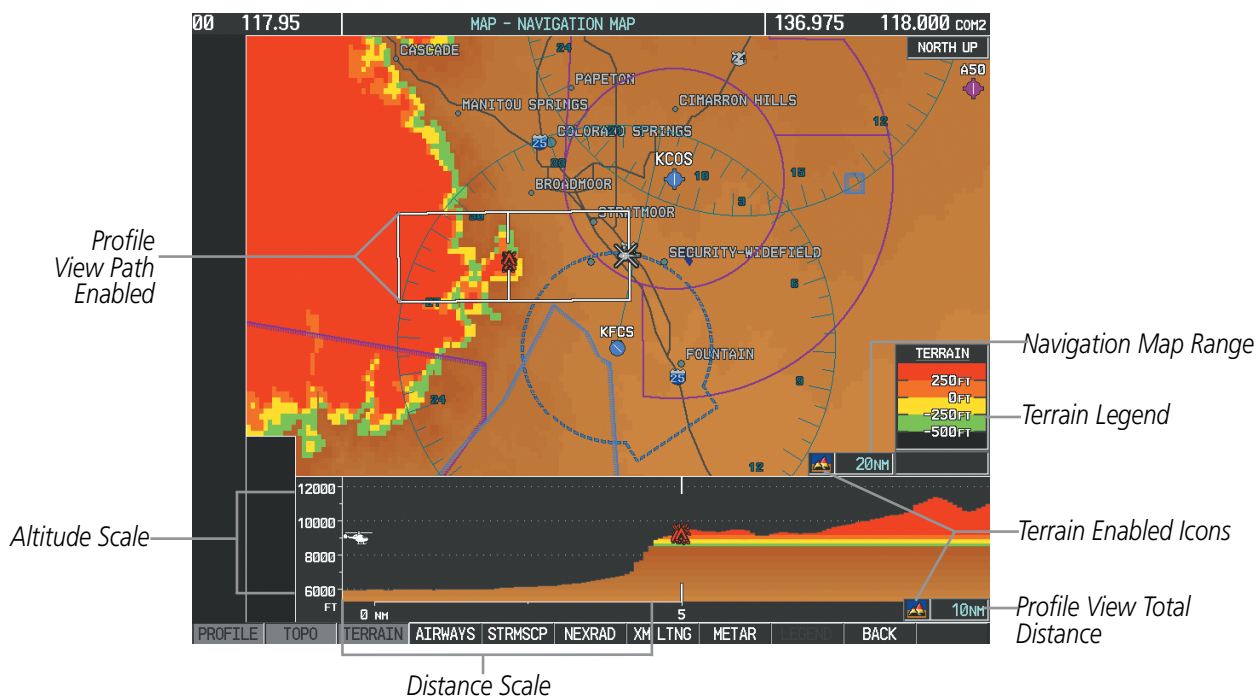
Figure 6-68 Navigation Map Page with Profile View Terrain and Topographic Data Enabled

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 is determined by the phase of flight, as annunciated on the HSI, and is widest during enroute or oceanic phases (Table 6-10).

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 6-10 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 and is only available when Profile View is enabled. White range markers on both edges of the Profile Path rectangle correspond to 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 6-69).

4) Turn the small **FMS** Knob to select the 'Profile' Group and press the **ENT** Key (Figure 6-70).

5) Turn the large **FMS** Knob or press the **ENT** Key to scroll through product selections (Figure 6-71).

 • PROFILE PATH – Turns the display of the Profile Path on or off and sets maximum range at which 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 6-69 Navigation Map Page Menu

Figure 6-70 Navigation Map Page Setup Menu

Figure 6-71 Navigation Map Page Setup Menu,
Profile Group

6.5 HTAWS

⚠️ **WARNING:** *Do not use HTAWS information for primary terrain avoidance. HTAWS is intended only to enhance situational awareness.*

✓ **NOTE:** *The data contained in the HTAWS 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 when the aircraft is outside of the installed terrain database coverage region.*

HTAWS (Helicopter Terrain Awareness and Warning System) is designed to increase situational awareness and aid in reducing controlled flight into terrain (CFIT) and obstacles. HTAWS provides visual annunciations and voice alerts when terrain and obstacles are within the given altitude threshold from the aircraft. The visual annunciations and voice alerts are advisory in nature only.

HTAWS satisfies TSO-C194 requirements for certification.

HTAWS requires the following to operate properly:

• A valid terrain and obstacle database

• A valid 3-D GPS position solution

• A valid radar altimeter

HTAWS 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. However, the displayed information should never be understood as being all-inclusive and data may be inaccurate.

HTAWS uses information provided from the GPS receiver to provide a horizontal position and altitude, along with additional altitude input from an optional radar altimeter. 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 HTAWS 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 HTAWS are referenced to MSL. Using the GPS position and GSL altitude, HTAWS 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, HTAWS can provide advanced alerts of predicted dangerous terrain conditions.

HTAWS incorporates altitude input from an optional radar altimeter for certain alerts.

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 HTAWS INFORMATION

HTAWS uses colors to depict terrain and obstacle alerts relative to aircraft altitude. Colors are adjusted automatically as the aircraft altitude changes. The colors and symbols in Figure 6-72 and Tables 6-11 and 6-12 are used to represent terrain, obstacles, and potential impact points.
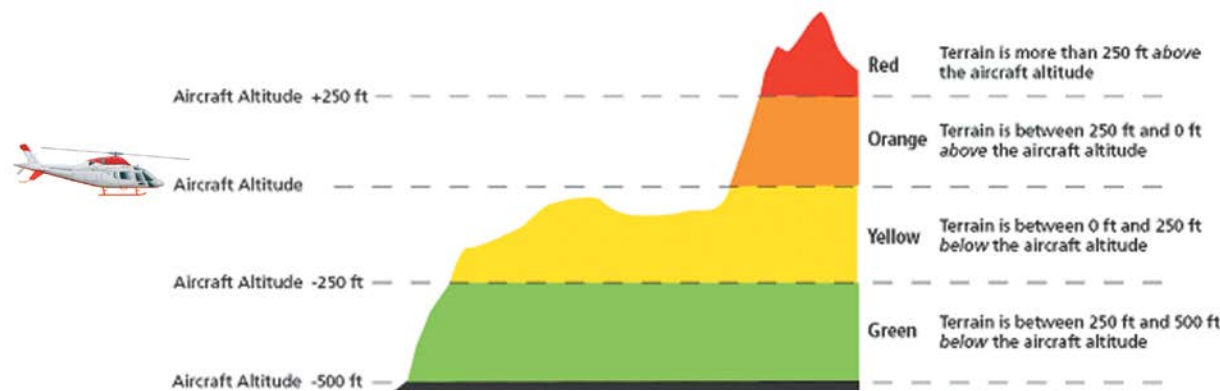
Figure 6-72 Terrain Altitude/Color Correlation for HTAWS

Unlighted Obstacle		Lighted Obstacle		Obstacle Location
< 1000' AGL	> 1000' AGL	< 1000' AGL	> 1000' AGL	
				Red obstacle is at or above current aircraft altitude
				Yellow obstacle is between 0' and 250' below current aircraft altitude
				Gray obstacle is 250' or more below current aircraft altitude

Table 6-11 HTAWS Obstacle Colors and Symbology

Potential Impact Point Symbol	Alert Type	Example Annunciation
✕	Warning	TERRAIN
✕	Caution	TERRAIN

Table 6-12 HTAWS Potential Impact Point Symbols with Alert Types

HTAWS PAGE

The MAP - HTAWS Page is specialized to show terrain, obstacle, and potential impact point data in relation to the aircraft's current altitude, without clutter from the basemap. It is the principal page for viewing HTAWS information. Aviation data (airports/heliports, VORs, and other NAVAIDs) can be displayed for reference. If an obstacle and the projected flight path of the aircraft intersect, the display automatically adjusts the map range to emphasize the closest potential impact point on the HTAWS 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 **RANGE** Knob from 1 to 200 nm, as indicated by the map range rings (or arcs).

Displaying the HTAWS Page:

1) Turn the large **FMS** Knob to select the Map Page Group.

2) Turn the small **FMS** Knob to select HTAWS Page.

Changing the HTAWS 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 HTAWS 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.
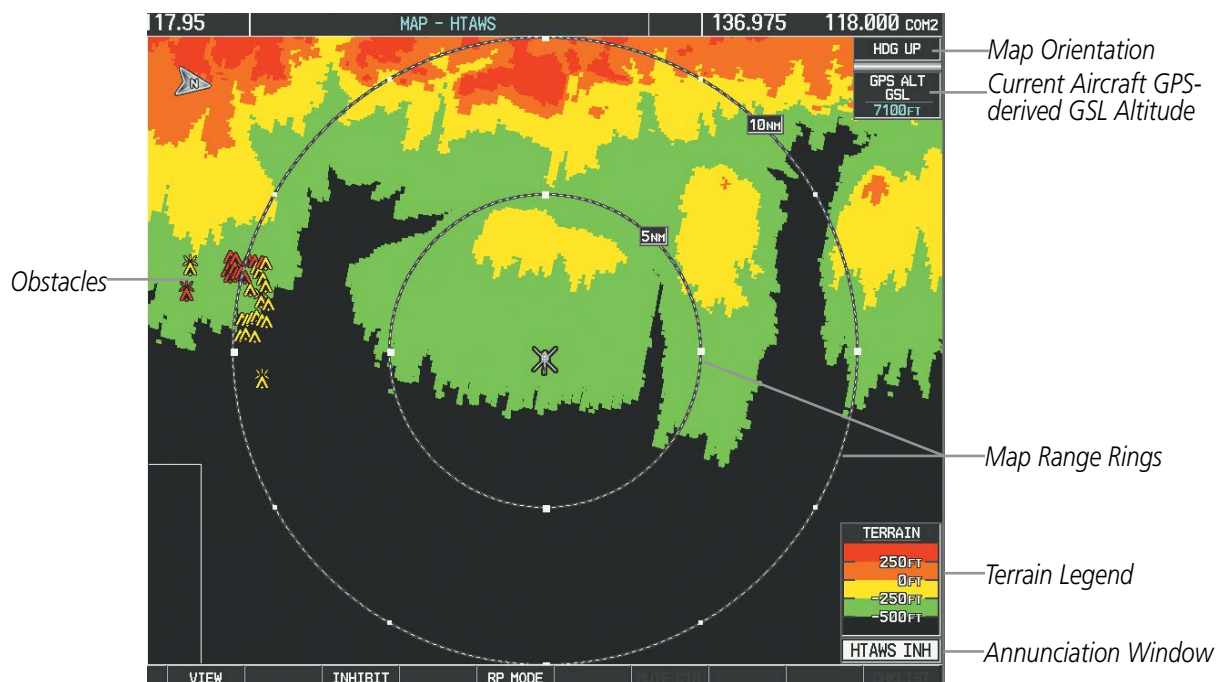
Figure 6-73 HTAWS Page (360 View)
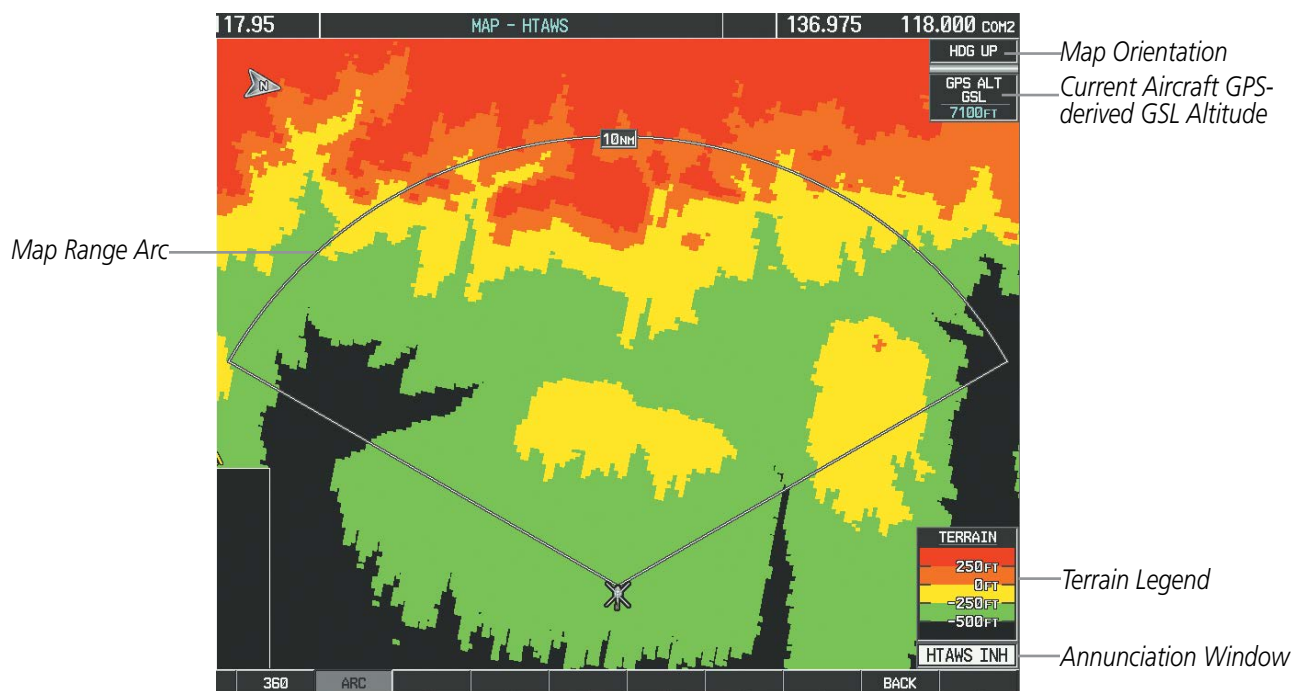
Figure 6-74 HTAWS Page (ARC View)

HTAWS ALERTS

Alerts are issued when flight conditions meet parameters that are set within HTAWS software algorithms. HTAWS alerts typically employ a CAUTION or a WARNING alert severity level, or both. When an alert is issued, the system displays visual annunciations and provides voice alerts. Table 6-13 shows HTAWS alert types with corresponding annunciations and voice alerts.

When an alert is issued, annunciations appear on the PFD and MFD. The HTAWS Alert Annunciation is shown to the upper left of the Altimeter on the PFD and below the Terrain Legend on the HTAWS Page on the MFD. If the HTAWS Page is not displayed at the time, a pop-up alert appears in the lower-right corner of 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 HTAWS Page)
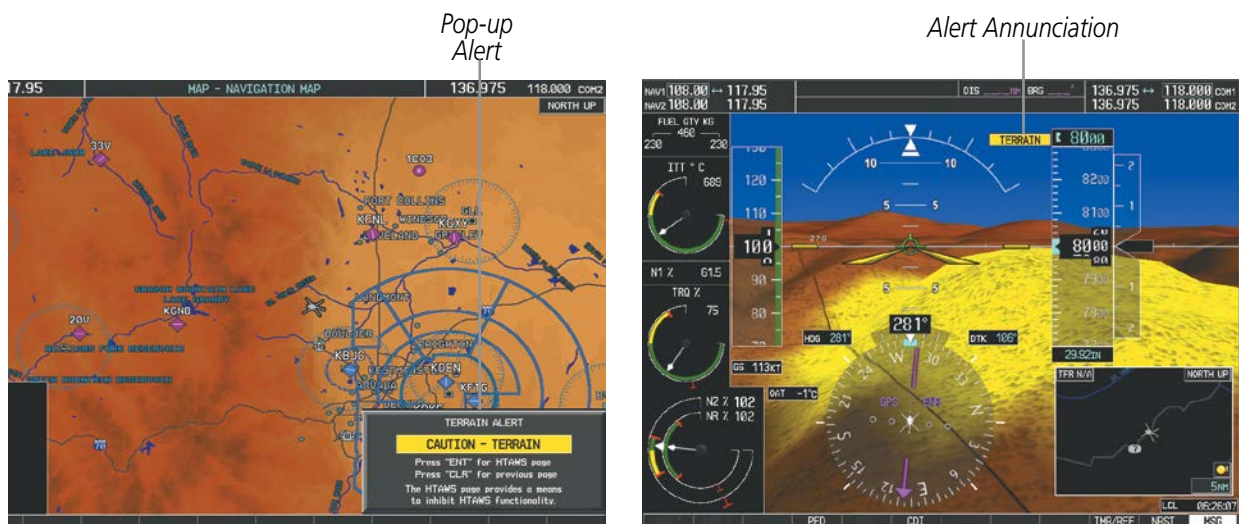
Figure 6-75 HTAWS Alert Annunciations
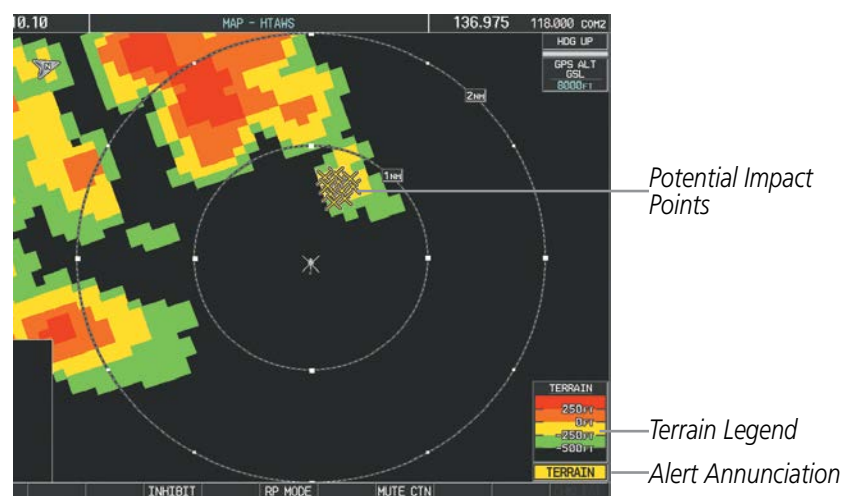
Figure 6-76 HTAWS Page

Alert Type	PFD/HTAWS Page Alert Annunciation	MFD Pop-Up Alert (except HTAWS 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)	OBSTACLE	WARNING – OBSTACLE	"Warning; Obstacle, Obstacle"
Imminent Obstacle Impact Warning (IOI)	OBSTACLE	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)	OBSTACLE	CAUTION – OBSTACLE	"Caution; Obstacle, Obstacle"
Imminent Obstacle Impact Caution (IOI)	OBSTACLE	CAUTION – OBSTACLE	"Caution; Obstacle, Obstacle"
Voice Callout (VCO)	None	None	"Five Hundred", "Four Fifty", "Four Hundred", Three Fifty", "Three Hundred", "Two Fifty", "Two Hundred", "One Fifty", "One Hundred", "Fifty"

Table 6-13 HTAWS Alerts Summary

HTAWS caution voice alerts can be muted while an alert is occurring. Muting an active caution alert has no effect on visual caution or warning annunciations or warning voice alerts. If new HTAWS cautions occur, muting will have no effect until it is enabled again.

Muting/Unmuting an Active HTAWS Caution Voice Alert:

1) Turn the large FMS Knob to select the HTAWS Page on the MFD.

2) Press the **MUTE CTN** Softkey.
   Or:

1) Press the **MENU** Key.

2) Select 'Mute Active Caution' or 'Unmute Active Caution' (choice dependent on current state) and press the **ENT** Key.
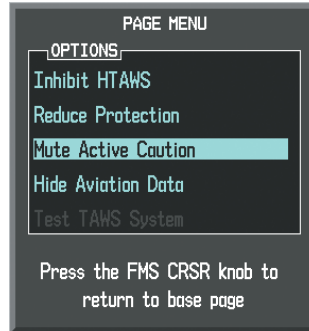
Figure 6-77 Muting a Caution Alert on the HTAWS Page Menu

FORWARD LOOKING TERRAIN AVOIDANCE (FLTA)

The Forward Looking Terrain Avoidance (FLTA) feature of HTAWS 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.

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 6-78. When an RTC alert is issued, a potential impact point is displayed on the HTAWS 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 HTAWS Page. The alert is annunciated when the projected vertical flight path is calculated to come within minimum clearance altitudes in Figure 6-78.

Required Terrain/Obstacle Clearance
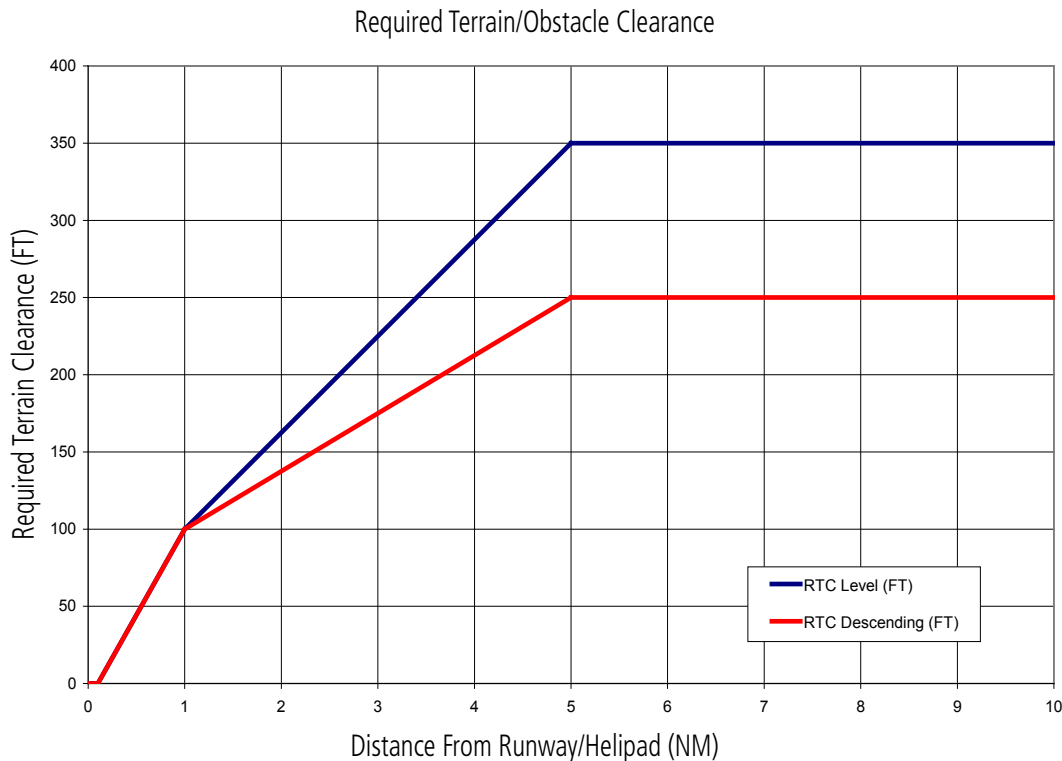
Figure 6-78 FLTA Alert Minimum Terrain and Obstacle Clearance Values

In situations when reduced FLTA alerting sensitivity may be desired, such as in low-level operations or during off-airport landings, HTAWS offers a Reduced Protection (RP) Mode. When RP Mode is enabled, the following occur:

• RTC is reduced to a maximum of 125 feet when groundspeed is at least 60 knots; RTC is reduced to zero feet at less than 60 knots.

• HTAWS reduces the distance of the projected flight path used to scan for terrain and obstacles.

• The system does not issue visual and voice caution alerts.

When RP Mode is enabled, the system status annunciation 'RP MODE' is shown on the PFD and on the HTAWS Page of the MFD.

**Figure 6-79 Reduced Protection Mode Enabled
System Status Annunciation**

Enabling/Disabling RP Mode:

1) Turn the large **FMS** Knob to select the HTAWS Page.

2) Press the **RP MODE** Softkey to inhibit or enable RP Mode (choice dependent on current state).

 Or:

1) Press the **MENU** Key.

2) Turn the FMS Knob to select 'Reduce Protection' or 'Enable Full Protection' (choice dependent on current state) and press the **ENT** Key.

FLTA caution and warning alerts are automatically disabled in any the following circumstances to reduce nuisance alerts:

• The groundspeed is less than 30 knots.

• The aircraft is operating within a region of a published ILS, LPV, LNAV/VNAV or LNAV+V approach within a defined descent path.

• The aircraft is in the vicinity of runways or helipad.

FLTA visual and voice caution and warning alerts can be manually inhibited. Discretion should be used when inhibiting HTAWS and the system should be enabled when appropriate. When HTAWS is inhibited, the system status annunciation 'HTAWS INH' is shown on the PFD and on the HTAWS Page of the MFD (Figure 6-80).

**Figure 6-80 HTAWS Alerting Disabled
(HTAWS Inhibited) Annunciation**

Inhibiting/enabling FLTA alerting:

1) Turn the large **FMS** Knob to select the HTAWS Page.

2) Press the **INHIBIT** Softkey to inhibit or enable HTAWS (choice dependent on current state).

Or:

3) Press the **MENU** Key.

4) Turn the FMS Knob to select 'Inhibit HTAWS' or 'Enable HTAWS' (choice dependent on current state) and press the **ENT** Key.

**Figure 6-81 Inhibiting FLTA Alerting on the
HTAWS Page Menu**

If HTAWS alerts are inhibited when the Final Approach Fix is the active waypoint in a GPS SBAS approach, a 'LOW ALT' annunciation may appear on the PFD next to the Altimeter if the current aircraft altitude is at least 164 feet below the prescribed altitude at the Final Approach Fix. See the Flight Instruments Section for details.

ALTITUDE VOICE CALLOUT (VCO) AURAL ALERTS

HTAWS provides aural altitude advisory alerts as the aircraft descends. VCO alerts are based on either radar altitude (if a radar altimeter is installed and available) or the GPS-derived height above terrain.

A VCO alert consists of a voice alert such as **"*five hundred*"**.

VCO alerts can be configured to occur at altitudes of 500', 450', 400', 350', 300', 250', 200', 150', 100', and 50'; alerts may also be disabled entirely. There are no display annunciations or pop-up alerts that accompany the VCO alert(s).

Configuring VCO alerting altitudes:

1) Turn the large **FMS** knob to select the AUX - System Setup Page.

2) If the Aux - System Setup 2 Page is not already displayed, press the **SETUP 2** Softkey.

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

4) Turn the large **FMS** Knob to highlight the altitude shown in the MAX SELECTED field.

5) Turn the small **FMS** Knob to select the maximum altitude at which VCO alerts will be enabled from (from 500 to 50 feet), or select NONE to disable all VCO alerts.

6) When finished, press the **FMS** Knob.

The system remembers the VCO alert altitude configuration through power cycles as part of the Pilot Profile.

Select the maximum altitude to issue VCO alerts, or 'NONE' to disable VCO alerts
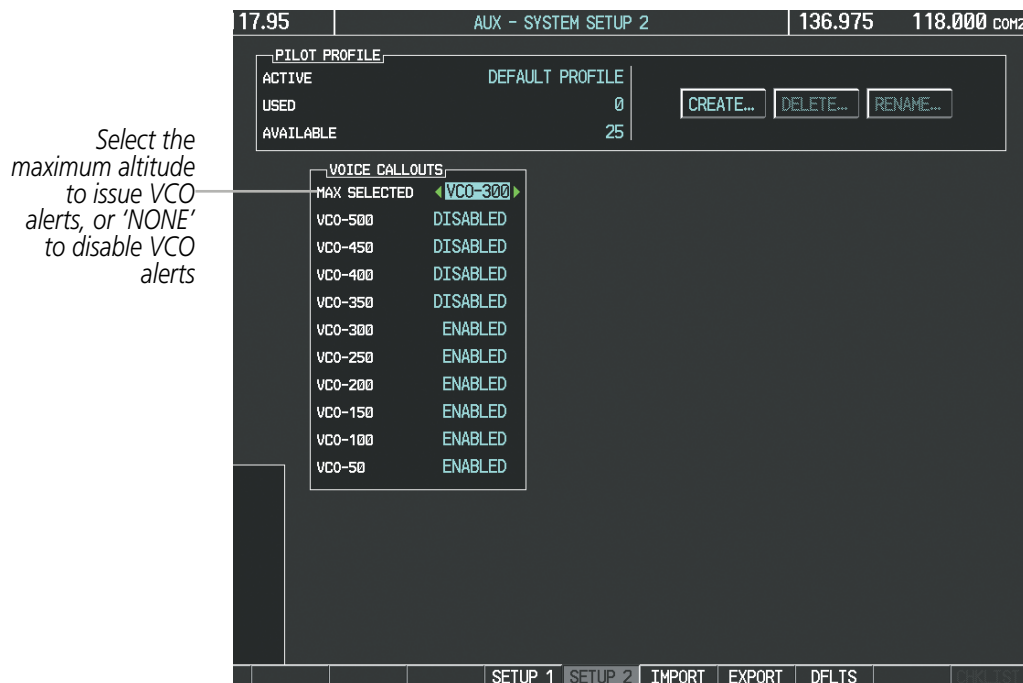
Figure 6-82 Voice Callout Settings
(AUX - System Setup 2 Page)

SYSTEM STATUS

During system power-up, HTAWS conducts a system test. The system test can also be manually initiated. A voice alert is issued at test completion. HTAWS System Testing is disabled when ground speed exceeds 30 knots. No terrain, obstacle, or VCO alerting is available while a system test is in progress.

Alert Type	PFD/HTAWS Page Status Annunciation	HTAWS Page Center Banner Annunciation	Voice Alert
System Test in Progress	HTAWS TEST	**HTAWS TEST**	None
System Test Pass	None	None	"HTAWS Test OK"
HTAWS System Failure	HTAWS FAIL	**HTAWS FAIL**	"HTAWS Failure"
HTAWS Not Available	HTAWS N/A	None	"HTAWS Not Available"
HTAWS Availability Restored	None	None	"HTAWS Available"*
HTAWS FLTA Alerting Inhibited	HTAWS INH	None	None
Reduced Protection Mode Enabled	RP MODE	None	None

* Voice alert not issued if HTAWS is inhibited.

Table 6-14 HTAWS System Status Annunciations

Manually testing the HTAWS System:

1) Select the HTAWS Page.

2) Press the **MENU** Key to display the Page Menu (Figure 6-83).

3) Select 'Test HTAWS System' and press the **ENT** Key to confirm the selection.
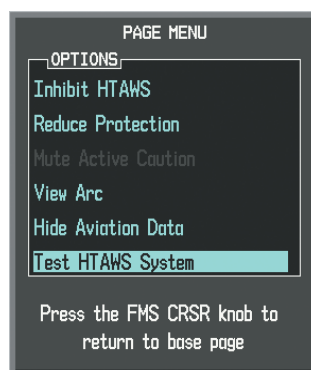
Figure 6-83 HTAWS Page Menu

HTAWS continually monitors several system-critical items such as database validity, hardware status, and GPS status. If the terrain/obstacle database is not available, the system generates an **"HTAWS Failure"** voice alert and displays the 'HTAWS FAIL' annunciation.

HTAWS 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 'HTAWS N/A' is generated in the annunciation window and on the HTAWS Page. The voice alert **"HTAWS**

Not Available" is also generated. When sufficient GPS signal is received and the aircraft is within the database coverage area, the aural message *"HTAWS Available"* is generated (unless HTAWS is inhibited).

Alert Cause	PFD/HTAWS Page Annunciation	HTAWS Page Center Banner Annunciation	Voice Alert
MFD Terrain or Obstacle database unavailable or invalid. HTAWS 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, HTAWS audio fault	HTAWS FAIL	HTAWS FAIL	"HTAWS Failure"
No GPS position	HTAWS N/A	NO GPS POSITION	"HTAWS Not Available" "HTAWS Available" when GPS position returns and HTAWS is not inhibited.
Excessively degraded GPS signal	HTAWS N/A	None	"HTAWS Not Available" "HTAWS Available" when sufficient GPS signal is received and HTAWS is not inhibited.
Out of database coverage area	HTAWS N/A	None	"HTAWS Not Available" "HTAWS Available" when aircraft enters database coverage area and HTAWS is not inhibited.

Table 6-15 HTAWS Abnormal Conditions

6.6 TRAFFIC INFORMATION SERVICE (TIS)

⚠ *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 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 both Traffic Advisory Systems (TAS) and TIS. Aircraft without altitude reporting capability are shown without altitude separation data or climb descent indication.*

✓ *NOTE: TIS is disabled if a Traffic Advisory System (TAS) 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 5 seconds. The G1000H 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 three different symbols (Table 6-16).

TIS Symbol	Description
◈	Non-Threat Traffic
●	Traffic Advisory (TA)
◑	Traffic Advisory Off Scale

Table 6-16 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 yellow circle symbol is generated. A TA which is detected, but is outside the selected map range, is indicated in a banner in the lower left corner of the map and a half TA symbol at the relative bearing of the intruder.

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 6-88) or in a banner at the lower left corner of maps other than the Traffic Map Page on which traffic display is enabled (Figure 6-84).

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

Traffic information can be displayed on the following maps (when TIS is operating):

- PFD Inset Map
- Navigation Map Page
- Traffic Map Page
- Trip Planning Page
- Nearest Pages
- Active Flight Plan Page

Displaying traffic information (maps other than the Traffic Map Page):

1) Select the **MAP** Softkey.

2) Select the **TRAFFIC** Softkey to display traffic data.

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 6-84 TIS Traffic on 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 6-85).

4) Turn the small **FMS** Knob to select the 'Traffic' Group and press the **ENT** Key (Figure 6-86).

5) Turn the large **FMS** Knob or press the **ENT** Key to scroll through product selections (Figure 6-87).

  • 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 only (Proximity Advisories (PA) not shown with TIS)

   - 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 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.
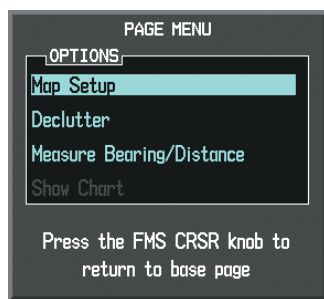
Figure 6-85 Navigation Map Page Menu

Figure 6-86 Navigation Map Page Setup Menu   **Figure 6-87 Navigation Map Page Setup Menu, Traffic Group**
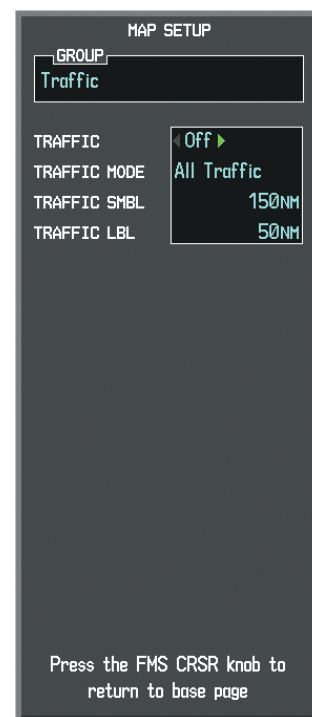
The Navigation Map Page Setup Menu provides a means in addition to the softkey for enabling/disabling display of traffic. The setup menu also controls the map range settings above which traffic data (symbols and labels) are decluttered from the display. If a map range larger than the map range setting 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.

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 map page for viewing TIS information. Aircraft orientation on this map is always heading up unless there is no valid heading. Map range is adjustable with the **RANGE** Knob 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 G1000H begins to display traffic information. Refer to the System Status discussion for more information.

> **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)** Confirm TIS is in Operating Mode:
>
> Select the **OPERATE** Softkey to begin displaying traffic.
>
> **Or**:
>
> **a)** Press the **MENU** Key.
>
> **b)** Select 'Operate Mode' (shown if TIS is in Standby Mode) and press the **ENT** Key.
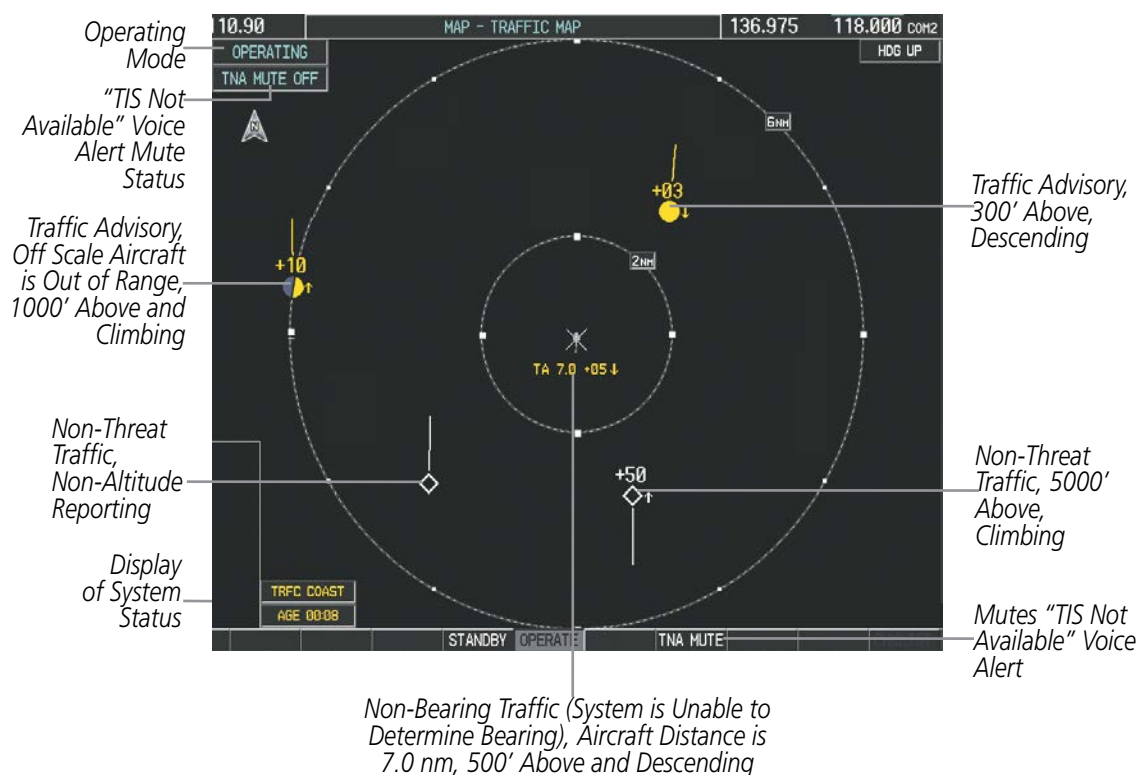
Figure 6-88 Traffic Map Page

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, flashing for 5 seconds and remaining 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.

Inset Map Displays When TA is Detected

Figure 6-89 Traffic Annunciation (PFD)

A *"TIS Not Available"* (TNA) voice alert is generated 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 Page.

Muting the "TIS Not Available" voice alert:

1) Select the Traffic Map Page.

2) Select the **TNA MUTE** Softkey. The status is displayed 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 G1000H 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 6-17 TIS Failure Annunciations

System Test has Failed

Data Not Received from Transponder

Figure 6-90 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 6-19 for additional failure annunciations

Table 6-18 TIS Modes

Switching between TIS modes:

1) Select the Traffic Map Page.

2) Select the **STANDBY** or **OPERATE** Softkey to switch between modes. 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 6-19).

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 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 6-19 TIS Traffic Status Annunciations

6.7 GARMIN GTS TRAFFIC

⚠️ **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 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:** *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 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.*

☑️ **NOTE:** *Radar altimeter data is optional for the Traffic Advisory System (TAS). If radar altimeter data is detected by the TAS at the beginning of a power cycle and that data is subsequently lost, the TAS will declare a fault and will not provide traffic information.*

☑️ **NOTE:** *TIS is disabled when TAS is installed.*

The Garmin GTS 800 Traffic Advisory System (TAS) enhances flight crew situational awareness by displaying traffic information for transponder-equipped aircraft. The system also provides visual and aural traffic alerts including voice announcements to assist in visually acquiring traffic.

The system is capable of tracking up to 45 intruding aircraft equipped with Mode A or C transponders, and up to 30 intruders equipped with Mode S transponders. A maximum of 30 aircraft with the highest threat potential can be displayed simultaneously. No traffic surveillance is provided for aircraft without operating transponders.

THEORY OF OPERATION

When the traffic system is in Operating Mode, the 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 traffic 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), the system provides visual annunciations and voice alerts.

TAS SURVEILLANCE VOLUME

The GTS 800 surveillance system monitors the airspace within ±10,000 feet of own altitude. Under ideal conditions, the GTS 800 unit scans transponder traffic up to 22 nm in the forward direction.   The range is somewhat reduced to the sides and aft of own aircraft due to the directional interrogation signal patterns. In

areas of greater transponder traffic density or when TCAS II (Traffic Alert and Collision Avoidance System II) systems are detected, the GTS 800 automatically reduces its interrogation transmitter power (and therefore range) in order to limit potential interference from other signals.

When paired with a 1090 MHz extended squitter transponder, the GTS 800 uses Automatic Dependent Surveillance - Broadcast (ADS-B) data from participating airborne aircraft transponders to enhance the positional accuracy and display of traffic within the TAS surveillance range. Traffic data supplied only by ADS-B Ground Based Transceivers (GBTs) is not displayed.

> **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 SYMBOLOGY

The GTS 800 uses symbology to depict intruding traffic using the symbols shown in Table 6-20.

Symbol	Description
	Traffic Advisory (TA) arrow with ADS-B directional information. Points in the direction of the intruder aircraft track. (Not available in all installations.)
	Traffic Advisory without ADS-B directional information.
	Traffic Advisory out of the selected display range. Displayed at outer range ring at proper bearing.
	Proximity Advisory (PA) arrow with ADS-B directional information. Points in the direction of the aircraft track. (Not available in all installations.)
	Proximity Advisory without ADS-B directional information.
	Non-threat traffic arrow with ADS-B directional information. Points in the direction of the intruder aircraft track. (Not available in all installations.)
	Non-Threat Traffic without ADS-B directional information
	PA or Non-threat traffic arrow with ADS-B directional information, but positional accuracy is degraded. Points in the direction of the aircraft track. (Not available in all installations.)

Table 6-20 GTS 800 Traffic Symbols

A Traffic Advisory (TA), displayed as a yellow 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 traffic beyond 6 nm that is neither a TA or PA.

A solid white rounded arrow indicates either a PA or Non-Threat traffic with ADS-B directional information, but the position of the traffic is shown with degraded accuracy.

Relative altitude, when available, is displayed above or below the corresponding intruder symbol in hundreds of feet (Figure 6-91). 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 (Figure 6-91) indicates traffic is climbing or descending at least 500 fpm with an upward or downward-pointing arrow respectively.
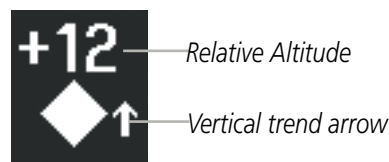
Figure 6-91 Intruder Altitude and Vertical Trend Arrow

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 6-92).
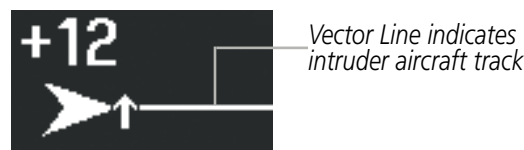
Figure 6-92 Intruder Traffic with ADS-B Directional Information and Track

Flight IDs may also be displayed with traffic symbols; see the Flight IDs discussion in this section for more information.

The traffic system automatically suppresses the display of altitude-reporting aircraft on the ground under either of the following conditions:

• On-ground aircraft is equipped with a Mode S transponder.

• On-ground aircraft is equipped with a Mode C transponder, and own aircraft's optional radar altimeter is displaying 400' AGL or less.

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/heliports. Level A (less) TA sensitivity is used when the optional radar altimeter indicates own aircraft is below 2000' AGL. If a radar altimeter is not installed or has

failed, the traffic system applies Level A sensitivity when the groundspeed is less than 120 knots. In all other conditions, the traffic system uses Level B (greater) TA sensitivity 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 6-21 TA Sensitivity Level and TA Alerting Criteria

TAS ALERTS

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 6-22). 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 tape on the PFD, flashes for five seconds and remains displayed until no TAs are detected in the area (Figure 6-93).

- The PFD Inset Map is automatically displayed with TA traffic.

If the bearing of TA traffic cannot be determined (Figure 6-95), a yellow text banner appears 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.

Inset Map Displays When TA is Detected

Figure 6-93 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 6-22 TA Descriptive Voice Announcements

If an optional radar altimeter indicates own aircraft is below 400' AGL, the GTS 800 automatically mutes traffic voice alerts.

SYSTEM TEST

NOTE: *Traffic surveillance is not available during the system test. Use caution when performing a system test during flight.*

The traffic system provides a system test mode to verify the system is operating normally. The test takes ten seconds to complete. When the system test is initiated, a test pattern of traffic symbols is displayed on the Traffic Map Page (Figure 6-94). The voice alert **"TAS System Test Passed"** or **"TAS System Test Failed"** is issued when the test is complete, and the traffic system will be in 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 **Range** knob to set the range to 2/6 nm to allow for the full test pattern to be displayed.

4) Select the **TEST** Softkey.

Or:

1) Press the **MENU** Key and turn the small **FMS** knob to select 'Test Mode'.

2) Press the **ENT** Key.
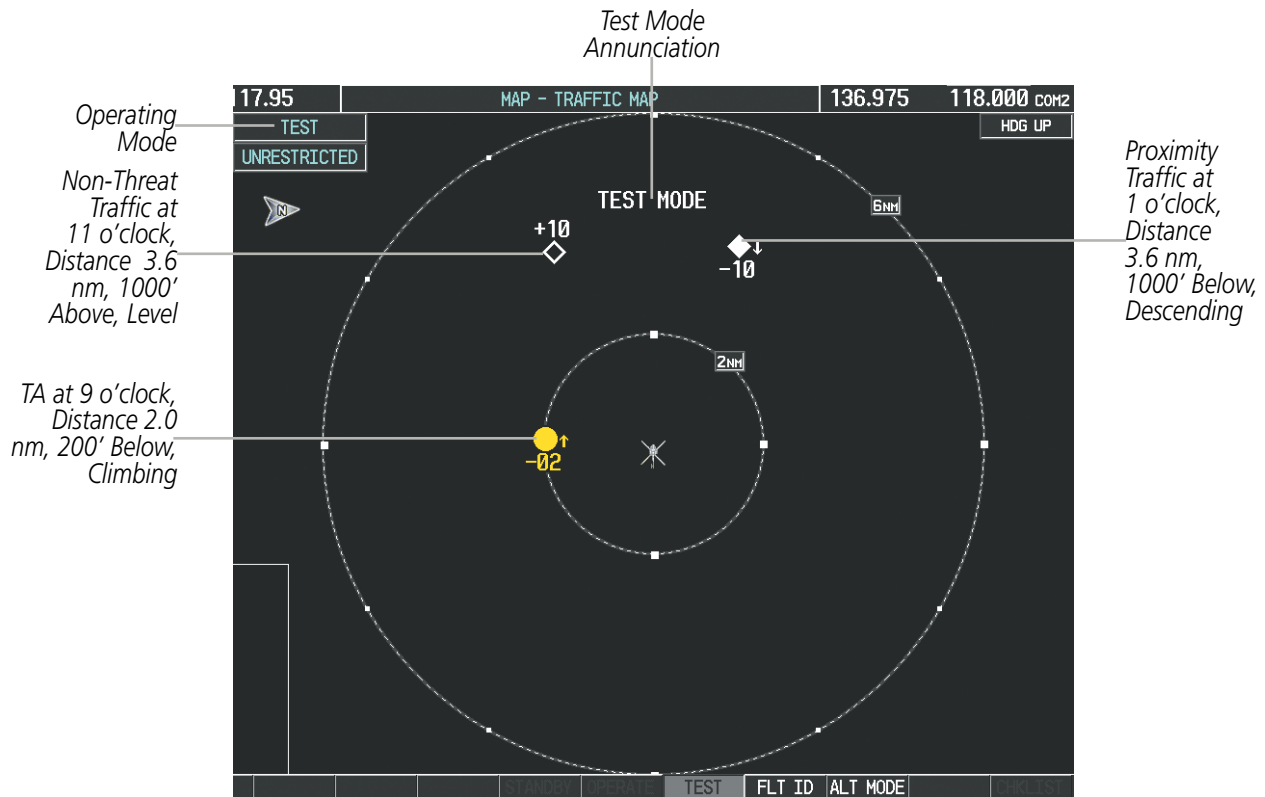
Figure 6-94 System Test in Progress with Test Pattern

OPERATION

After power-up, the traffic system is in Standby Mode. The system must be in Operating Mode for traffic to be displayed and for TAs to be issued.

Selecting the **OPERATE** Softkey allows the system to switch from Standby Mode to Operating Mode as necessary. Selecting the **STANDBY** Softkey forces the unit into Standby Mode.

Switching from operating mode to standby mode:

On the Traffic Page, select 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, select 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 system switches from Standby Mode to Operating Mode as necessary.

TRAFFIC MAP PAGE

The Traffic Map Page shows surrounding traffic data in relation to the aircraft's current position and altitude, without basemap clutter. It is the principal page for viewing traffic information. Aircraft orientation is always heading up unless there is no valid heading. Map range is adjustable with the **RANGE** Knob from 2 to 12 nm, as indicated by the map range rings.

The traffic mode and altitude display mode are annunciated in the upper left corner of the page.
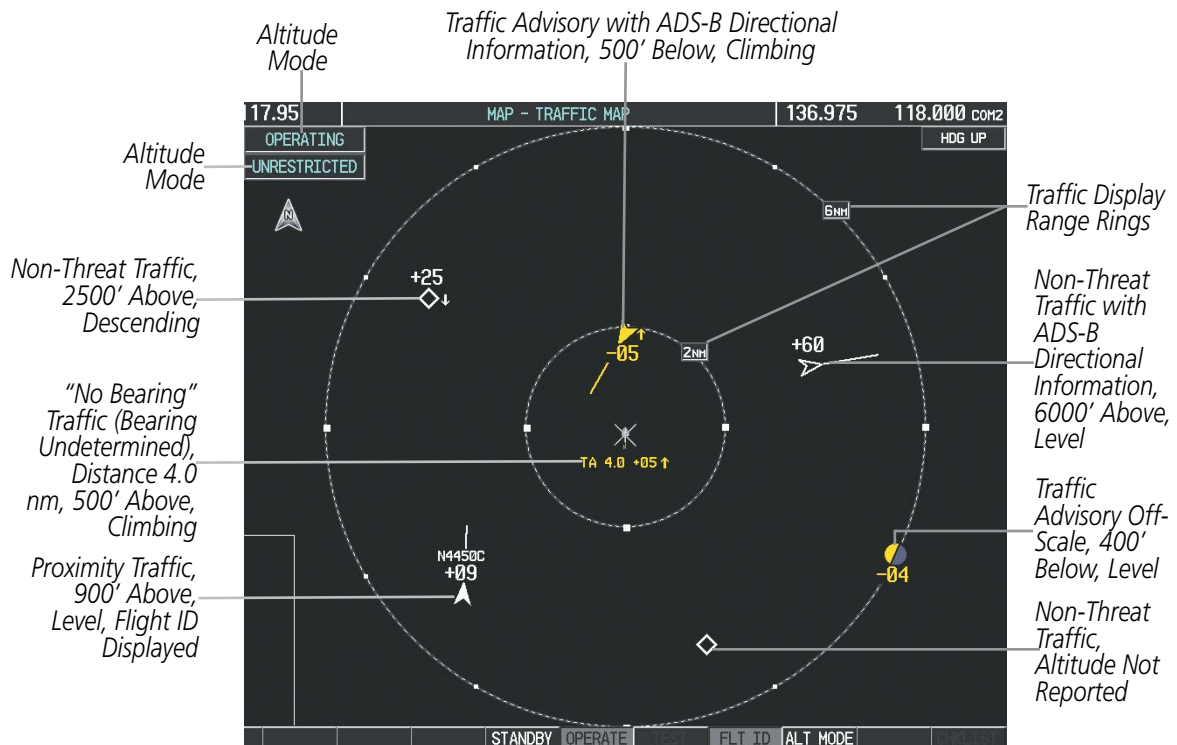
Figure 6-95 Traffic Map Page

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) Select the **OPERATE** Softkey to begin displaying traffic. 'OPERATING' is displayed in the Traffic mode field.

4) Select the **STANDBY** Softkey to place the system in the Standby mode. 'STANDBY' is displayed in the Traffic mode field.

5) Turn the **RANGE** Knob 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. TAs occurring outside of these limits will always be shown.

Changing the altitude range:

1) On the Traffic Map Page, select the **ALT MODE** Softkey.

2) Select one of the following Softkeys:

   • **ABOVE:** Displays non-threat and proximity traffic from 9000 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 9000 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, select 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) Select the **ENT** Softkey.

FLIGHT ID DISPLAY

The Flight IDs of other aircraft (when available) can be enabled for display on the Traffic Map Page (Figure 6-96). 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.
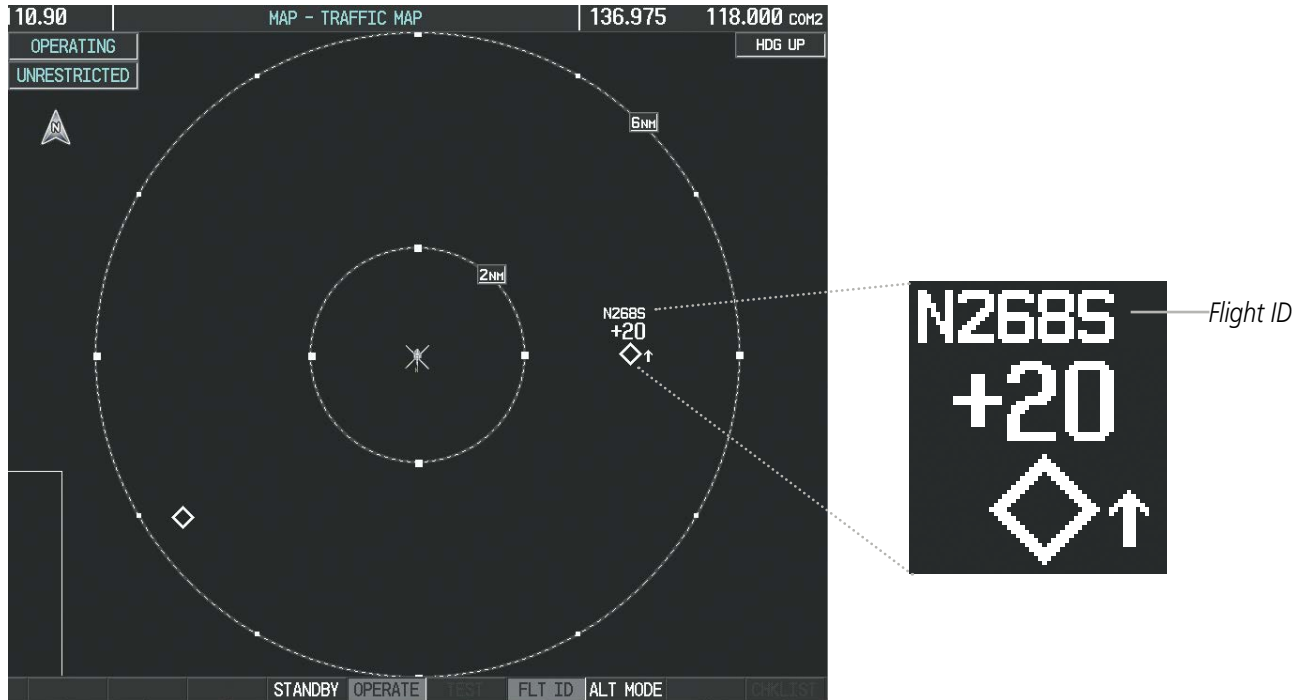
Figure 6-96 Traffic Map Page with Flight IDs Enabled

Enabling/Disabling Flight ID Display:

On the Traffic Map Page, select 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 6-97).

3) Press the **ENT** Key.
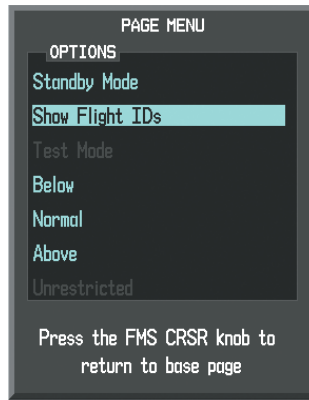
Figure 6-97 Traffic Map Page Menu

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 **RANGE** Knob from 2 to 12 nm, as indicated by the map range rings.

Changing the display range on the Traffic Map Page:

1) Turn the **RANGE** Knob.

2) The following range options are available:

- 2 nm

- 2 and 6 nm

- 6 and 12 nm

ADDITIONAL TRAFFIC DISPLAYS

Traffic information can be displayed on the following maps on the MFD when the unit is operating:

- Navigation Map Page
- Nearest Pages
- Traffic Map Page
- Active Flight Plan Page
- Trip Planning Page
- System Pages

Traffic information can also be displayed on the PFD when Synthetic Vision Technology (SVT) is enabled. See the Additional Features Section for details.

Displaying traffic information (MFD maps other than the Traffic Map Page):

1) Select the **MAP** Softkey.

2) Select 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 6-98).

Displaying traffic on the Navigation Map

1) Ensure the TAS system is operating. With the Navigation Map displayed, select the **MAP** Softkey.

2) Select the **TRAFFIC** Softkey. Traffic is now displayed on the map as shown in the figure.
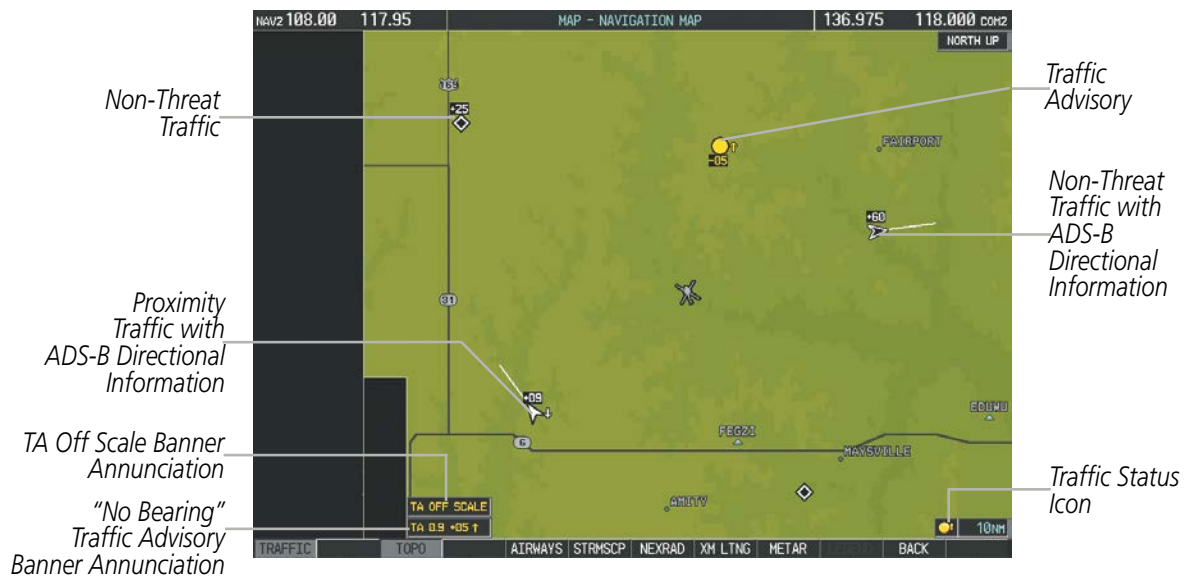
Figure 6-98 TAS Traffic on Navigation Map

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 6-99).

4) Turn the small **FMS** Knob to select the Traffic Group and press the **ENT** Key (Figure 6-100).

5) Turn the large **FMS** Knob or press the **ENT** Key to scroll through the selections (Figure 6-101).

- 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.
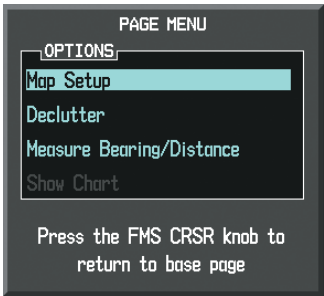
Figure 6-99 Navigation Map Page Menu
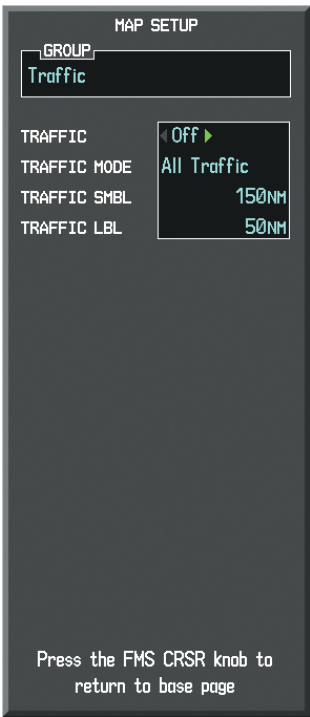
Figure 6-100 Navigation Map Page Setup Menu   Figure 6-101 Navigation Map Page Setup Menu, Traffic Group

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.

SYSTEM STATUS

The traffic mode is annunciated in the upper left corner of the Traffic Map Page.

Mode	Traffic Mode Annunciation (Traffic Map Page)	Traffic Display Status Icon (Other Maps)
Traffic System Test Initiated	**TEST** (also shown in white in center of page)	
Operating	**OPERATING**	
Standby	**STANDBY** (also shown in white in center of page)	
Traffic System Failed*	**FAIL**	

* See Table 6-24 for additional failure annunciations

Table 6-23 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 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
FAILED	Incorrect data format received from the traffic unit, or data has been lost from radar altimeter (if installed)

Table 6-24 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 6-25 Traffic Status Annunciations

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SECTION 7 ADDITIONAL FEATURES

> **NOTE:** With the availability of SafeTaxi, ChartView, or FliteCharts in electronic form, it is still advisable to carry another source of charts on board the aircraft.

Additional features of the system include the following:

- Synthetic Vision Technology (SVT)
- SafeTaxi® diagrams
- ChartView and FliteCharts® electronic charts
- Airport Directory (AOPA or AC-U-KWIK)
- Scheduler
- Flight Data Logging

The 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 or AC-U-KWIK Airport Directory offer detailed information for a selected airport, such as available services, hours of operation, and lodging options.

The Scheduler feature can be used to enter and display short term or long term reminder messages such as 'Switch fuel tanks' or 'Altimeter-Transponder Check' 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.

7.1 SYNTHETIC VISION TECHNOLOGY (SVT)

⚠️ **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 Synthetic Vision Technology (SVT) is a visual enhancement to the G1000H 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. The depicted imagery is derived from the aircraft attitude, heading, GPS three-dimensional position, and a six arc-second database of terrain, obstacles, and other relevant features. The terrain data resolution of six arc-seconds, meaning that the terrain elevation contours are stored in squares measuring six 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, 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 colors used to display the terrain elevation contours are similar to that of the topo map display.

The Helicopter Terrain Awareness and Warning System (HTAWS) 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 HTAWS 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
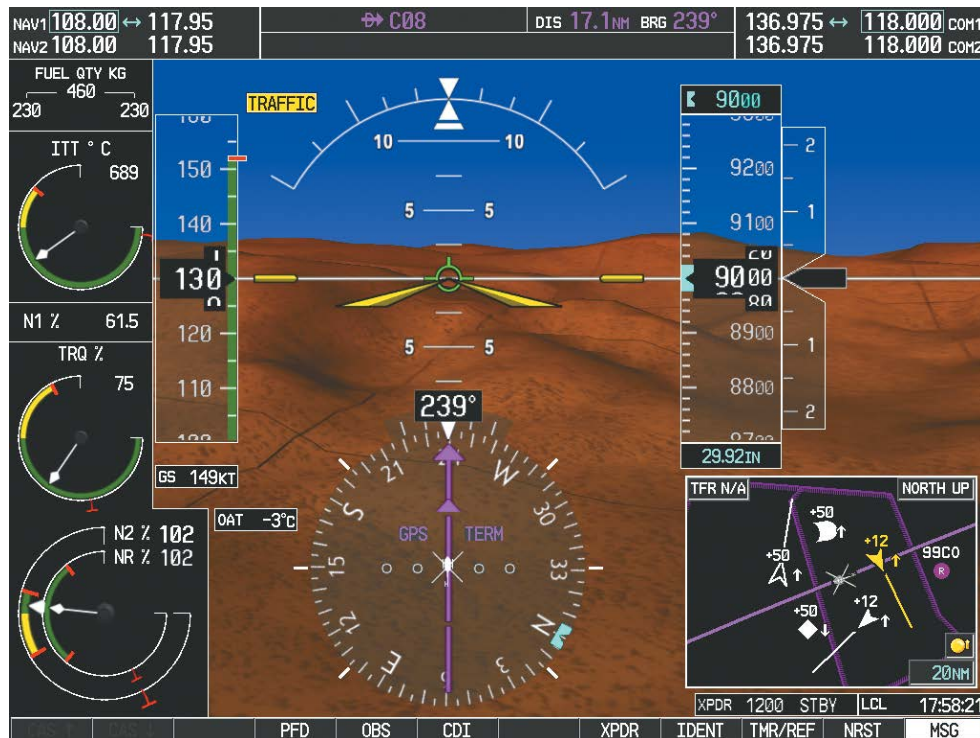
Figure 7-1 Synthetic Vision Imagery

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 scale 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.
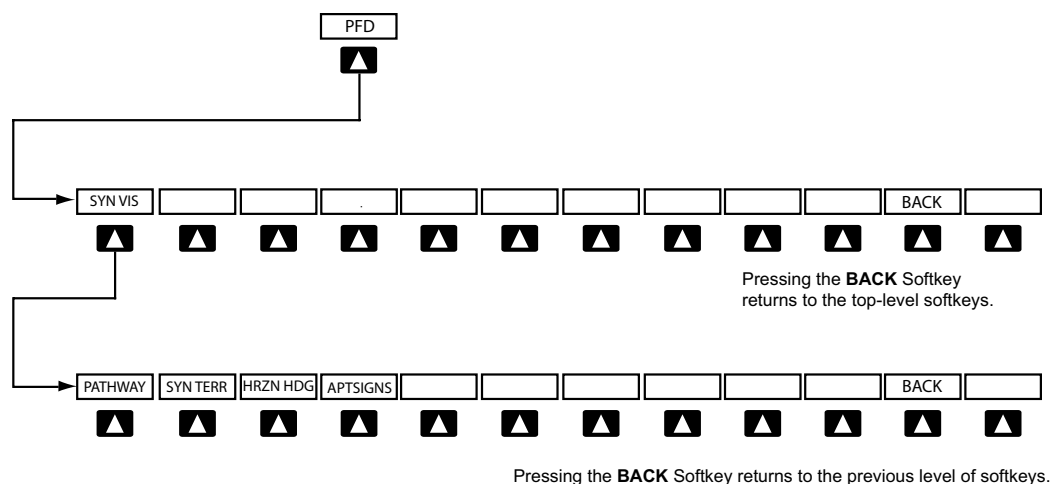
Figure 7-2 SVT Softkeys

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 7-3 SVT on the Primary Flight Display

Labels around the figure:
- Airport Runway
- Flight Path Marker
- Own Ship Symbol
- SVT Softkeys
- Selected Altitude
- Zero Pitch Line (ZPL) with Compass Heading Marks
- Pathways
- Synthetic Terrain

✓ **NOTE:** Pathways and terrain features are not a substitute for standard course and altitude deviation information provided by the altimeter, CDI, and VDI.

✓ **NOTE:** Pathways are not available when the cross-pointer (X-Pointer) flight director format is selected.

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 7-4). 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.
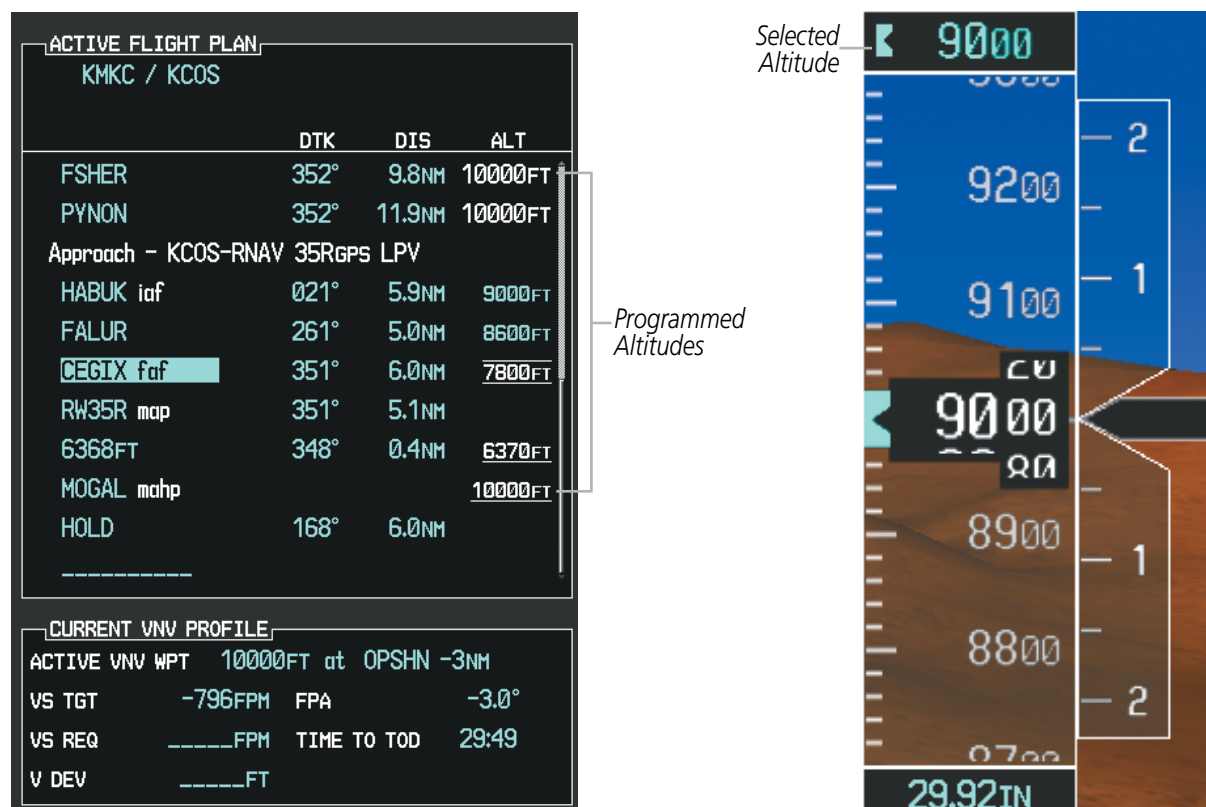
Figure 7-4 Programmed and Selected Altitude

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. Pathways may then be re-displayed by pressing the **PATHWAY** Softkey.

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 7-5, 7-6). 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.
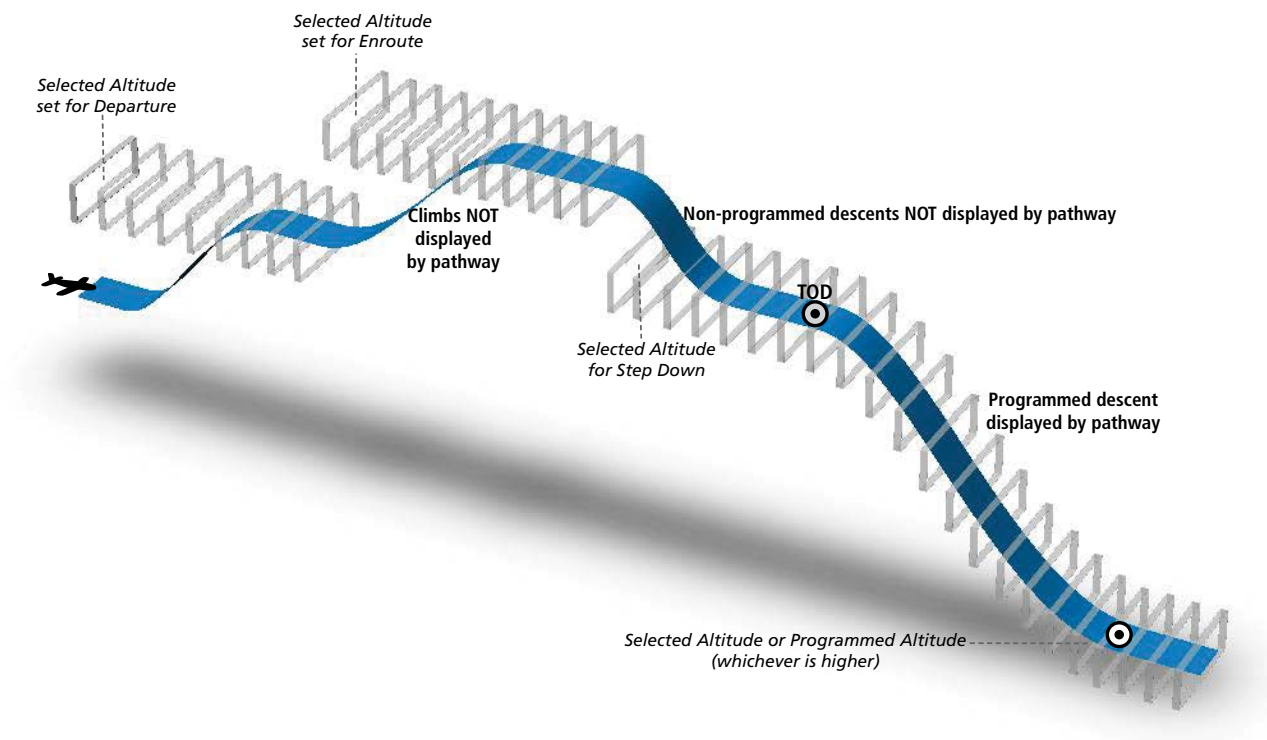
Figure 7-5 SVT Pathways, Enroute and Descent

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.
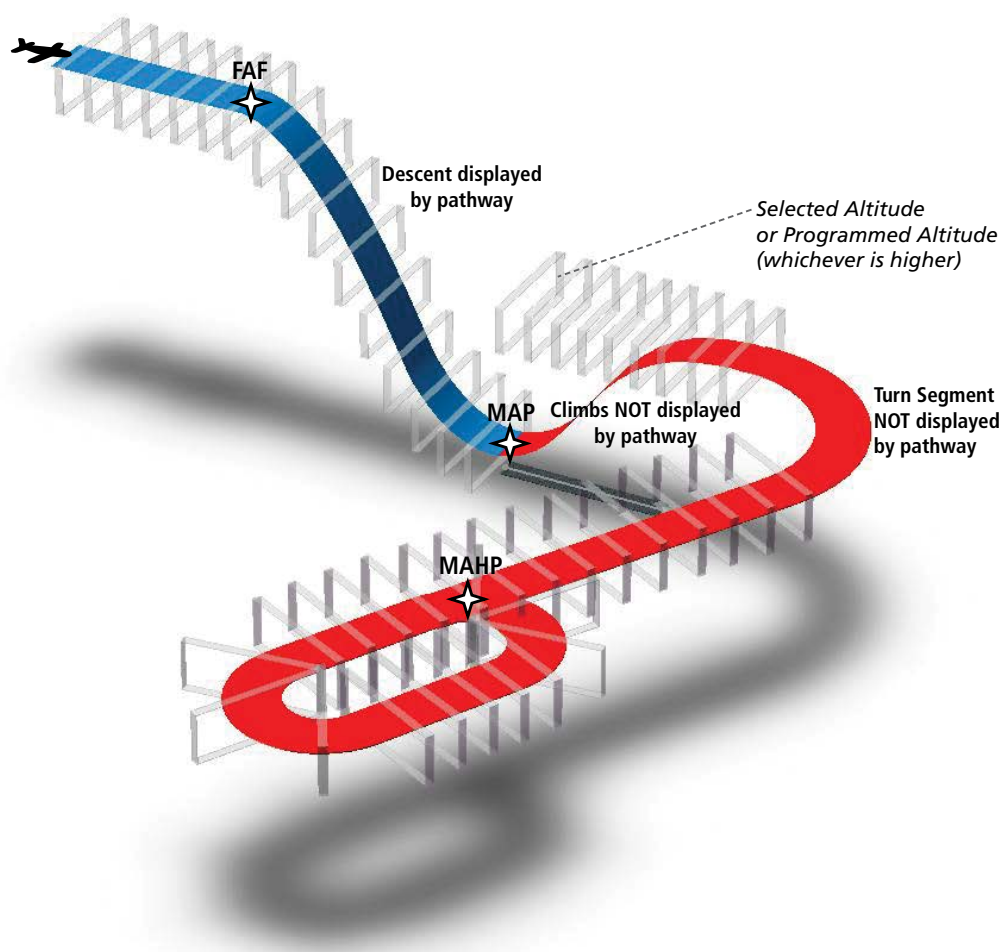
Figure 7-6 SVT Pathways, Approach, Missed Approach, and Holding

FLIGHT PATH MARKER

> **NOTE:** *The Flight Path Marker is not available when the cross-pointer (X-Pointer) flight director format is selected.*

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 Own Ship 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 7-7).

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 HTAWS. However, decisions regarding terrain and/or obstacle avoidance should not be made using only the FPM.

Figure 7-7 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 within 250 feet laterally of the aircraft will not be displayed on the SVT display. 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 8 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 7-8 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 displayed in white. Other runways will be gray in color. 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 7-9 Airport Runways

HTAWS ALERTING

Terrain alerting on the synthetic terrain display is triggered by Forward-looking Terrain Avoidance (FLTA). When an obstacle becomes a potential impact point the color of the obstacle matches the red or yellow X displayed on the MFD HTAWS Page. For more detailed information regarding HTAWS, 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 7-10 Terrain Alert

Obstacles are represented on the synthetic terrain display by standard two-dimensional tower symbols as found on MFD HTAWS Page and charts. Obstacle symbols appear in the perspective view with relative height above terrain and distance from the aircraft. Unlike on the MFD HTAWS Page, 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 7-11 Obstacle

GARMIN

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.

Configuring 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*
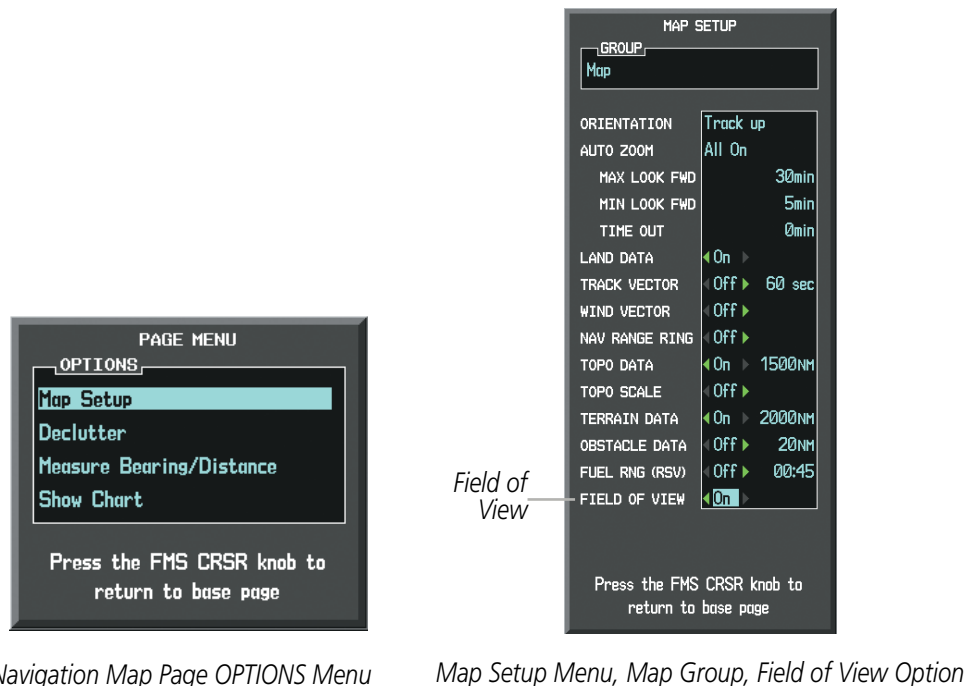
Figure 7-12 Option Menus

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.

Field of View on the MFD   *SVT View on the PFD*

Figure 7-13 PFD and MFD Field of View Comparison

7.2 SAFETAXI

SafeTaxi is an optional 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 rotorcraft 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.

Aircraft Position

Taxiway Identification

Airport Hot Spot Outline

Airport Features

DCLTR Softkey Removes Taxiway Markings
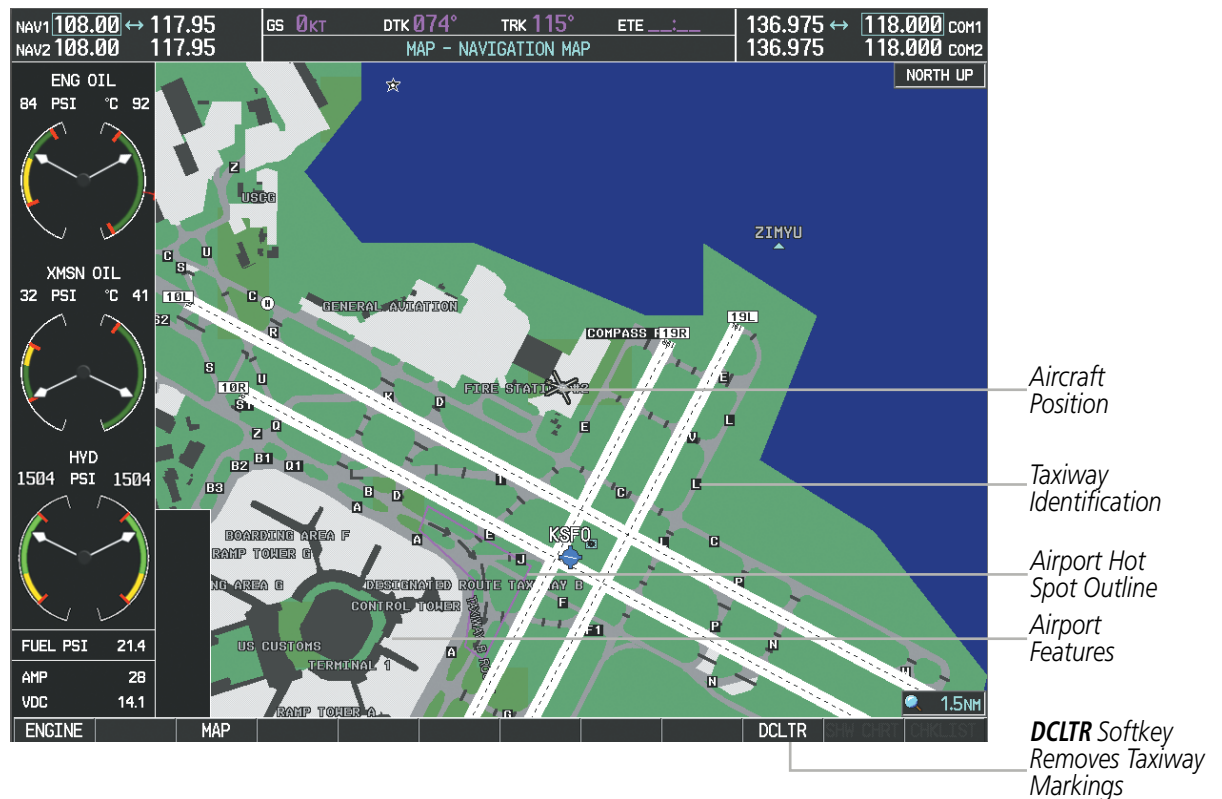
Figure 7-14 SafeTaxi Depiction on the Navigation Map Page

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 and 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.
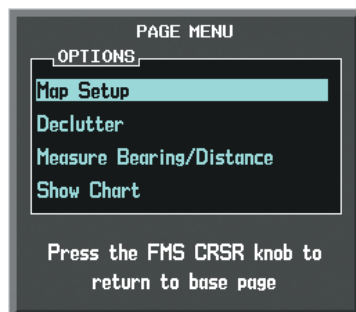
Figure 7-15 Navigation Map PAGE MENU, Map Setup Option

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.
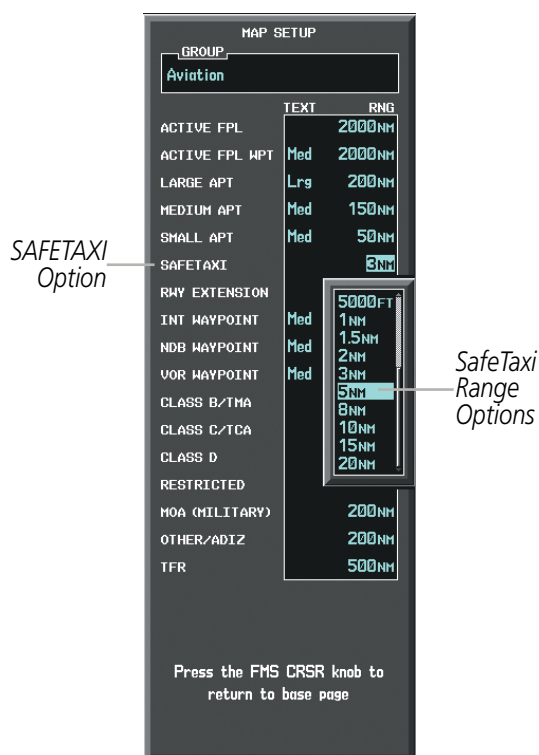
Figure 7-16 MAP SETUP Menu, Aviation Group, SAFETAXI Range Options

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.
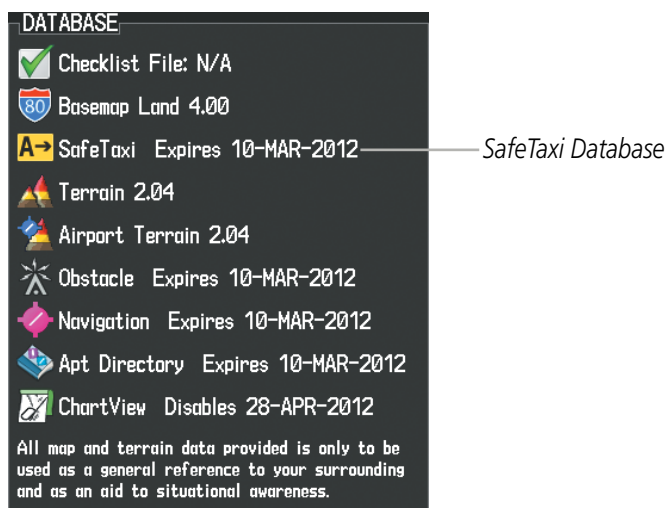
Figure 7-17 Power-up Page, SafeTaxi Database

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 7-1 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 7-18.

Select 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.
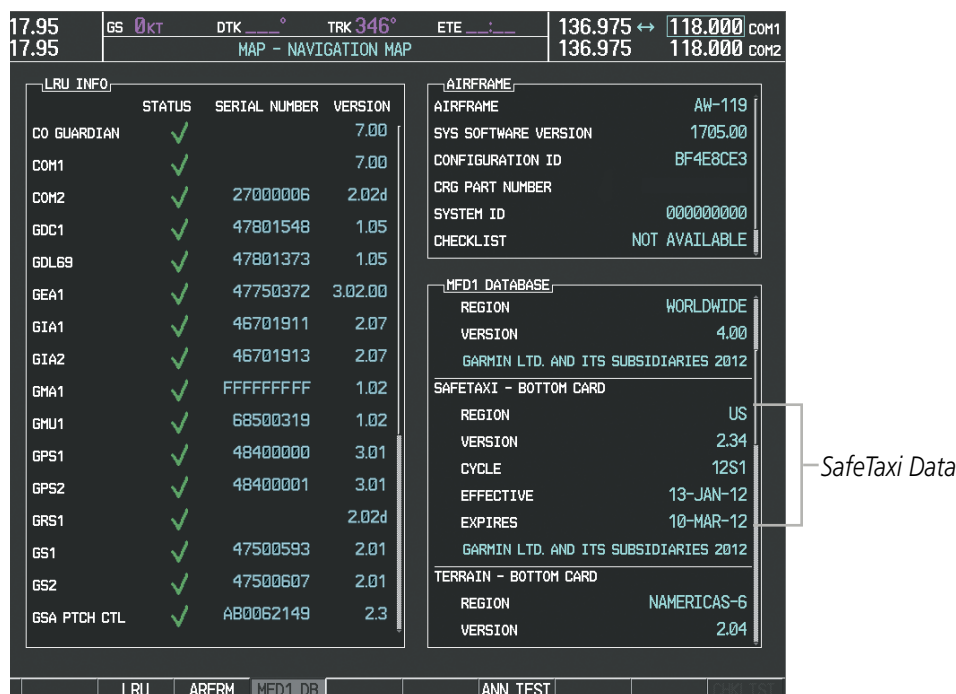
Figure 7-18 AUX – System Status Page, SafeTaxi Current Information

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 7-18 and 7-19). NOT AVAILABLE appears in blue in the REGION field if SafeTaxi data is not available on the database card (Figure 7-19). An expired SafeTaxi database is not disabled and will continue to function indefinitely.

Select 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 7-19 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*
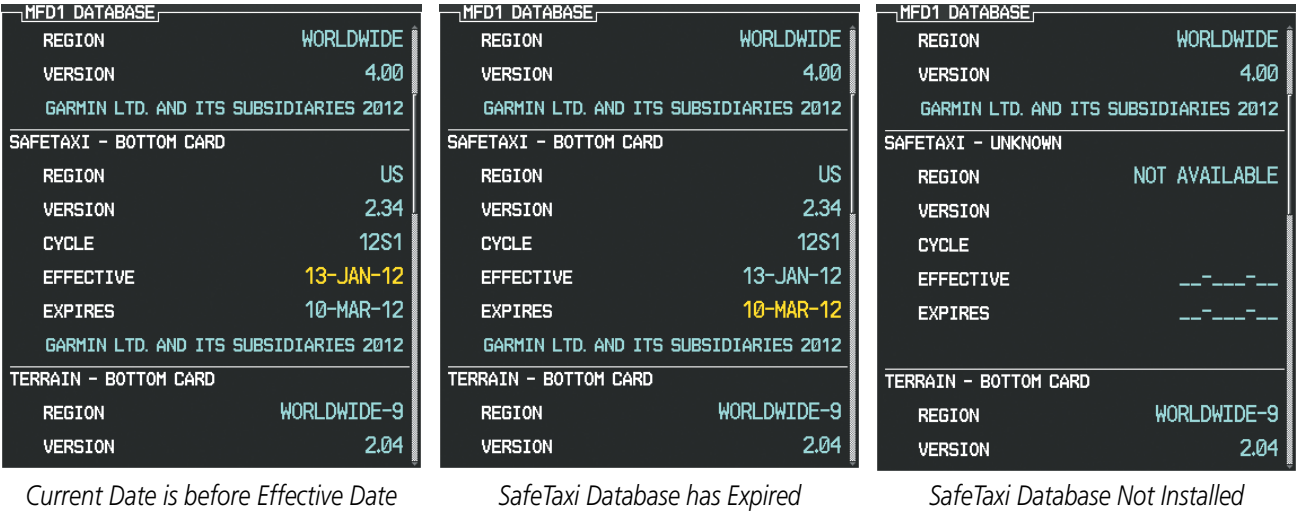
Figure 7-19 AUX – System Status Page, SafeTaxi Database Status

7.3 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 7-20) 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 7-20 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.
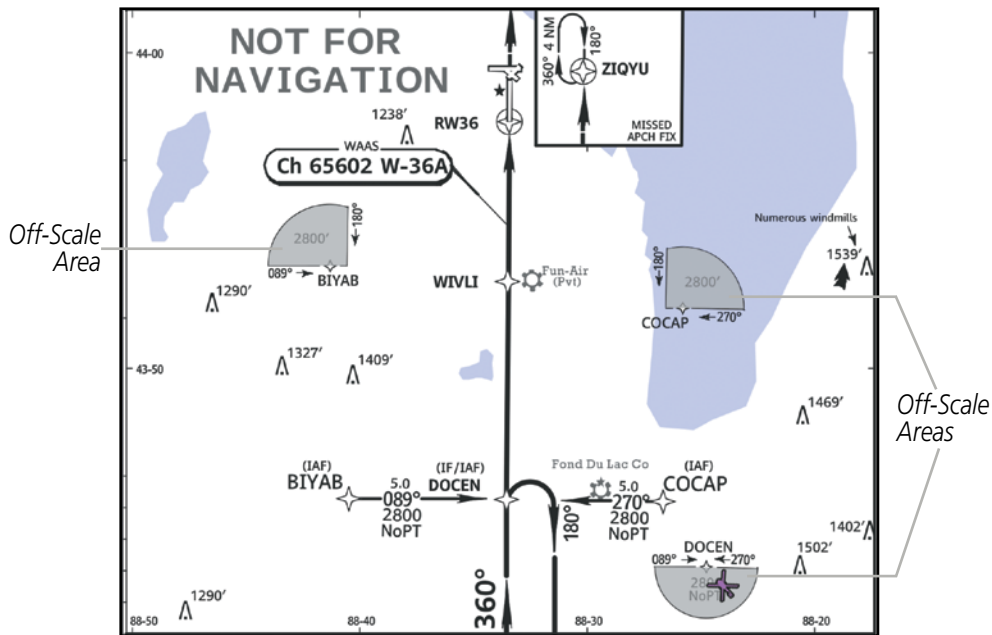
Figure 7-20 Sample Chart Indicating Off-Scale Areas

> **NOTE:** *Do not maneuver the aircraft based solely upon the geo-referenced aircraft symbol.*

- 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, selecting the **SHW CHRT** Softkey displays the available terminal chart and advances to the chart selection level of softkeys: **CHRT OPT**, **CHRT**, **INFO-1/2**, **DP**, **STAR**, **APR**, **WX**, **NOTAM**, and **GO BACK**. The chart selection softkeys shown below appear on the Airport Information Page.

Selecting the **GO BACK** Softkey reverts to the top level softkeys and previous page.

Selecting 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.
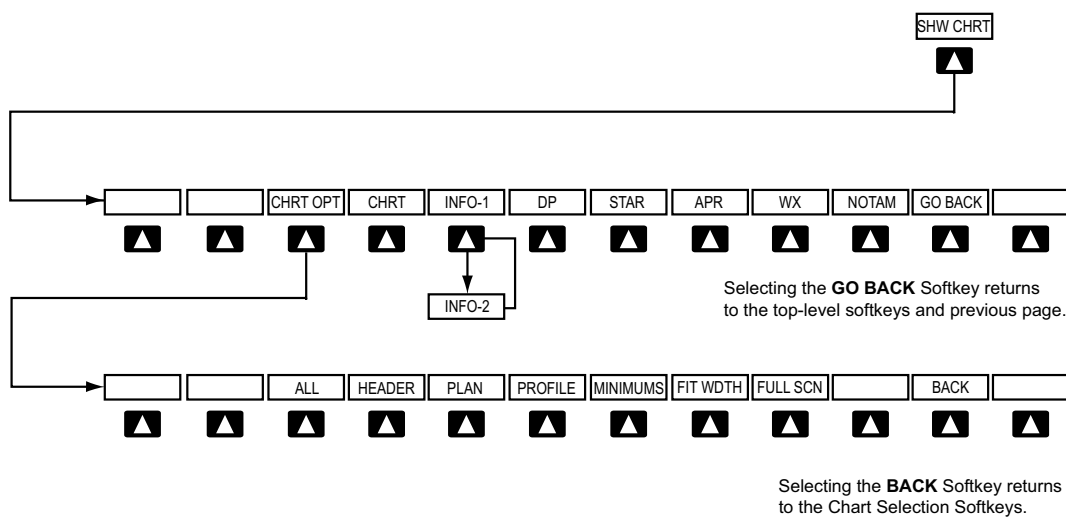
Figure 7-21 ChartView SHW CHRT, Chart Selection, and Chart Option Softkeys

TERMINAL PROCEDURES CHARTS

Selecting Terminal Procedures Charts:

While viewing the Navigation Map Page, Nearest Airport Page, or Flight Plan Page, select 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.
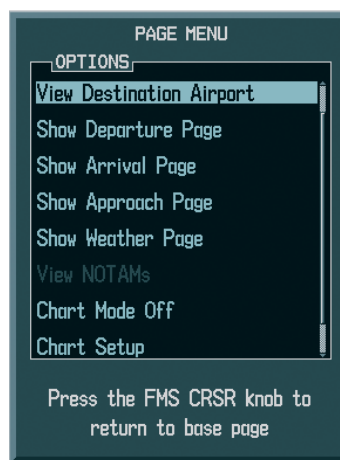
Navigation Map Page OPTIONS Menu   *Waypoint Airport Information Page OPTIONS Menu*

Figure 7-22 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 7-23 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 7-24 Unable To Display Chart Banner

When a chart is not available by selecting 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, selecting 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, select 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. (Select 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 7-25 Approach Information Page, Chart Selection

While the APPROACH Box is selected using the **FMS** Knob, the G1000H 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 7-29). 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.

Selecting 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.

*Select **CHRT** Softkey to Switch Between ChartView and WPT - Airport Information Page*

Figure 7-26 CHRT Softkey, Airport Information Page

Selecting 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, selecting 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 Figure 7-27, the aircraft is located on the ramp at the air carrier terminal 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 7-27 Airport Information Page, INFO View, Full Screen Width

In the example shown in Figure 7-27, the Class B Chart is selected. Pressing the **ENT** Key displays the Charlotte Class B Airspace Chart (Figure 7-28).
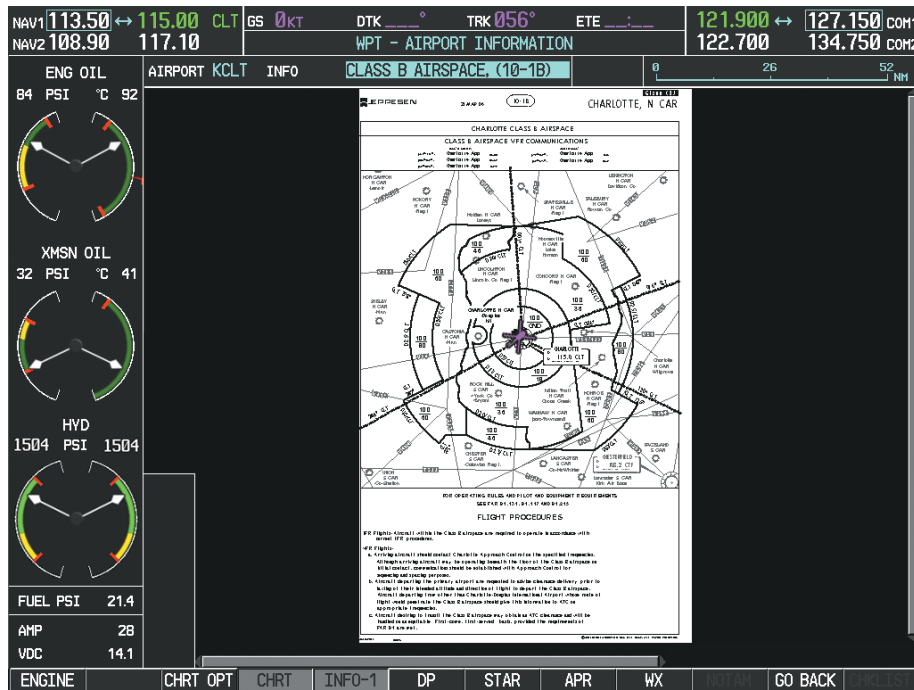
Figure 7-28 Airport Information Page, Class B Chart Selected from INFO View

Selecting the **DP** Softkey displays the Departure Procedure Chart if available.
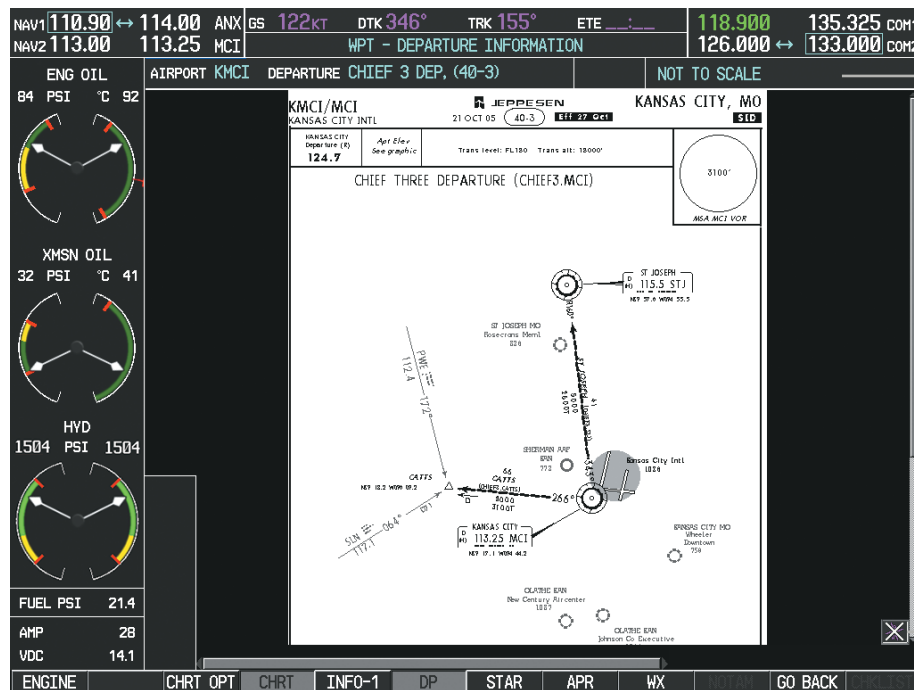
Figure 7-29 Departure Information Page

Selecting the **STAR** Softkey displays the Standard Terminal Arrival Chart if available.

Chart Not To Scale

Change Range and Scroll Through the Chart With the Joystick

Aircraft Not Shown Icon
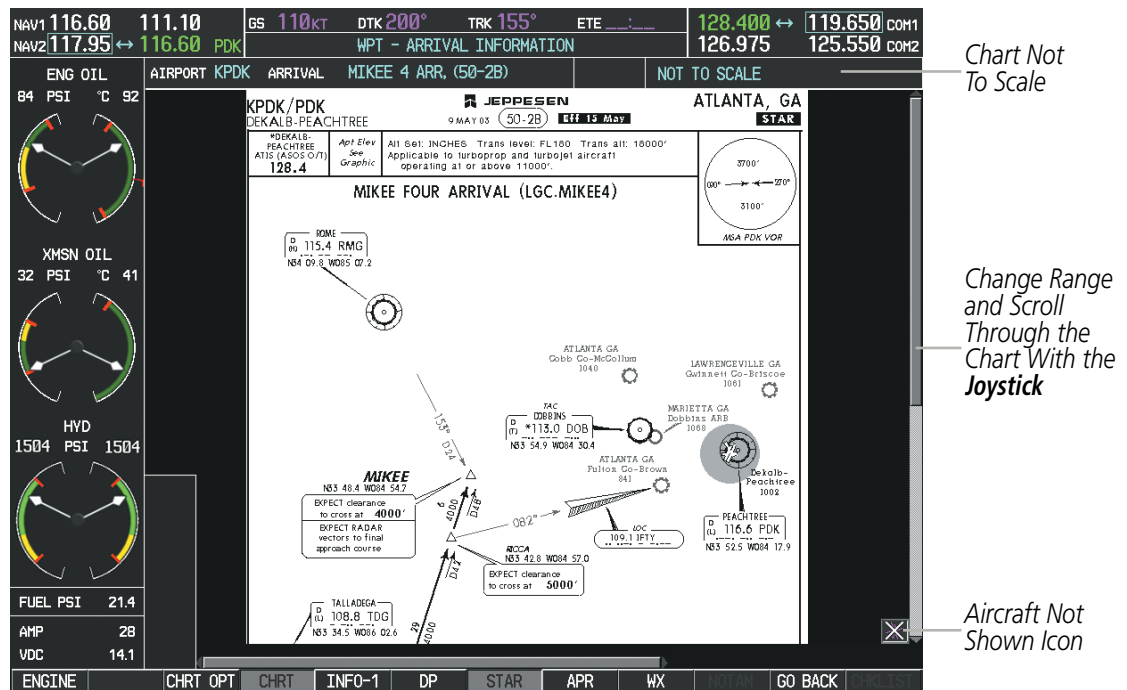
Figure 7-30 Arrival Information Page

Selecting the **APR** Softkey displays the approach chart for the airport if available.
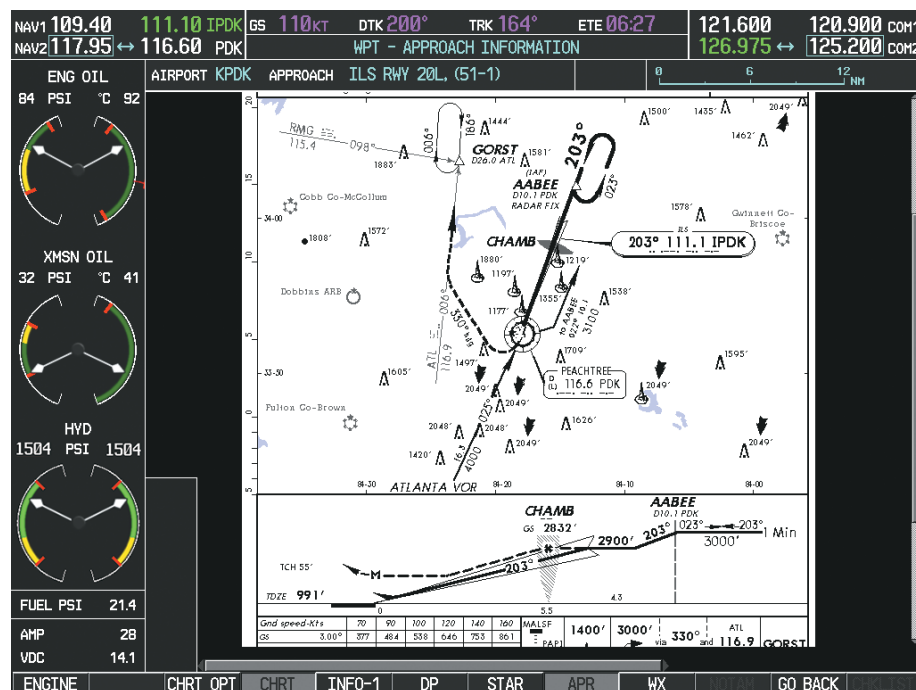
Figure 7-31 Approach Information Page

Selecting the **WX** Softkey shows the airport weather frequency information, and includes weather data such as METAR and TAF from the SiriusXM Data Link Receiver, when available. Weather information is available only when an SiriusXM Data Link Receiver is installed and the SiriusXM Weather subscription is current.

WX Info When Available

WX Softkey Selected
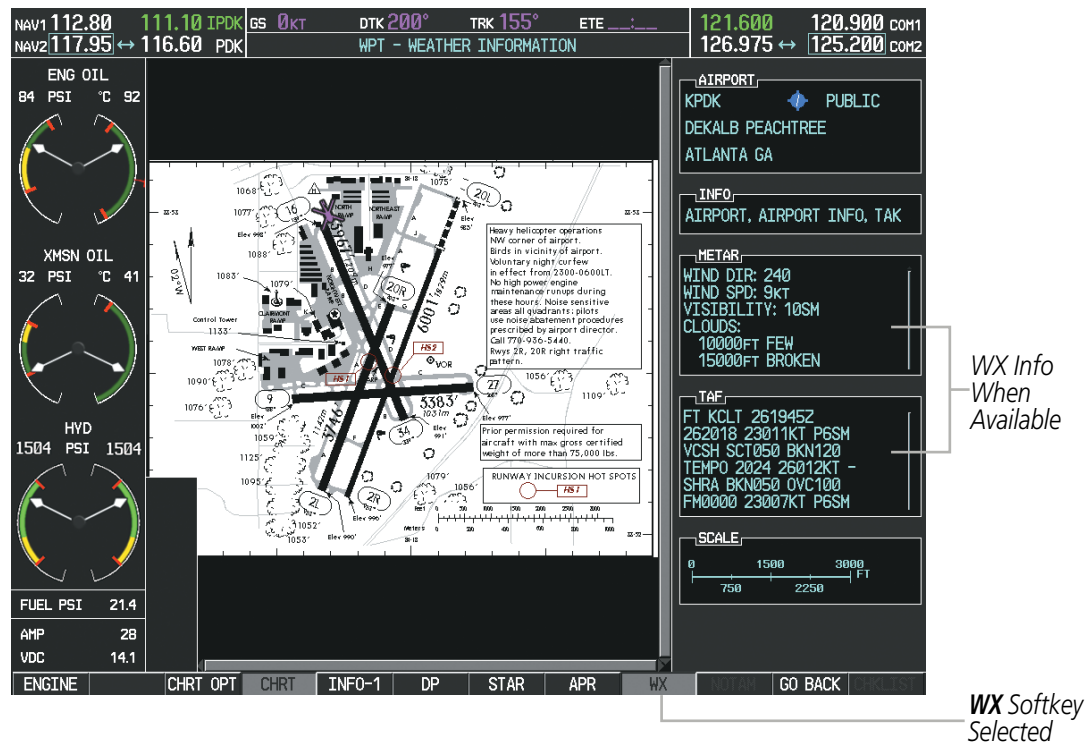
Figure 7-32 Weather Information Page

> **NOTE:** *A subdued softkey label indicates the function is disabled.*

> **NOTE:** *Only NOTAMs applicable to specific information conveyed on the displayed Jeppesen chart are available when the NOTAM Softkey is selected. There may be other NOTAMs available pertaining to the flight that may not be displayed. Contact Jeppesen for more information regarding Jeppesen database-published NOTAMs.*

Recent NOTAMS applicable to the current ChartView cycle are included in the ChartView database. Selecting 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 7-32. The **NOTAM** Softkey may appear on the Airport Information Page and all of the chart page selections.
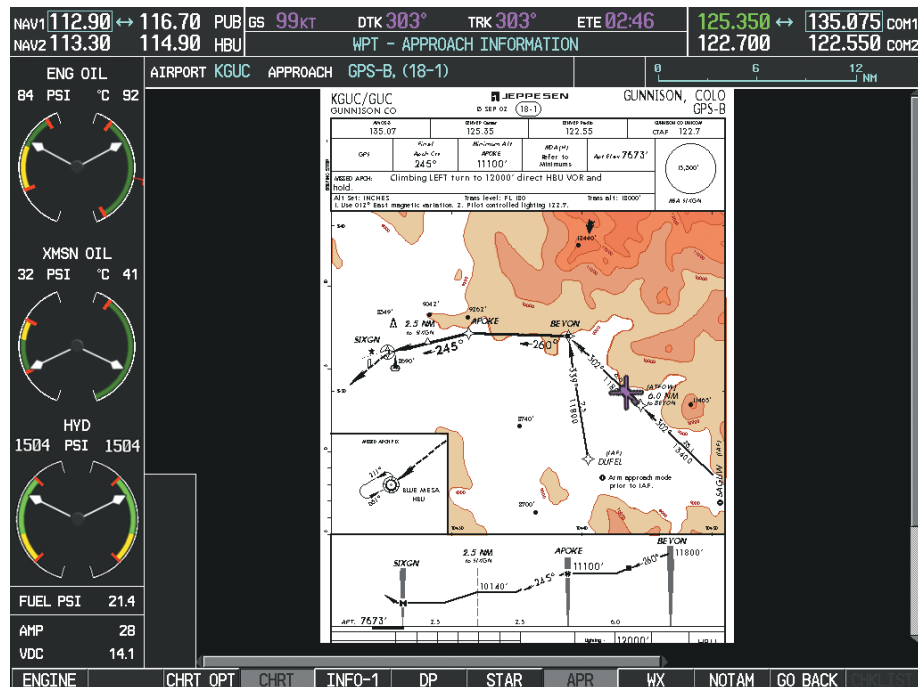
NOTAM Softkey Appears for Selected Airports

Figure 7-33 NOTAM Softkey Highlighted
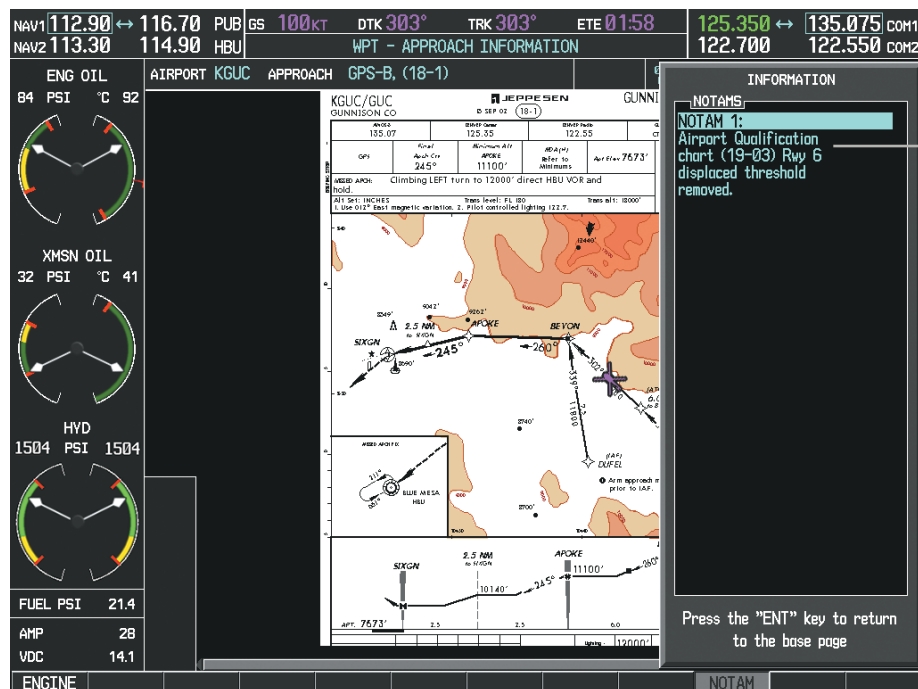
Local NOTAM on This Airport

NOTAM Softkey Selected

Figure 7-34 Airport Information Page, Local NOTAMs

Selecting the **NOTAM** Softkey again removes the NOTAMS information.

Selecting the **GO BACK** Softkey reverts to the previous page (Navigation Map Page, Nearest Pages, or Flight Plan Page).

CHART OPTIONS

Selecting the **CHRT OPT** Softkey displays the next level of softkeys, the chart options level (Figure 7-21).

Selecting the **ALL** Softkey shows the complete approach chart on the screen.

Complete Chart Shown
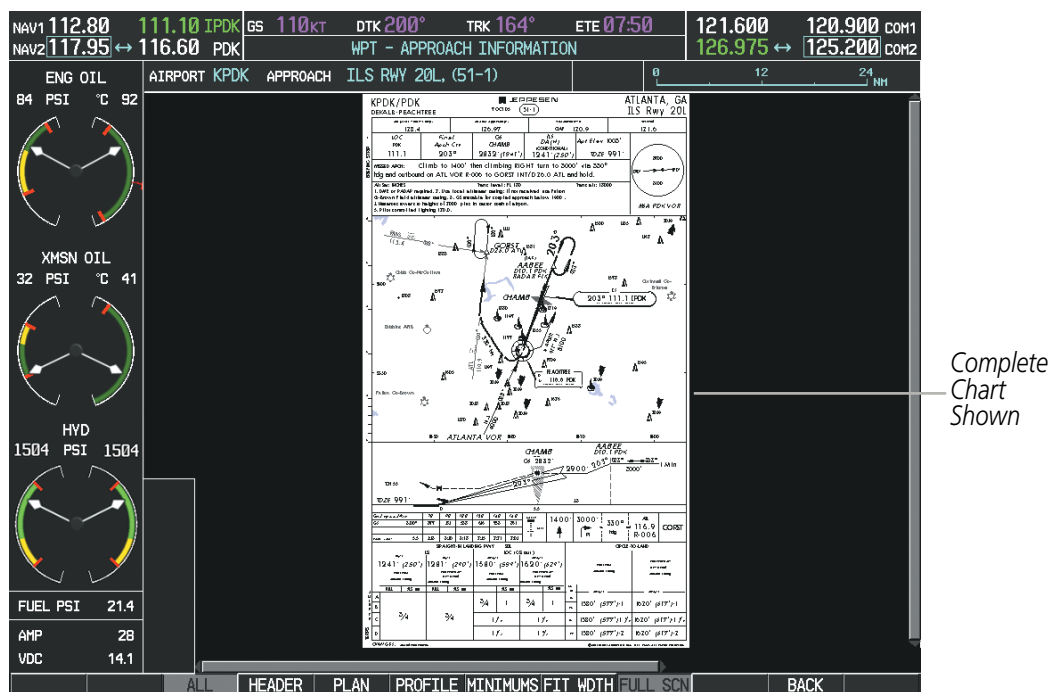
Figure 7-35 Approach Information Page, ALL View

Selecting the **HEADER** Softkey shows the header view (approach chart briefing strip) on the screen.
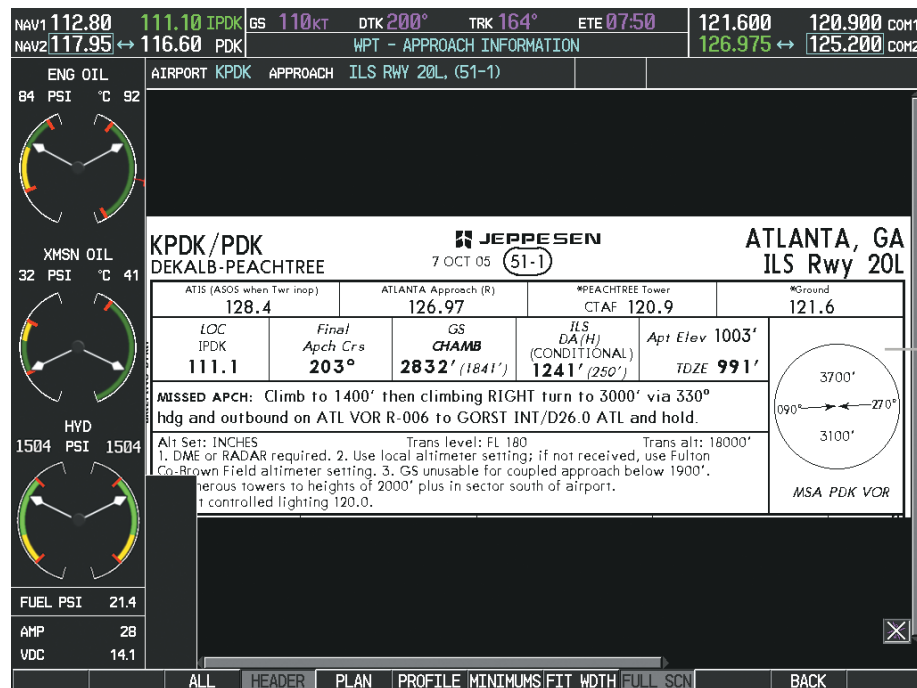
Figure 7-36 Approach Information Page, Header View

Selecting the **PLAN** Softkey shows the approach chart two dimensional plan view.
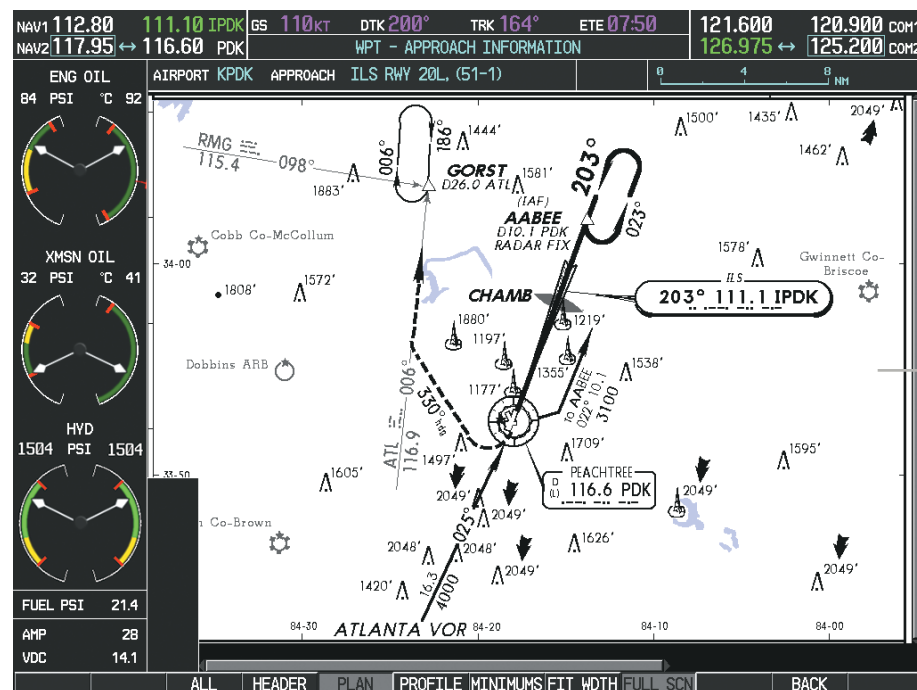
Figure 7-37 Approach Information Page, Plan View

Selecting the **PROFILE** Softkey displays the approach chart descent profile strip.
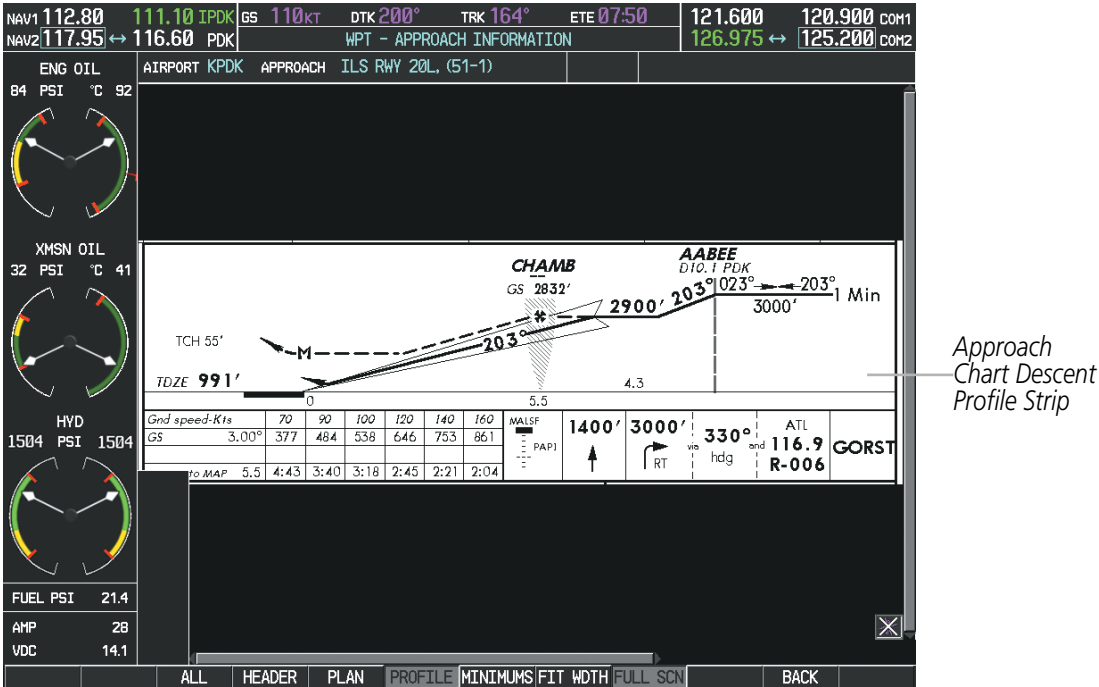
Figure 7-38 Approach Information Page, Profile View, Full Screen Width

Selecting the **MINIMUMS** Softkey displays the minimum descent altitude/visibility strip at the bottom of the approach chart.
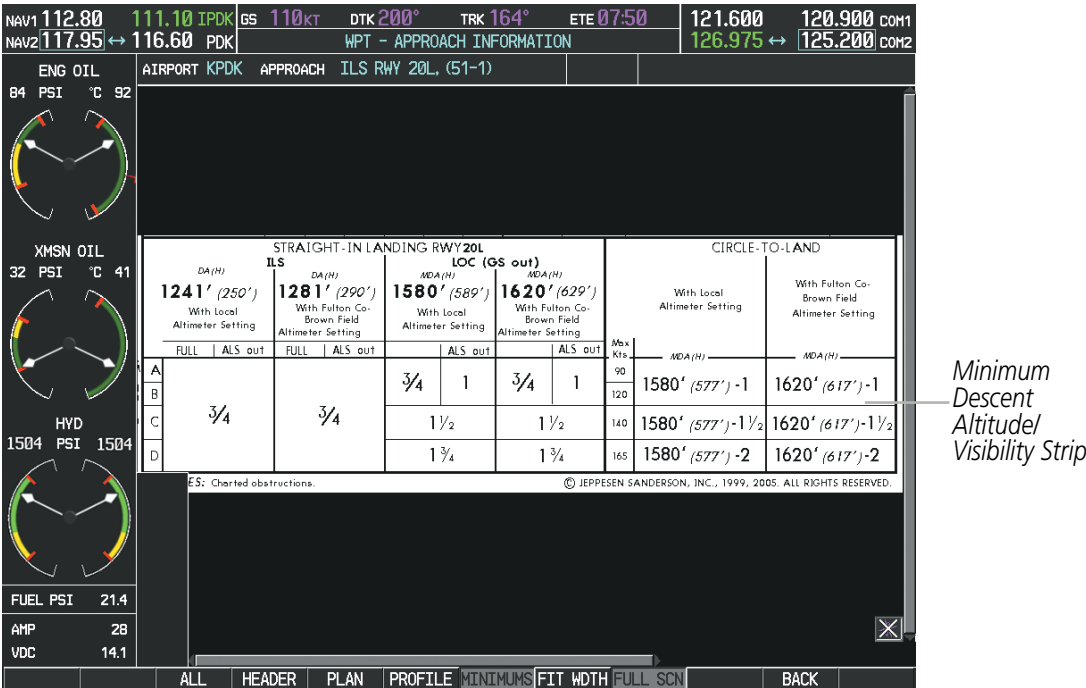
Figure 7-39 Approach Information Page, Minimums View, Full Screen Width

If the chart scale has been adjusted to view a small area of the chart, selecting the **FIT WIDTH** Softkey changes the chart size to fit the available screen width.
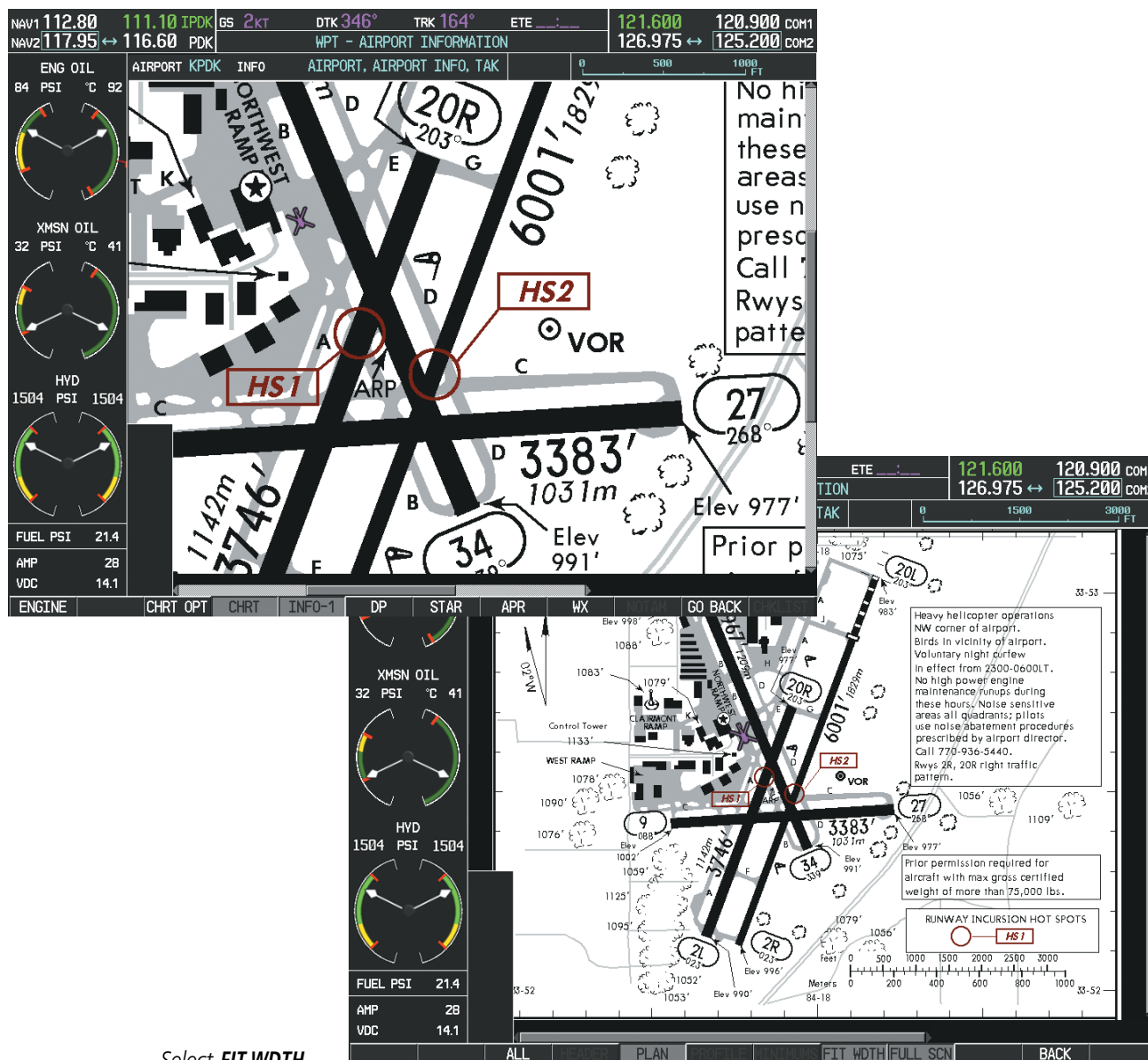
*Select **FIT WDTH** Softkey to Show Full Chart Width*

Figure 7-40 Airport Information Page, FIT WDTH Softkey Selected

Selecting 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, select 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.
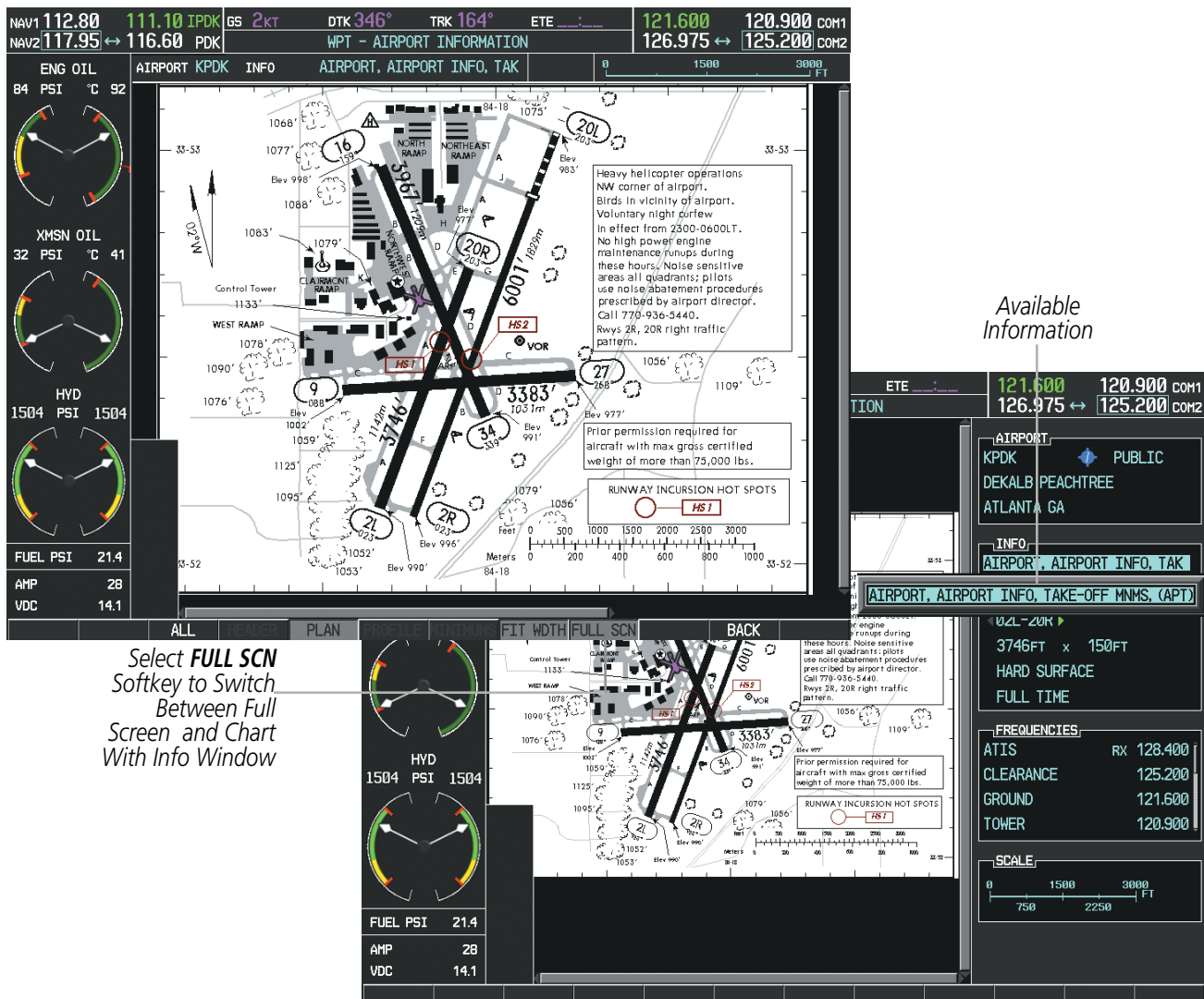
Figure 7-41 Airport Information Page, Full Screen and Info Window

Selecting 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.
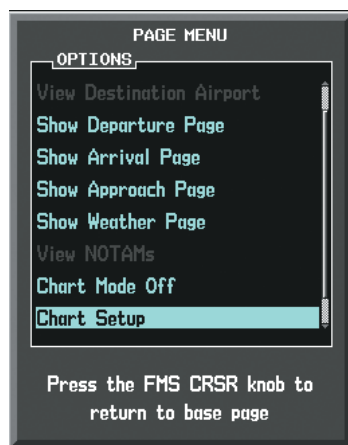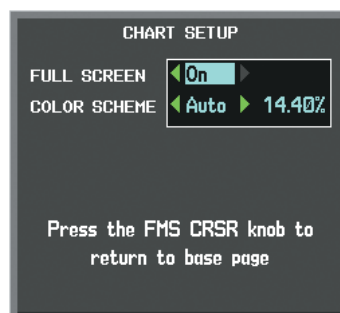
Chart Setup Option	*Full Screen On/Off Selection*

Figure 7-42 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 G1000H 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.
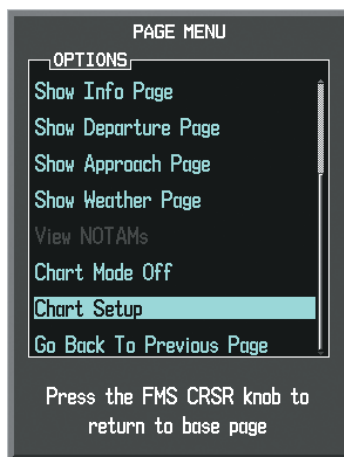
Figure 7-43 Waypoint Information Page, OPTIONS Menu

3) Turn the large **FMS** Knob to move to the COLOR SCHEME Option (Figure 7-44).

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 7-44 Arrival Information Page, Day View
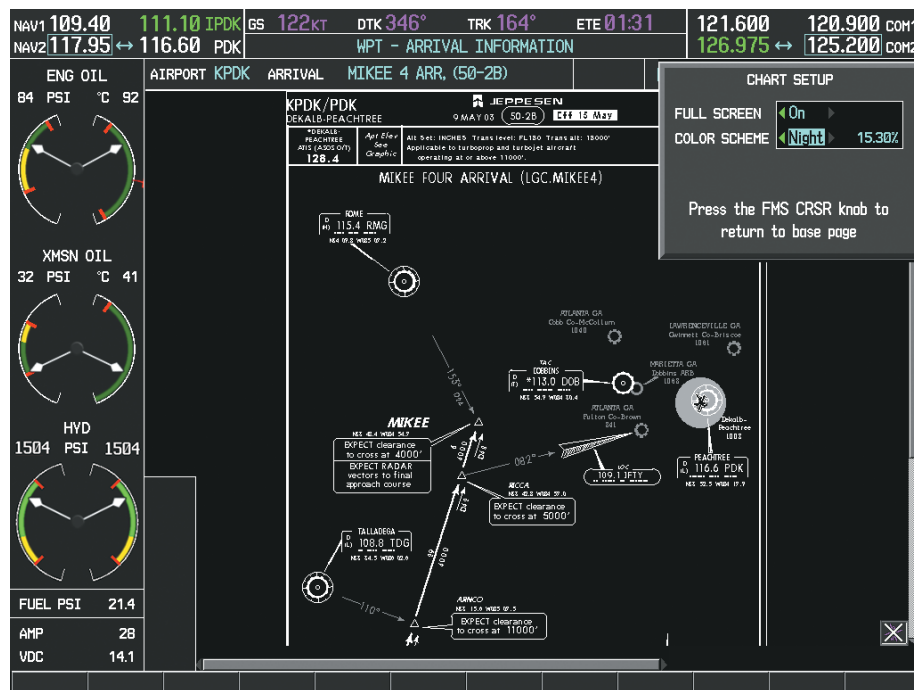
Figure 7-45 Arrival Information Page, Night View

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.
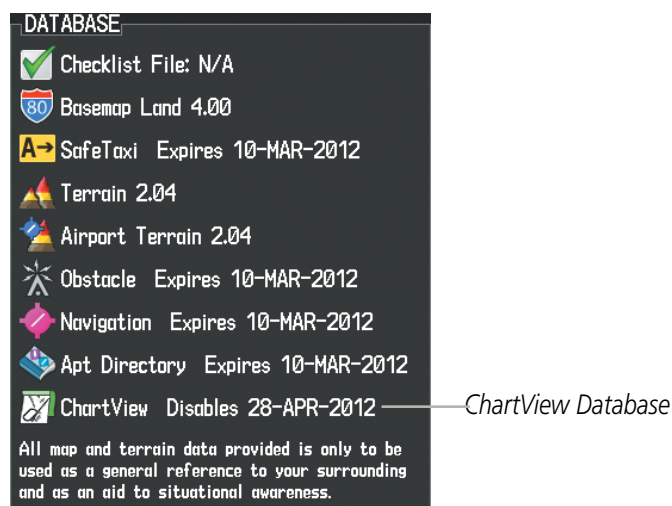
Figure 7-46 Power-up Page, ChartView Database

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 7-2 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.*

Select 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, 1204, is deciphered as follows:

12 – Indicates the year 2012

04 – Indicates the fourth issue of the ChartView database for the year

The EXPIRES date 05–MAR–12 is the date that this database should be replaced with the next issue.

The DISABLES date 14–MAY–12 is the date that this database becomes inoperative.
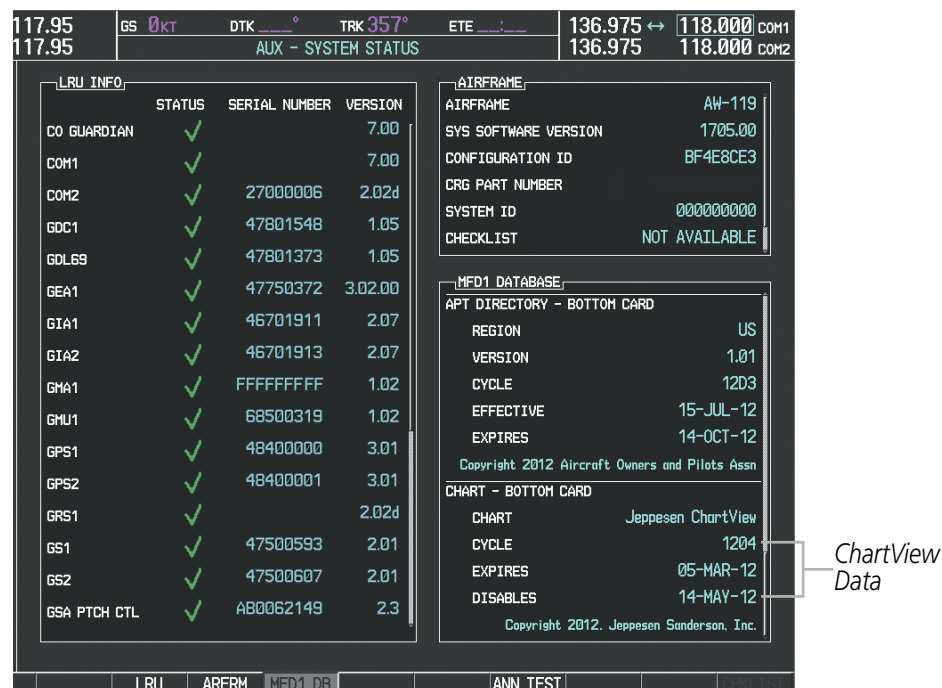
Figure 7-47 AUX – System Status Page, ChartView Current and Available

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 7-48. The EXPIRES date is the revision date for the next database cycle. The DISABLES date is the date that this database cycle is no longer viewable. A date displayed in yellow indicates that date has passed. 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 7-48 AUX – System Status Page, ChartView Database Status

7.4 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.

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. An aircraft symbol may be displayed within an off-scale area depicted on some charts.

Figure 7-49 shows examples of off-scale areas, indicated by the grey shading. Note, these areas are not shaded on the published chart. 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.

The FliteCharts database subscription is available from Garmin. Available data includes:

- Arrivals (STAR)
- Departure Procedures (DP)
- Approaches
- Airport Diagrams
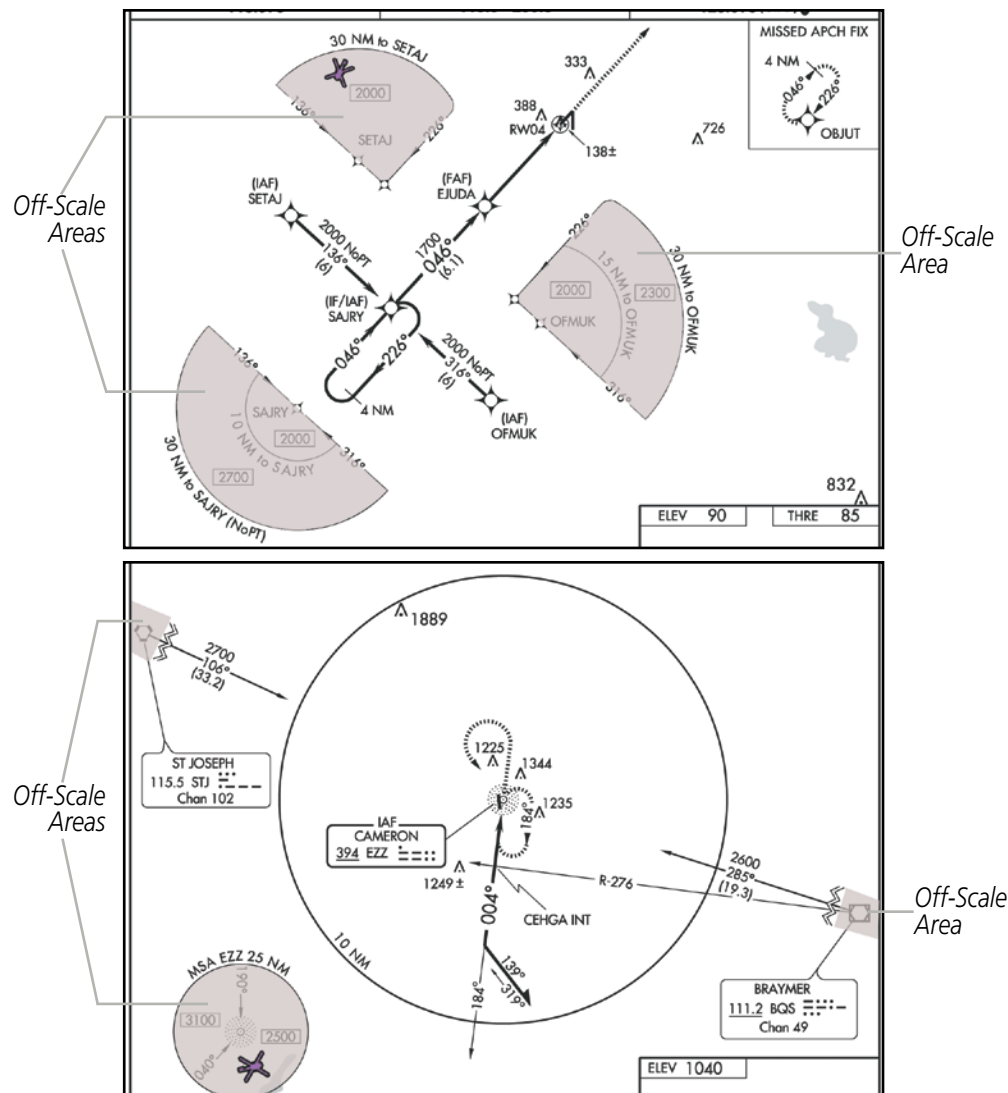
Figure 7-49 Sample Chart Indicating Off-Scale Areas

> ✓ **NOTE:** *Do not maneuver the aircraft based solely upon the geo-referenced aircraft symbol.*

- 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, selecting the **SHW CHRT** Softkey displays the available terminal chart and advances to the chart selection level of softkeys: **CHRT OPT**, **CHRT**, **INFO-1/2**, **DP**, **STAR**, **APR**, **WX**, and **GO BACK**. The chart selection softkeys appear on the Airport Information Page.

Selecting the **GO BACK** Softkey reverts to the top level softkeys and previous page.

Selecting 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.
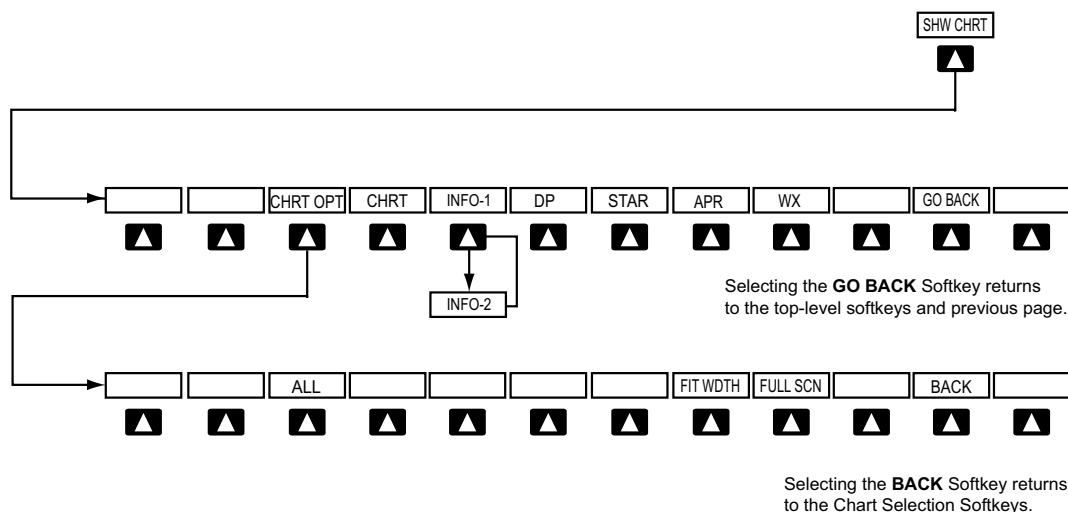
Figure 7-50 FliteCharts SHW CHRT, Chart Selection, and Chart Option Softkeys

TERMINAL PROCEDURES CHARTS

Selecting Terminal Procedures Charts:

While viewing the Navigation Map Page, Nearest Airport Page, or Flight Plan Page, select 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 7-51 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 7-52 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 7-53 Unable To Display Chart Banner

GARMIN.

When a chart is not available by selecting 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, selecting 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, select 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. (Select 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 7-54 Approach Information Page, Chart Selection

While the APPROACH Box is selected using the **FMS** Knob, the G1000H 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 Chart Scale Box displays a banner NOT TO SCALE.

Selecting 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.

*Select **CHRT** Softkey to Switch Between FliteCharts and Navigation Map Page*

Figure 7-55 CHRT Softkey, Airport Information Page

Selecting 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, selecting 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 7-55) or to the right of the chart (Figure 7-56) 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.
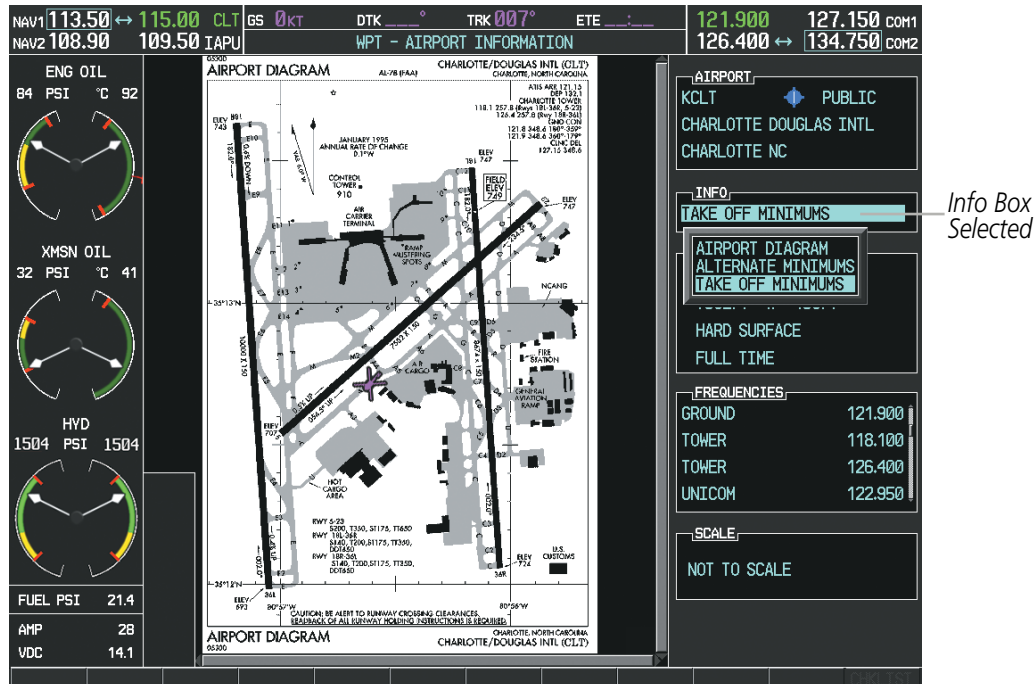
Figure 7-56 Airport Information Page, INFO View with Airport Information

In the example shown in Figure 7-56, TAKE OFF MINIMUMS is selected. Pressing the **ENT** Key displays the Take-off Minimums and Departure Procedures Chart (Figure 7-57).
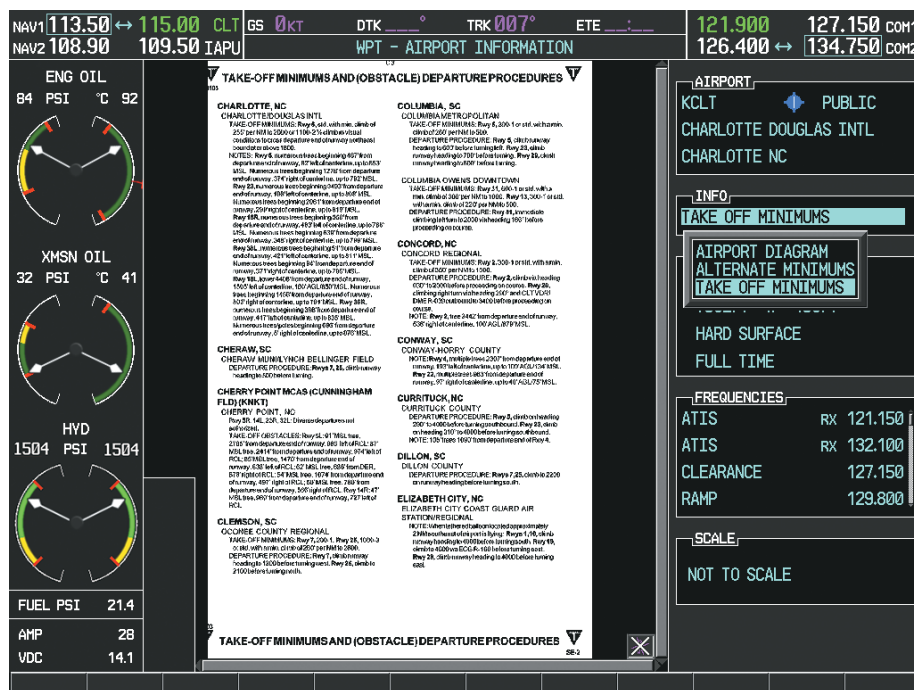
Figure 7-57 Airport Information Page, TAKE OFF MINIMUMS Selected from INFO View

Selecting the **DP** Softkey displays the Departure Procedure Chart if available.
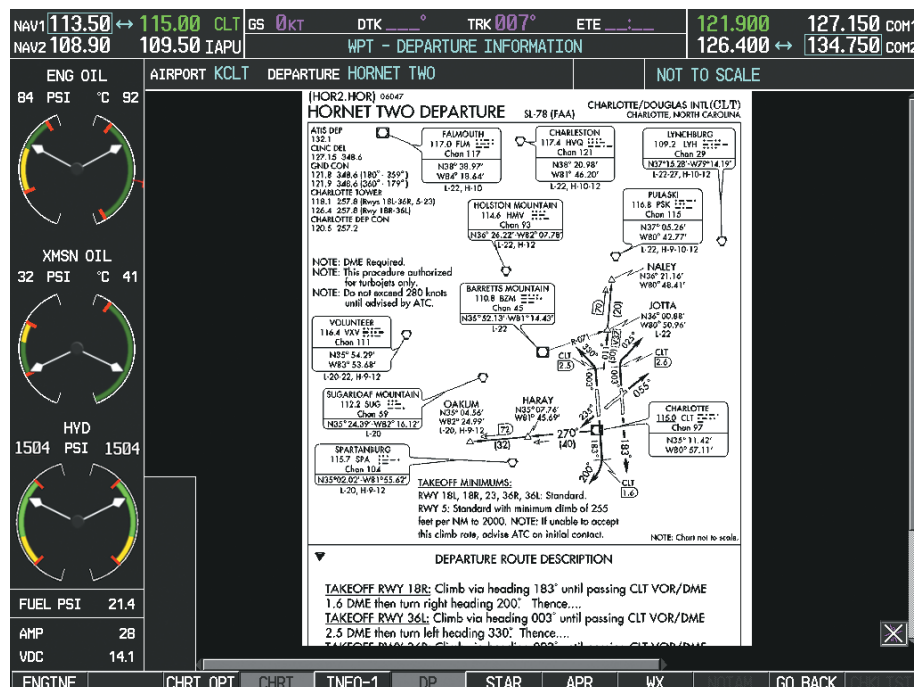
Figure 7-58 Departure Information Page

Selecting the **STAR** Softkey displays the Standard Terminal Arrival Chart if available.
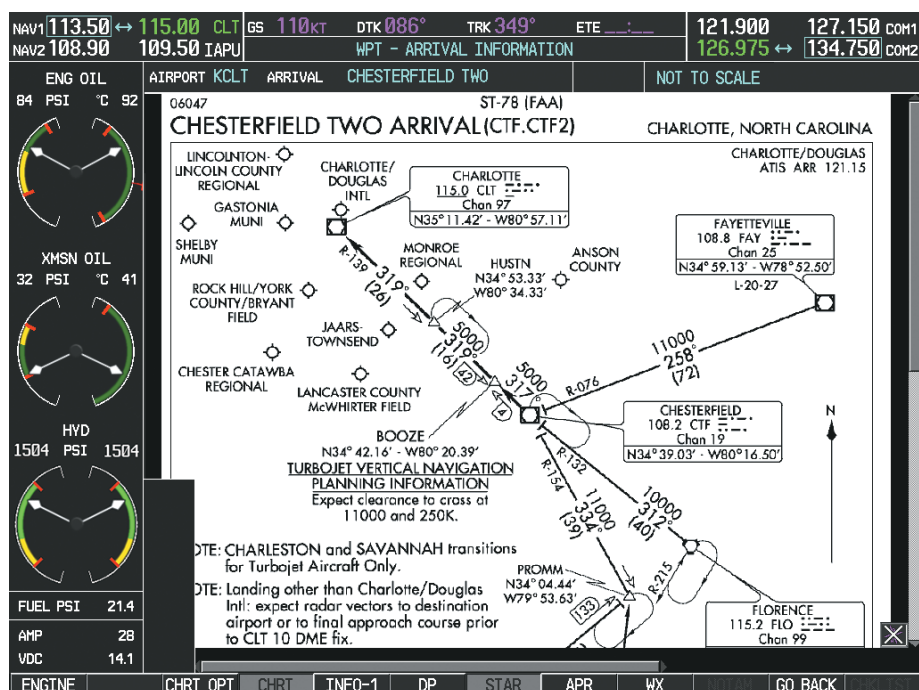
Figure 7-59 Arrival Information Page

Selecting the **APR** Softkey displays the approach chart for the airport if available.
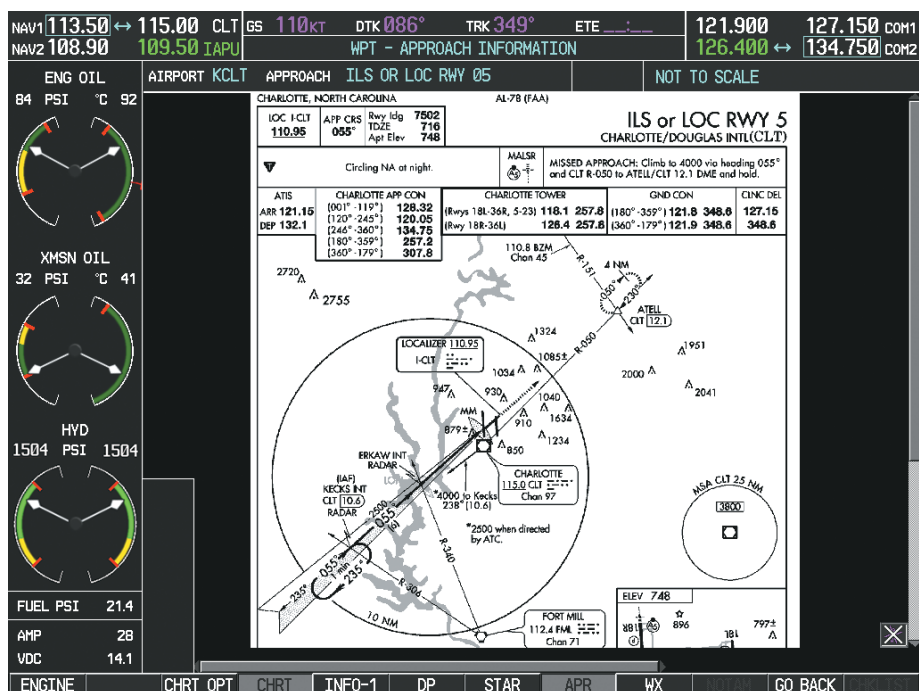
Figure 7-60 Approach Information Page

Selecting the **WX** Softkey shows the airport weather frequency information, when available, and includes weather data such as METAR and TAF from the SiriusXM Data Link Receiver. Weather information is available only when an SiriusXM Data Link Receiver is installed and the SiriusXM Weather subscription is current.

Selecting Additional Information:

1) While viewing the Airport Taxi Diagram, select 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 G1000H 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.
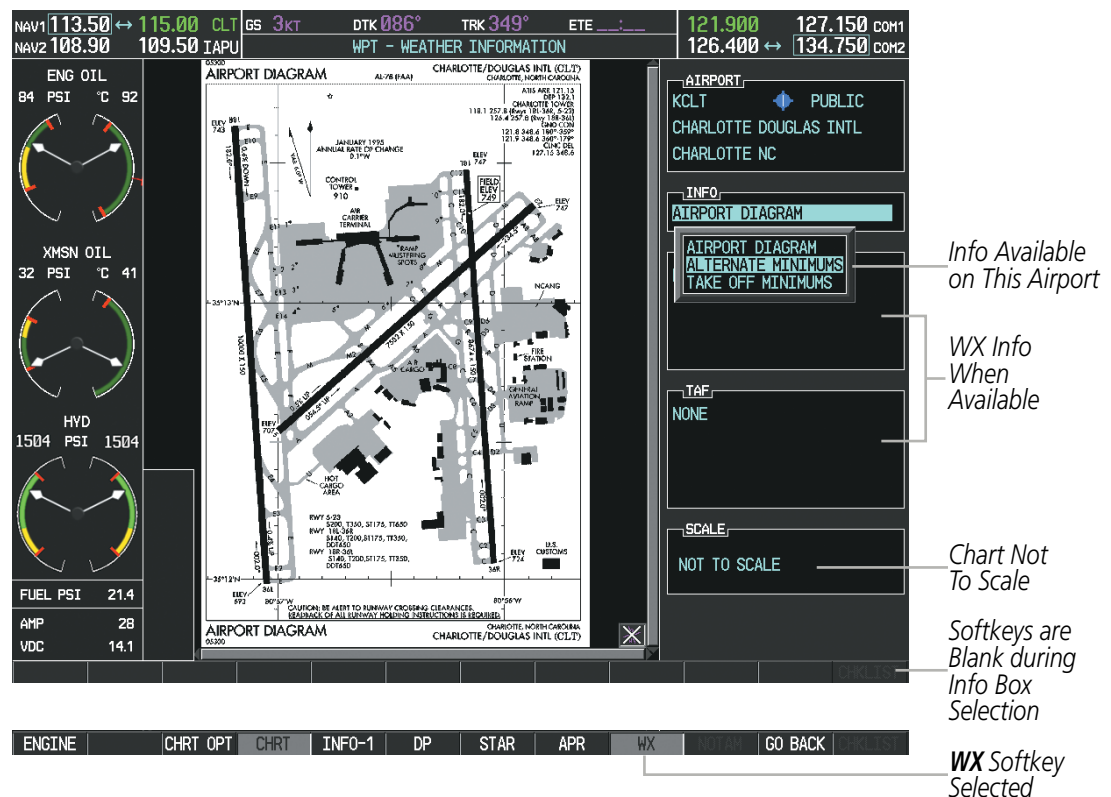
Figure 7-61 Weather Information Page, WX Softkey Selected

Selecting the **GO BACK** Softkey reverts to the previous page (Navigation Map Page or Flight Plan Page).

CHART OPTIONS

Selecting the **CHRT OPT** Softkey displays the next level of softkeys, the chart options level (Figure 7-50).

Selecting the **ALL** Softkey shows the complete chart on the screen.

Figure 7-62 Airport Information Page, ALL View Selected

Selecting 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.

*Select **FIT WDTH** Softkey to Show Full Chart Width*

Figure 7-63 Approach Information Page, FIT WDTH Softkey Selected

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Selecting the **FULL SCN** Softkey alternates between removing and replacing the data window to the right.

*Select **FULL SCN** Softkey to Switch Between Chart on Full Screen and Chart with Info Window*
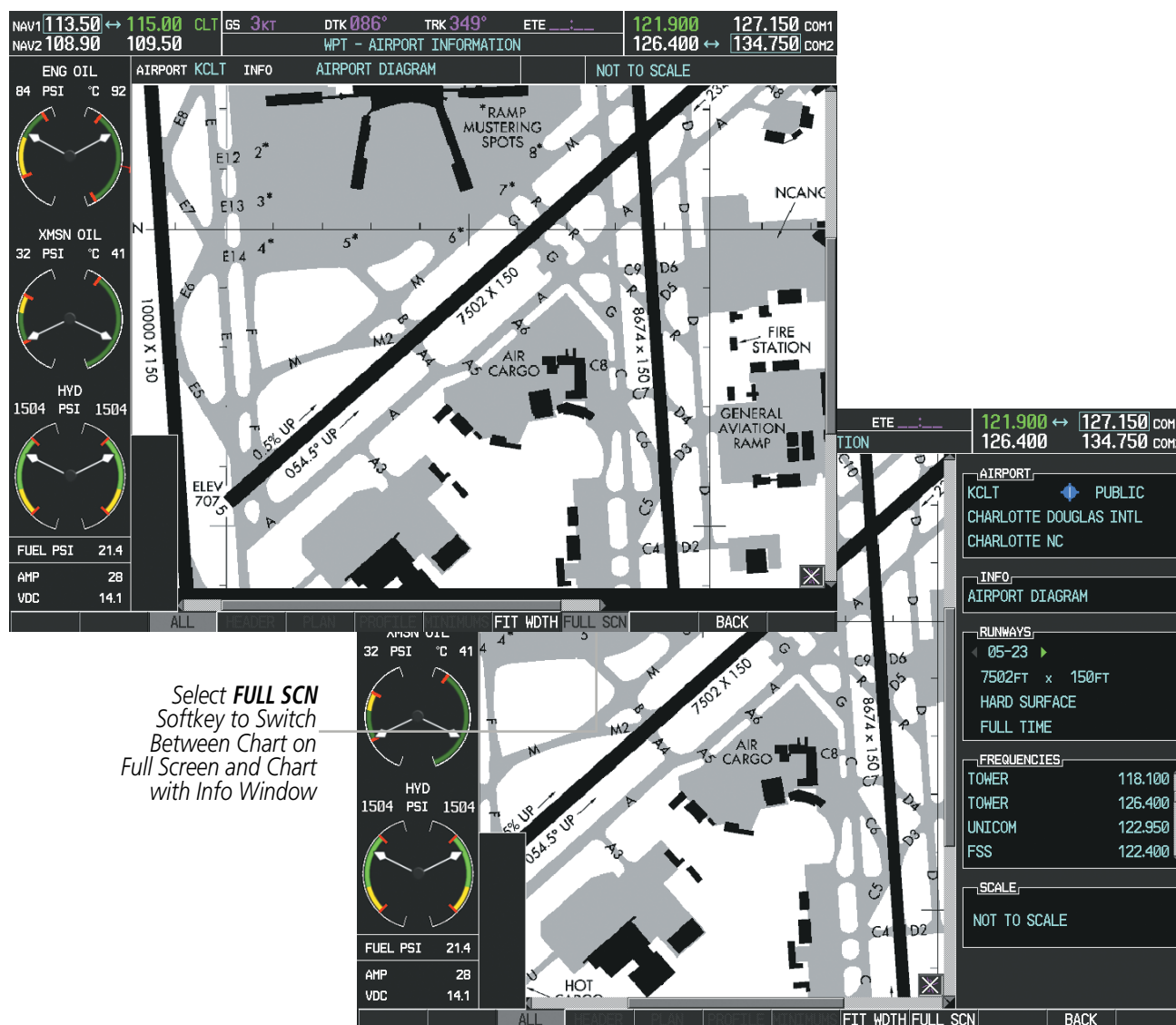
Figure 7-64 Airport Information Page, Full Screen and Info Window

Selecting 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.
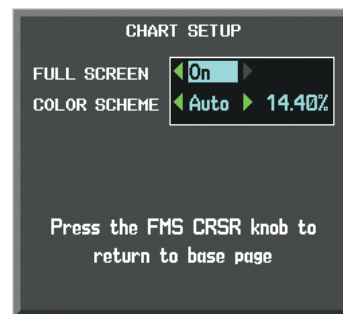
Chart Setup Option *Full Screen On/Off Selection*

Figure 7-65 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 G1000H 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.
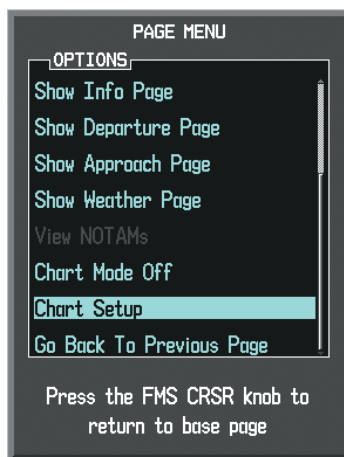
Figure 7-66 Waypoint Information Page, OPTIONS Menu

3) Turn the large **FMS** Knob to move to the COLOR SCHEME Option (Figure 7-67).

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 7-67 Approach Information Page, Day View
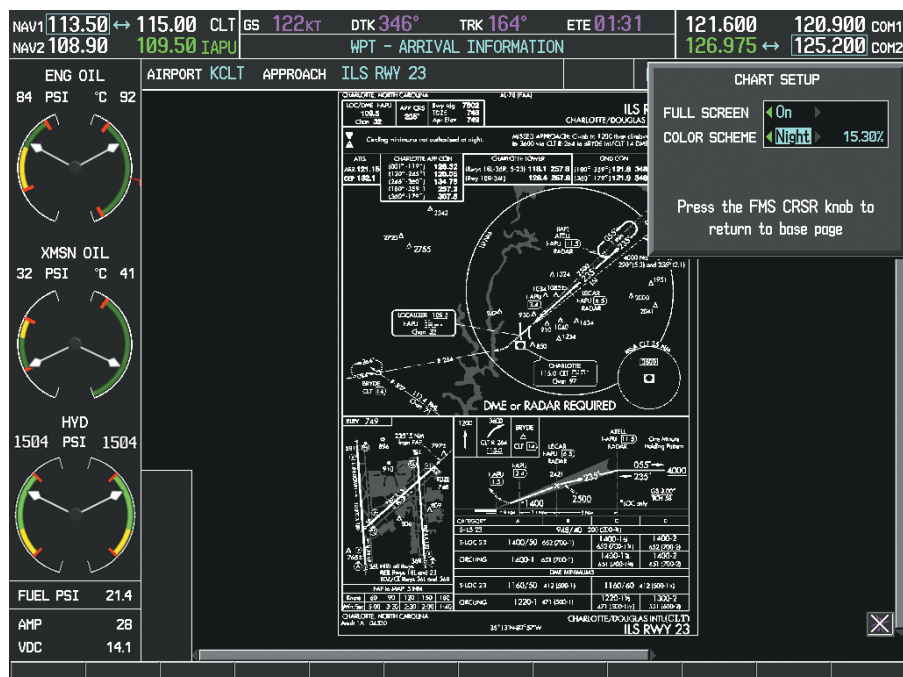
Figure 7-68 Approach Information Page, Night View

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 7-69 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 7-3 FliteCharts Power-up Page Annunciations and Definitions

Other possible AUX - System Status page conditions are shown in Figure 7-70. '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.*

Select 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, 1205, is deciphered as follows:

12 – Indicates the year 2012

05 – Indicates the fifth issue of the FliteCharts database for the year

The FliteCharts EFFECTIVE date 07–MAY–12 is the first date that this database is current.

The FliteCharts EXPIRES date 04–JUN–12 is the last date that this database is current.

The DISABLES date 01–DEC–12 is the date that this database becomes inoperative.

Figure 7-70 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 three possible AUX - System Status page conditions are shown here. 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. A date displayed in yellow indicates that date has passed. The DISABLES date is the date that this database cycle is no longer viewable. A date displayed in yellow indicates that date has passed. REGION and CYCLE NOT AVAILABLE in blue, indicate that FliteCharts database is not available on the database card or no database card is inserted.

MFD1 DATABASE	
VERSION	1.01
CYCLE	12D1
EFFECTIVE	13-JAN-12
EXPIRES	10-MAR-12
Copyright 2012 Aircraft Owners and Pilots Assn	
CHART - BOTTOM CARD	
CHART	FliteCharts
REGION	US
CYCLE	1202
EFFECTIVE	10-FEB-12
EXPIRES	10-MAR-12
DISABLES	06-SEP-12
Copyright 2012. Garmin Ltd. or its subsidiaries	

Current Date is Before Effective Date

MFD1 DATABASE	
VERSION	1.01
CYCLE	12D1
EFFECTIVE	13-JAN-12
EXPIRES	10-MAR-12
Copyright 2012 Aircraft Owners and Pilots Assn	
CHART - BOTTOM CARD	
CHART	FliteCharts
REGION	US
CYCLE	1202
EFFECTIVE	10-FEB-12
EXPIRES	10-MAR-12
DISABLES	06-SEP-12
Copyright 2012. Garmin Ltd. or its subsidiaries	

FliteCharts Expired, but is not Disabled

MFD1 DATABASE	
VERSION	1.01
CYCLE	12D1
EFFECTIVE	13-JAN-12
EXPIRES	10-MAR-12
Copyright 2012 Aircraft Owners and Pilots Assn	
CHART - BOTTOM CARD	
CHART	FliteCharts
REGION	US
CYCLE	1202
EFFECTIVE	10-FEB-12
EXPIRES	10-MAR-12
DISABLES	06-SEP-12
Copyright 2012. Garmin Ltd. or its subsidiaries	

FliteCharts Database is Disabled

MFD1 DATABASE	
VERSION	1.01
CYCLE	12D1
EFFECTIVE	13-JAN-12
EXPIRES	10-MAR-12
Copyright 2012 Aircraft Owners and Pilots Assn	
CHART - UNKNOWN	
CHART	FliteCharts
REGION	NOT AVAILABLE
CYCLE	NOT AVAILABLE
EFFECTIVE	__-____-__
EXPIRES	__-____-__
DISABLES	__-____-__

FliteCharts Database is Not Available

Figure 7-71 AUX – System Status Page, FliteCharts Datbase Status

7.5 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 7-72.

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 7-72 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.

DATABASE
- ✓ Checklist File: N/A
- 🛡 Basemap Land 4.00
- A→ SafeTaxi   Expires 10-MAR-2012
- ▲ Terrain 2.04
- ▲ Airport Terrain 2.04
- ✳ Obstacle   Expires 10-MAR-2012
- ◆ Navigation   Expires 10-MAR-2012
- ◆ Apt Directory   Expires 10-MAR-2012 ——— *Airport Directory Database*
- 📄 ChartView   Disables 28-APR-2012

All map and terrain data provided is only to be used as a general reference to your surrounding and as an aid to situational awareness.
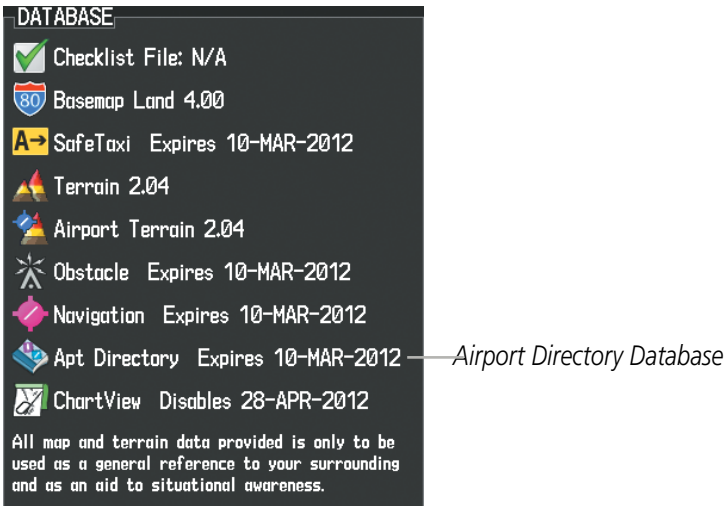
Figure 7-73 Power-up Page, Airport Directory Database

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 7-4 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 7-74.

Select 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, 12D3, is deciphered as follows:

12 – Indicates the year 2012

D – Indicates the data is for Airport Directory

3 – Indicates the third issue of the Airport Directory database for the year

The Airport Directory EFFECTIVE date 15–JUL–12 is the beginning date for the current database cycle. The Airport Directory EXPIRES date 14–OCT–12 is the revision date for the next database cycle.

Figure 7-74 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 7-4). 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.

7.6 SCHEDULER

The Scheduler feature can be used to enter and display reminder messages (e.g., Phase 1 Inspection, Switch fuel tanks, or Altimeter-Transponder Check) in the Alerts 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.
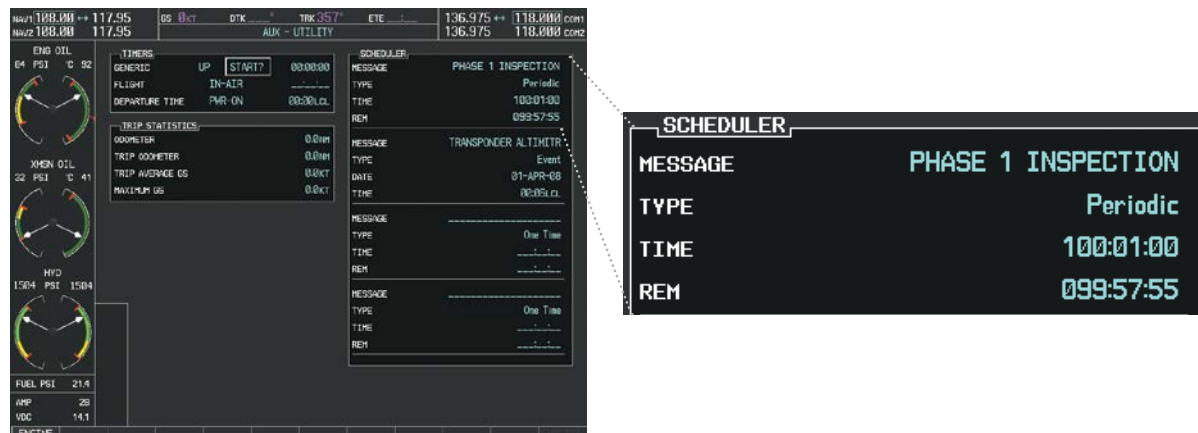
Figure 7-75 Scheduler (Utility Page)

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 Alertss 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 text.

Scheduler messages appear in the Alertss 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 pressed. Pressing the **ALERTS** Softkey again removes the Alertss Window from the display, and the scheduler message is deleted from the message queue.

Figure 7-76 PFD Alerts Window

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7.7 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 G1000 system is capable of logging for the AW119 aircraft.

- 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)

- Autopilot On/Off
- GPS fix
- GPS horizontal alert limit
- GPS vertical alert limit
- SBAS GPS horizontal protection level
- SBAS GPS vertical protection level
- Fuel Qty (right & left)(kg)
- Fuel Pressure (psi)
- Oil Pressure (psi)
- Oil Temperature (deg. F)
- Torque (ft/lbs.)
- ITT (deg. F)
- N1 (% RPM)
- N2 (% RPM)

The file containing the recorded data will appear in the format shown in Figure 7-77. This file can be imported into most computer spreadsheet applications.

Local Date
YYMMDD

Local 24hr Time
HHMMSS

Nearest Airport
(A blank will be
inserted if no
airport is found)

log_130210_104506_KIXD.csv

Figure 7-77 Log File Format

Data logging status can be monitored on the AUX-UTILITY Page.

7.8 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

- 6 Arc-second Terrain data

- Obstacle data

- HTAWS function is not available, in test mode, or failed

- The position of the aircraft exceeds the range of the terrain database.

GDL 69AH 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

For troubleshooting purposes, check the LRU Information Box on the AUX - System Status Page for Data Link Receiver (GDL 69H/69AH) 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 7-78 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	XM subscription is not activated

Table 7-5 GDL 69/69A Data Link Receiver Error Messages

BLANK PAGE

ANNUNCIATIONS AND ALERTS

CREW ALERTING SYSTEM (CAS)

When Crew Alerting System (CAS) messages are generated, a CAS window containing messages appears to the right of the vertical speed indicator on the PFD. Up to 10 messages can be displayed; when more than 10 messages accumulate, the **CAS** Softkeys becomes available. Use the **CAS↑** and **CAS↓** Softkeys to scroll up and down through the messages in the PFD CAS Window.

PFD CAS Window

CAS Scrolling Softkeys (Disabled Until More Than 10 Messages are Displayed)
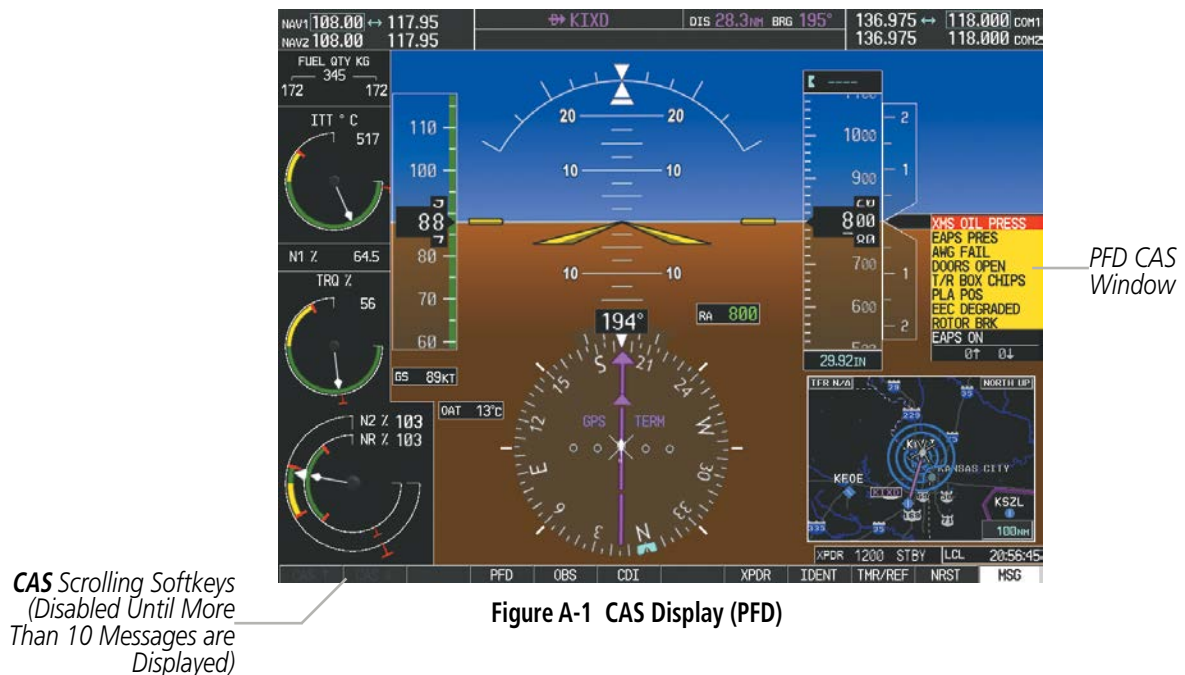
Figure A-1 CAS Display (PFD)

CAS MESSAGE PRIORITIZATION

> **NOTE:** *Information on CAS messages in this pilot's guide is always superseded by the RFM. Refer to the RFM for recommended pilot actions.*

CAS messages are grouped by criticality (warning, caution, safe operating advisory) and sorted by order of appearance (most recent messages on top). The color of the message is based on its urgency and on required action.

- **Warning** (red) – Immediate crew awareness and immediate crew action required; accompanied by one or more aural tones; and a flashing 'WARNING" Master Warning light is illuminated to the right of the PFD.

- **Caution** (yellow) – Immediate crew awareness and subsequent corrective action required; accompanied by a flashing 'CAUTION' Master Caution light is illuminated to the right of the PFD.

- **Safe Operating Advisory** (green) – Crew awareness required.

A CAS message does not appear more than once at a given time. Warning and caution CAS messages flash when they are generated, and continue to flash until acknowledged, or until the triggered condition is inactive for more than three seconds.

After the acknowledgment, a message remains displayed at the top of its respective priority group in the CAS Window until either a newer message of the same priority appears or the condition(s) that caused the alert to display no longer exist.

WARNING MESSAGES

NOTE: *See the Rotorcraft Flight Manual (RFM) for recommended pilot actions.*

Annunciation Text	Audio Alert
BATT HOT	900Hz Tone + "Warning"
BATT OFF	900Hz Tone + "Warning"
ENG FIRE	2700Hz - 900Hz Tone + "Engine Fire"
ENG OIL HOT	900Hz Tone + "Warning"
ENG OIL PRESS	900Hz Tone + "Warning"
ENG OUT	700Hz-1700Hz + "Engine Out"
ROTOR HIGH	900Hz + "Rotor High"
ROTOR LOW	2700Hz + "Rotor Low"
RTR BRK ON	900Hz Tone + "Warning"
XMS OIL HOT	900Hz Tone + "Warning"
XMS OIL PRESS	900Hz Tone + "Warning"

Table A-1 Warning CAS Messages

CAUTION MESSAGES

NOTE: *See the Rotorcraft Flight Manual (RFM) for recommended pilot actions.*

The following CAS messages produce a single chime:

Annunciation Text
ATT OFF
AWG FAIL
BATT DISCH
CARGO HOOK ARM
CARGO HOOK OPEN
DC GEN
DOORS OPEN
EAPS PRES
EEC DEGRADED
EEC FAIL
ENG AGB CHIPS

Table A-2 Caution CAS Messages

Annunciation Text
ENG OIL PRESS
ENG RGB CHIPS
EXT PWR ON
F LOW FAIL
FIRE DET
FLOATS ARMED
FUEL DRAIN 1
FUEL DRAIN 2
FUEL FILTER
FUEL LOW
FUEL PRESS
FUEL PUMP 1
FUEL PUMP 2
FUEL PUMP 1-2
GEN CONTR
HOIST CABLE LKD
HOIST CUT ARMD
HOOK UTIL
HYD PRESS 1
HYD PRESS 2
HYD PRESS 1-2
INV 1 OFF
INV 2 OFF
INV 1-2 OFF
MEC OPN
MISCMP-P
PITOT HTR FAIL
PLA POS
ROTOR BRK
SAS 1
SAS 2
SAS 1-2
SERVO 1
SERVO 2
SERVO 1-2
SFTY HOOK ARM

Table A-2 Caution CAS Messages

Annunciation Text
SFTY HOOK OPEN
T/R BOX CHIPS
UTIL DOOR
VG 1
VG 2
VG 1-2
XFER PUMP
XMSN OIL CHIPS
XMS OIL PRESS

Table A-2 Caution CAS Messages

SAFE OPERATING ADVISORY

NOTE: *See the Rotorcraft Flight Manual (RFM) for recommended pilot actions.*

The following CAS messages do not produce an audio alert:

Annunciation Text
ECS ON
HEATER ON
EAPS ON
ENG START
PITOT HEAT
EEC OPN
IGNITER ON
LANDING LT ON
FT OFF
HOIST ON
OXYGEN OPEN
VENT ON

Table A-3 Safe Operating Advisory CAS Messages

MESSAGE ADVISORY ALERTS

Alerts Window Message	Audio Alert
AVN FAN FAIL – Avionics Fan Fail	None

VOICE ALERTS

Voice Alert	Description
"Minimums, minimums"	The aircraft has descended below the preset barometric minimum descent altitude.
"Vertical track"	The aircraft is one minute from Top of Descent. Issued only when vertical navigation is enabled.
"Traffic"	Played when a Traffic Advisory (TA) is issued (TIS and GTS 800).
"TIS Not Available"	The aircraft is outside the Traffic Information Service (TIS) coverage area.
"Traffic, Traffic"	Played when a Traffic Advisory (TA) is issued (Skywatch TAS system).
"Traffic Advisory System Test Passed"	Played when the Skywatch TAS system passes a pilot-initiated self test.
"Traffic Advisory System Test Failed"	Played when the Skywatch TAS system fails a pilot-initiated self test.
"TAS System Test Passed"	Played when the GTS 800 TAS system passes a pilot-initiated self test.
"TAS System Test Failed"	Played when the GTS 800 TAS system fails a pilot-initiated self test.
"One o'clock" through "Twelve o'clock" or "No Bearing"	Intruder bearing (GTS 800 only)
"High", "Low", "Same Altitude" (if within 200 feet of own altitude), or "Altitude not available"	Intruder relative altitude (GTS 800 only)
"Less than one mile", "One Mile" through "Ten Miles", or "More than ten miles"	Intruder distance (GTS 800 only)

G1000H SYSTEM ANNUNCIATIONS

When a new message is issued, the **MSG** Softkey will flash to alert the flight crew of a new message. It will continue to flash until acknowledged by pressing the softkey. Active messages are displayed in white text. Messages that have become inactive will change to gray text. The **MSG** Softkey will flash if the state of a displayed message changes or a new message is displayed. The inactive messages can be removed from the Message Window by pressing the flashing **MSG** Softkey.

The G1000H System Messages conveys messages to the flight crew regarding problems with the G1000H system. Typically, a large red "X" appears in a window when a related LRU fails or detects invalid data.

When an LRU or an LRU function fails, a large red "X" is typically displayed on windows associated with the failed data. The following section describes various system annunciations. Refer to the RFM for additional information regarding pilot responses to these annunciations.

> **NOTE:** *Upon power-up of the G1000H system, certain windows remain invalid as G1000H equipment begins to initialize. All windows should be operational within one minute of power-up. Should any window continue to remain flagged, the G1000H system should be serviced by a Garmin-authorized repair facility.*

System Annunciation Red 'X'

Messages Window

Message Softkey Annunciation
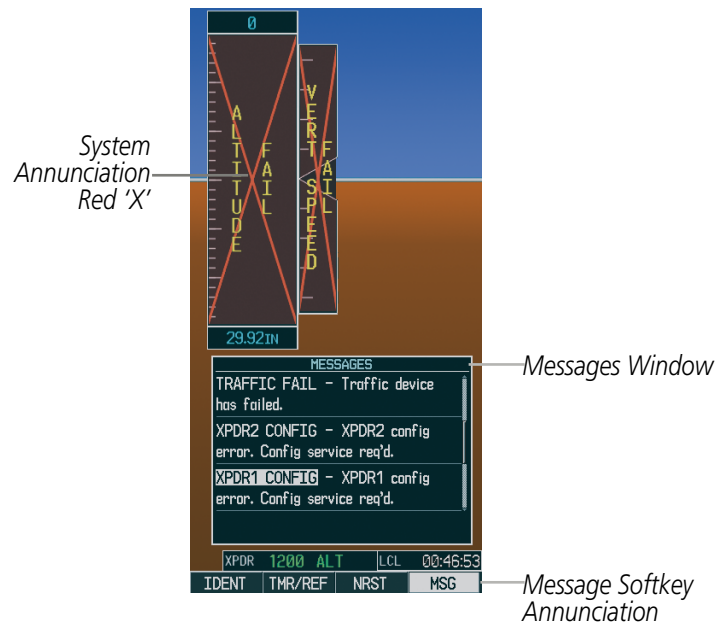
Figure A-2 G1000H System Messages

GIA 63H Integrated Avionics Units

GIA 63H Integrated Avionics Units

GDC 74H Air Data Computer

GEA 71H Engine Airframe Unit Or GIA 63W Integrated Avionics Unit

GRS 77H AHRS Or GMU 44 Magnetometer

GIA 63H Integrated Avionics Units

GDC 74H Air Data Computer

GTX 33H Transponder Or GIA 63H Integrated Avionics Units
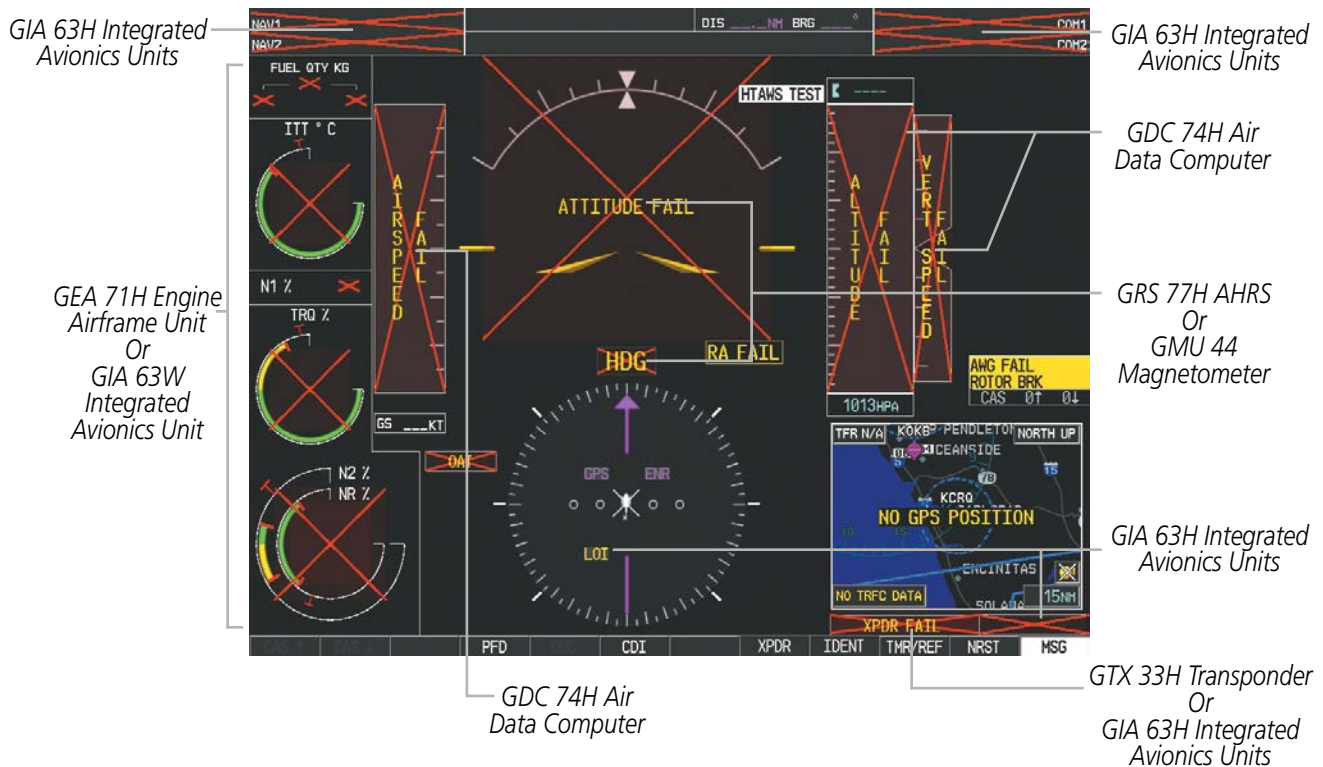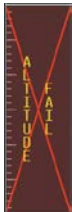
Figure A-3 G1000H System Failure Annunciations

System Annunciation	Comment
Attitude and Heading Reference System is aligning.	
Display system is not receiving attitude information from the AHRS.	
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 RFM).	
Indicates a configuration module failure.	
Display system is not receiving airspeed input from air data computer.	
Display system is not receiving altitude input from the 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 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.	
Indicates the fuel in the right tank is not usable when the fuel quantity is less than 120kg and the Fuel Transfer Pump fails.	
Radar Altimeter data is invalid.	
Other Various Red X Indications	A red "X" through any other display field (such as engine instrumentation display) indicates that the field is not receiving valid data.

HTAWS ALERTS

Alert Type	PFD/HTAWS Page Alert Annunciation	MFD Pop-Up Alert (except HTAWS 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)	OBSTACLE	WARNING – OBSTACLE	"Warning; Obstacle, Obstacle"
Imminent Obstacle Impact Warning (IOI)	OBSTACLE	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)	OBSTACLE	CAUTION – OBSTACLE	"Caution; Obstacle, Obstacle"
Imminent Obstacle Impact Caution (IOI)	OBSTACLE	CAUTION – OBSTACLE	"Caution; Obstacle, Obstacle"
Voice Callout (VCO)	None	None	"Five Hundred", "Four Fifty", "Four Hundred", "Three Fifty", "Three Hundred", "Two Fifty", "Two Hundred", "One Fifty", "One Hundred", "Fifty"

HTAWS Alerts Summary

HTAWS SYSTEM STATUS ANNUNCIATIONS

Alert Type	PFD/HTAWS Page Status Annunciation	HTAWS Page Center Banner Annunciation	Aural Message
System Test in Progress	HTAWS TEST	HTAWS TEST	None
System Test Pass	None	None	"HTAWS Test OK"
HTAWS System Failure	HTAWS FAIL	HTAWS FAIL	"HTAWS Failure"
HTAWS Not Available	HTAWS N/A	None	"HTAWS Not Available"
HTAWS Availability Restored	None	None	"HTAWS Available"*
HTAWS FLTA Alerting Inhibited	HTAWS INH	None	None
Reduced Protection Mode Enabled	RP MODE	None	None
MFD Terrain or Obstacle database unavailable or invalid. HTAWS 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, HTAWS audio fault	HTAWS FAIL	HTAWS FAIL	"HTAWS Failure"
No GPS position	HTAWS N/A	NO GPS POSITION	"HTAWS Not Available" "HTAWS Available" when GPS position returns and HTAWS is not inhibited.
Excessively degraded GPS signal	HTAWS N/A	None	"HTAWS Not Available" "HTAWS Available" when sufficient GPS signal is received and HTAWS is not inhibited.
Out of database coverage area	HTAWS N/A	None	"HTAWS Not Available" "HTAWS Available" when aircraft enters database coverage area and HTAWS is not inhibited.

Aural message not issued if HTAWS is inhibited.

TERRAIN-SVS ALERTS

Alert Type	PFD/MFD TERRAIN-SVS Page Annunciation	MFD Pop-Up Alert	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	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"

TERRAIN-SVS SYSTEM STATUS ANNUNCIATIONS

Alert Type	PFD/MFD Alert Annunciation	TERRAIN-SVS Page Annunciation	Aural Message
System Test in Progress	TER TEST	**TERRAIN TEST**	None
System Test Pass	None	None	"Terrain System Test OK"
Terrain Alerting is disabled	TER INH	None	None
MFD Terrain or Obstacle database unavailable or invalid. Terrain-SVS operating with PFD Terrain or Obstacle databases	None	**TERRAIN DATABASE FAILURE**	None
Terrain System Test Fail	TER FAIL	**TERRAIN FAIL**	"Terrain System Failure"
Terrain or Obstacle database unavailable or invalid, invalid software configuration, system audio fault	TER FAIL	**TERRAIN FAIL**	"Terrain System Failure"
No GPS position	TER N/A	**NO GPS POSITION**	"Terrain System Not Available"
Excessively degraded GPS signal, Out of database coverage area	TER N/A	None	"Terrain System Not Available"
Sufficient GPS signal received after loss	None	None	"Terrain System Available"

G1000H SYSTEM MESSAGE ADVISORIES

> **NOTE:** *This Section provides information regarding G1000H 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 AgustaWestland AW119Kx Rotorcraft Flight Manual (RFM) and Rotorcraft Flight Manual Supplement (RFMS) takes precedence over any conflicting guidance found in this section.*

This section describes various G1000H 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 G1000H System Annunciation section.

MFD & PFD MESSAGE ADVISORIES

Message	Comments
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 & PFD with preferred settings, if desired.
XTALK ERROR – A flight display crosstalk error has occurred.	The MFD and PFDs are not communicating with each other. The system should be serviced.
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.
MFD1 SERVICE – MFD1 needs service. Return unit for repair.	
MANIFEST – PFD1 software mismatch, communication halted.	The PFD and/or MFD has incorrect software installed. The system should be serviced.
MANIFEST – MFD1 software mismatch, communication halted.	
PFD1 CONFIG – PFD1 config error. Config service req'd.	The PFD configuration settings do not match backup configuration memory. The system should be serviced.
MFD1 CONFIG – MFD1 config error. Config service req'd.	The MFD configuration settings do not match backup configuration memory. The system should be serviced.
SW MISMATCH – GDU software version mismatch. Xtalk is off.	The MFD and PFDs have different software versions installed. The system should be serviced.
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.
MFD1 COOLING – MFD1 has poor cooling. Reducing power usage.	
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.
MFD1 KEYSTK – MFD [key name] Key is stuck.	
CNFG MODULE – PFD1 configuration module is inoperative.	The PFD1 configuration module backup memory has failed. The system should be serviced.
PFD1 VOLTAGE – PFD1 has low voltage. Reducing power usage	The PFD1 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.

DATABASE MESSAGE ADVISORIES

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.	
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.	
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.	
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.	
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.	
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.	
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.	
MFD1 DB ERR – MFD1 Chartview database error exists.	The MFD 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 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 Airport Directory database error exists.	The MFD 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.
DB MISMATCH – Navigation database mismatch. Xtalk is off.	The PFDs and MFD have different navigation database versions or types (Americas, European, etc.) installed. Crossfill is off. Install correct navigation database version or type in all displays.

DATABASE MESSAGE ADVISORIES (CONT.)

Message	Comments
DB MISMATCH – Terrain database mismatch.	The PFDs and MFD have different terrain database versions or types installed. Install correct terrain database version or type in all displays.
DB MISMATCH – Obstacle database mismatch.	The PFDs and MFD have different obstacle database installed. Install correct obstacle database in all displays.
NAV DB UPDATED – Active navigation database updated.	System has updated the active navigation database from the standby navigation database.
TERRAIN DSP – [PFD1 or MFD1] Terrain awareness display unavailable.	One of the terrain or obstacle databases required for HTAWS in the specified PFD or MFD is missing or invalid.

GIA 63H MESSAGE ADVISORIES

Message	Comments
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.	
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.	

GIA 63H MESSAGE ADVISORIES (CONT.)

Message	Comments
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 – GFC software mismatch, communication halted.	Incorrect servo software is installed, or gain settings are incorrect.
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.	
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 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.	
LOI – GPS integrity lost. Crosscheck with other NAVS.	GPS integrity is insufficient for the current phase of flight.
GPS NAV LOST – Loss of GPS navigation. Insufficient satellites.	Loss of GPS navigation due to insufficient satellites.
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.
ABORT APR – Loss of GPS navigation. Abort approach.	Abort approach due to loss of GPS navigation.
APR DWNGRADE – Approach downgraded.	Vertical guidance generated by SBAS is unavailable, use LNAV only minimums.
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'.
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.	

GIA 63H MESSAGE ADVISORIES (CONT.)

Message	Comments
NAV1 SERVICE – NAV1 needs service. Return unit for repair. **NAV2 SERVICE** – NAV2 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.
NAV1 RMT XFR – NAV1 remote transfer key is stuck. **NAV2 RMT XFR** – NAV2 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.
G/S1 FAIL – G/S1 is inoperative. **G/S2 FAIL** – G/S2 is inoperative.	A failure has been detected in glideslope receiver 1 and/or receiver 2. The system should be serviced.
G/S1 SERVICE – G/S1 needs service. Return unit for repair. **G/S2 SERVICE** – G/S2 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.

GEA 71H MESSAGE ADVISORIES

Message	Comments
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.
MANIFEST – GEA1 software mismatch, communication halted.	The #1 GEA 71 has incorrect software installed. The system should be serviced.

GTX 33H MESSAGE ADVISORIES

Message	Comments
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.
MANIFEST – GTX1 software mismatch, communication halted.	The transponder has incorrect software installed. The system should be serviced.
XPDR1 SRVC – XPDR1 needs service. Return unit for repair.	The #1 transponder should be serviced when possible.
XPDR1 FAIL – XPDR1 is inoperative.	There is no communication with the #1 transponder.

GRS 77H MESSAGE ADVISORIES

Message	Comments
AHRS1 TAS – AHRS1 not receiving valid 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.
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.
AHRS1 GPS – AHRS1 not receiving any GPS information.	The #1 AHRS is not receiving any or any useful GPS information. Check RFMS 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.
AHRS1 GPS – AHRS1 operating exclusively in no-GPS mode.	The #1 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.
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.
MANIFEST – GRS1 software mismatch, communication halted.	The #1 AHRS has incorrect software installed. The system should be serviced.

GMU 44 MESSAGE ADVISORIES

Message	Comments
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.
MANIFEST – GMU1 software mismatch, communication halted.	The GMU 44 has incorrect software installed. The system should be serviced.

GDL 69AH MESSAGE ADVISORIES

Message	Comments
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
MANIFEST – GDL software mismatch, communication halted.	The GDL 69 has incorrect software installed. The system should be serviced.

GDC 74H MESSAGE ADVISORIES

Message	Comments
ADC1 ALT EC – ADC1 altitude error correction is unavailable.	GDC is reporting that the altitude error correction is unavailable.
ADC1 AS EC – ADC1 airspeed error correction is unavailable.	GDC is reporting that the airspeed error correction is unavailable.
MANIFEST – GDC1 software mismatch, communication halted.	The GDC 74B has incorrect software installed. The system should be serviced.

GTS 800 MESSAGE ADVISORIES

Message	Comments
GTS CONFIG – GTS config error. Config service req'd.	The GTS and GDU have incompatible configurations. This alert is also set when the GTS has an invalid mode S address configured or the mode S address does not match both XPDR mode S addresses.
MANIFEST – GTS software mismatch, communication halted.	The GTS has incorrect software installed. The G1000H system should be serviced.

MISCELLANEOUS MESSAGE ADVISORIES

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.
TIMER EXPIRD – Timer has expired.	The system notifies the pilot that the timer has expired.
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.
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.
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.

MISCELLANEOUS MESSAGE ADVISORIES (CONT.)

Message	Comments
WPT ARRIVAL – Arriving at waypoint -[xxxx]	Arriving at waypoint [xxxx], where [xxxx] is the waypoint name.
STEEP TURN – Steep turn ahead.	A steep turn is 15 seconds ahead. Prepare to turn.
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 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.
APR INACTV – Approach is not active.	The system notifies the pilot that the loaded approach is not active. Activate approach when required.
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.
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.
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.
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.
NO WGS84 WPT – Non WGS 84 waypoint for navigation -[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.
TRAFFIC FAIL – Traffic device has failed.	The system is no longer receiving data from the traffic system. The traffic device should be serviced.
FAILED PATH – A data path has failed.	A data path connected to the GDU, GSD 41, or the GIA 63/W has failed.

MISCELLANEOUS MESSAGE ADVISORIES (CONT.)

Message	Comments
MAG VAR WARN – Large magnetic variance. Verify all course angles.	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°.
SVT – SVT DISABLED: Out of available terrain region.	Synthetic Vision is disabled because the aircraft is not within the boundaries of the installed terrain database.
SVT – SVT 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.
SCHEDULER [#] – <message>.	Message criteria entered by the user.
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.
[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.
[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.
HDG PRESET MODE – Magnetic anomaly detected. HPM is available.	The magnetometer has detected a magnetic anomaly that could affect heading indications. Heading Preset Mode may be used.

GARMIN.

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.

DATABASE MANAGEMENT

⚠️ **CAUTION:** *Never disconnect power to the system when loading a database. Power interruption 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 G1000H. 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:** *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 new navigation database version 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:      1204               1205
EFFECTIVE:  09-APR-2012        07-MAY-2012
EXPIRES:    07-MAY-2012        04-JUN-2012

NO WILL BE ASSUMED IN 21 SECONDS.
```

Figure B-1 Standby Navigation Database Prompt

3) Press the **NO** Softkey to proceed to loading the active database.

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:      1204                 1205
EFFECTIVE:  09-APR-2012          07-MAY-2012
EXPIRES:    07-MAY-2012          04-JUN-2012

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 display (PFD 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**). 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 the 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:      1204            1205
EFFECTIVE:  09-APR-2012     07-MAY-2012
EXPIRES:    07-MAY-2012     04-JUN-2012

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:       1204                1205
EFFECTIVE:   09-APR-2012         07-MAY-2012
EXPIRES:     07-MAY-2012         04-JUN-2012

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:       1204                1205
EFFECTIVE:   09-APR-2012         07-MAY-2012
EXPIRES:     07-MAY-2012         04-JUN-2012

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 the 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**). Verify the correct standby navigation database cycle information is shown for each display.

> **NOTE:** *The system compares the active databases on the PFD and the MFD, and displays a system alert message 'DB Mismatch' if they are not identical. Similarly, if the standby databases on the 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
- Obstacle
- SafeTaxi
- FliteCharts
- Airport Directory (AOPA)

After subscribing to the desired database product, these database products will be downloaded and ultimately stored on two Supplemental Data Cards (with the exception of FliteCharts, which is loaded on only one card). 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.

MFD

Expanded Basemap
Terrain
Obstacle
SafeTaxi
Airport Directory (AOPA)
FliteCharts or ChartView

PFD

Expanded Basemap
Terrain
Obstacle
SafeTaxi
Airport Directory (AOPA)
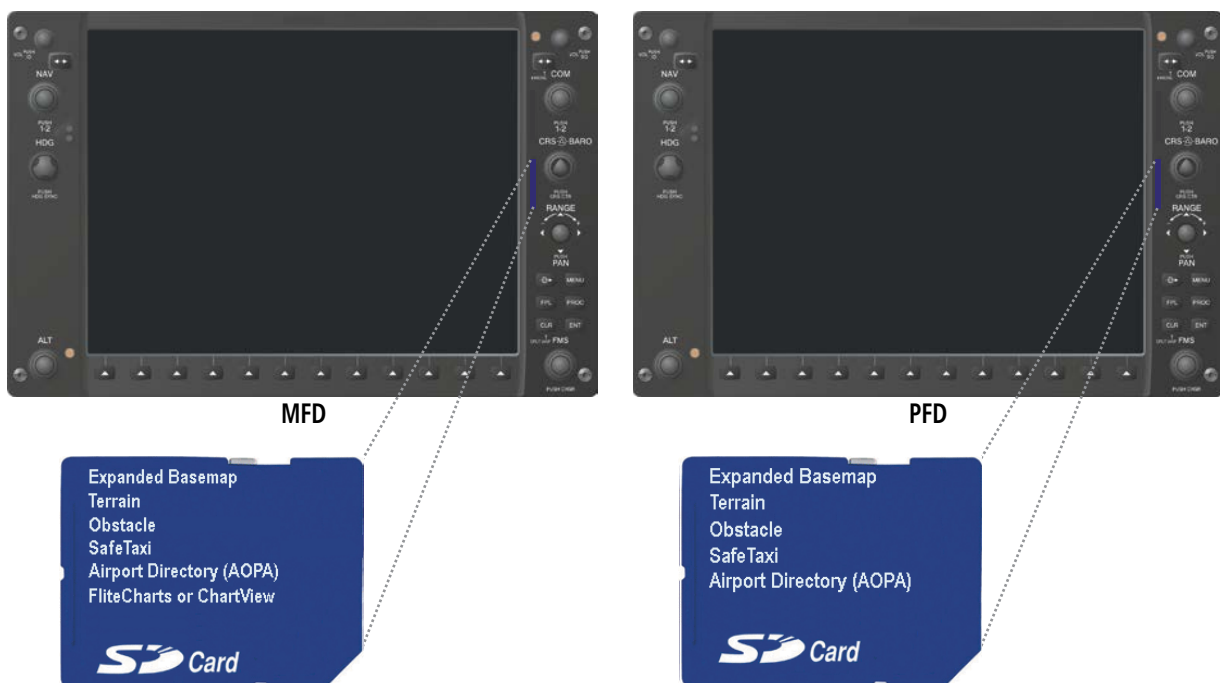
Figure B-7 Correct Database Locations

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. These databases are updated periodically and have no expiration date.

The obstacle database contains data for obstacles, such as towers, that pose a potential hazard to aircraft. 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 Airport Directory provides data on airports and heliports throughout the U.S., and offers detailed information for over 5,300 U. S. airports, along with the names and phone numbers of thousands of FBOs. This database is updated four times per year.

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 the 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, Airport Terrain, 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.

> **NOTE:** The 6-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 switch between the PFD and MFD. Database status information in the Database Window will reflect the database of the selected display. 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 display 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.

'Card Full' 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 (running 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 (010-00330-4A, -4B, -4C, -4D, -4E, or -4F) from the PFD 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.
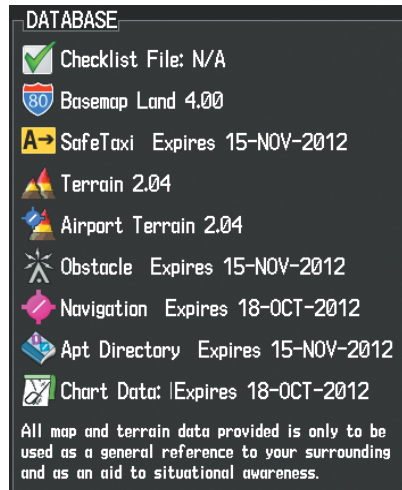
Figure B-10 Database Information on the Power-up Screen

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**). 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 the AHRS (GRS). If the system determines the MV DB needs to be updated, a prompt is displayed on the Navigation Map Page.
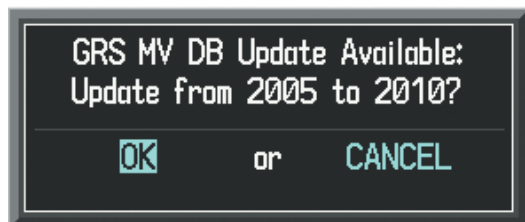
Figure B-12 GRS Magnetic Field Variation Database Update Prompt

Loading the magnetic field variation database update:

1) With 'OK' highlighted, as shown 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 GRS

2) When the upload is complete, the system is ready for use.

GLOSSARY

ACC	accuracy		CA	Course to Altitude
ACT, ACTV	active, activate		CALC	calculator
ADC	air data computer		Calibrated Airspeed	Indicated airspeed corrected for installation and instrument errors.
ADF	Automatic Direction Finder			
ADI	Attitude Direction Indicator		CD	Course to DME distance
AF	Arc to fix		CDI	Course Deviation Indicator
AFCS	Automatic Flight Control System		CDU	Control Display Unit
AFRM	airframe		CF	Course to Fix
AGL	Above Ground Level		CHT	Cylinder Head Temperature
AHRS	Attitude and Heading Reference System		CHKLIST	checklist
AIM	Aeronautical Information Manual		CHNL	channel
AIRMET	Airman's Meteorological Information		CI	Course to Intercept
ALRT	alert		CLD	cloud
ALT	altitude		CLR	clear
ALT, ALTN	alternator, alternate		cm	centimeter
AMPS	amperes		CNS	Communication, Navigation, & Surveillance
ANNUNC	annunciation			
ANT	antenna		CO	carbon monoxide
AOPA	Aircraft Owners & Pilots Association		COM	communication radio
AP	autopilot		CONFIG	configuration
AP DISC	autopilot disconnect		COOL	coolant
APR	approach		COPLT	co-pilot
APT	airport, aerodrome		Course	The line between two points to be followed by the aircraft.
ARINC	Aeronautical Radio Incorporated			
ARSPC	airspace		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.
ARTCC	Air Route Traffic Control Center			
ARV	arrival			
AS	airspeed			
ASB	Aviation Support Branch			
ASOS	Automated Surface Observing System			
ATC	Air Traffic Control		CR	Course to Radial
ATCRBS	ATC Radar Beacon System		CRG	Cockpit Reference Guide
ATIS	Automatic Terminal Information Service		CRNT	current
ATK	along-track		Crosstrack Error	The distance the aircraft is off a desired course in either direction, left or right.
AUTOSEQ	automatic sequence			
AUX	auxiliary		CRS	course
AWOS	Automated Weather Observing System		CRS	Course to Steer
			CRSR	cursor
			CTA	Control Area
B ALT	barometric altitude		CTRL	control
BARO	barometric setting		Cumulative	The total of all legs in a flight plan.
BATT	battery		CVR	Cockpit Voice Recorder
BC	backcourse		CVRG	coverage
Bearing	The compass direction from the present position to a destination waypoint.		CWS	control wheel steering
			CYL	cylinder
BFO	beat frequency oscillator			
BKSP	backspace		D ALT	density altitude
BRG	bearing		DB, DBASE	database
C	center runway		dBZ	decibels 'Z' (radar return)
°C	degrees Celsius		DCLTR, DECLTR	declutter

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DEC FUEL	decrease fuel	EPE	Estimated Position Error
deg	degree	EPU	Estimated Position Uncertainty
DEIC, DEICE	de-icing	ERR	error
DEP	departure	ESA	Enroute Safe Altitude
Desired Track	The desired course between the active "from" and "to" waypoints.	Estimated Position Error	A measure of horizontal GPS position error derived by satellite geometry conditions and other factors.
DEST	destination		
DF	Direct to Fix	Estimated Time of Arrival	The estimated time at which the aircraft should reach the destination waypoint, based upon current speed and track.
DFLT	default		
DGRD	degrade		
DH	decision height	Estimated Time Enroute	The estimated time it takes to reach the destination waypoint from the present position, based upon current ground speed.
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).		
		ETA	Estimated Time of Arrival
DIR	direction	ETE	Estimated Time Enroute
DIS	distance	EXPIRD	expired
Distance	The 'great circle' distance from the present position to a destination waypoint.	°F	degrees Fahrenheit
		FA	Course From Fix to Altitude
DME	Distance Measuring Equipment	FAA	Federal Aviation Administration
DOP	Dilution of Precision	FADEC	Full Authority Digital Engine Control
DP	Departure Procedure	FAF	Final Approach Fix
DPRT	departure	FAIL	failure
DR	dead reckoning	FC	Course From Fix to Distance
DSBL	disabled	FCC	Federal Communication Commission
DTK	Desired Track	FCST	forecast
		FD	Course From Fix to DME Distance
E	empty, east	FD	flight director
ECU	Engine Control Unit	FDE	Fault Detection and Exclusion
Efficiency	A measure of fuel consumption, expressed in distance per unit of fuel.	FFLOW	fuel flow
		FIS-B	Flight Information Services-Broadcast
EGT	Exhaust Gas Temperature	FISDL	Flight Information Service Data Link
EIS	Engine Indication System	FL	flight level
EGNOS	European Geostationary Navigation Overlay Service	FLC	Flight Level Change
		FM	Course From Fix to Manual Termination
ELEV	elevation	FMS	Flight Management System
ELEV	elevator	FOB	Fuel On Board
EMERGCY	emergency	FPL	flight plan
EMI	Electromagnetic Interference	fpm	feet per minute
ENDUR	endurance	FREQ	frequency
Endurance	Flight endurance, or total possible flight time based on available fuel on board.	FRZ	freezing
		FSS	Flight Service Station
ENG	engine	ft	foot/feet
ENGD	engaged	Fuel Flow	The fuel flow rate, expressed in units of fuel per hour.
ENR	enroute		
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.	Fuel On Board	The total amount of usable fuel on board the aircraft.
ENT	enter	G/S, GS	glideslope

GA	go-around	HTAWS	Helicopter Terrain Awareness and Warning System
gal, gl	gallon(s)		
GBOX	gearbox	HUL	Horizontal Uncertainty Level
GDC	Garmin Air Data Computer	Hz	Hertz
GDU	Garmin Display Unit	I	Inner Marker
GEA	Garmin Engine/Airframe Unit	IAF	Initial Approach Fix
GEO	geographic	IAT	Indicated Air Temperature
GFC	Garmin Flight Control	ICAO	International Civil Aviation Organization
GIA	Garmin Integrated Avionics Unit	ICS	Intercom System
GLS	Global Navigation Satellite Landing System	ID	Identification/Morse Code Identifier
		IDENT, IDNT	identification
GMC	Garmin Mode Controller	IF	Initial Fix
GMT	Greenwich Mean Time	IFR	Instrument Flight Rules
GMU	Garmin Magnetometer Unit	IG	Imperial gallon
GND	ground	ILS	Instrument Landing System
gph	gallons per hour	IMC	Instrument Meteorological Conditions
GPS	Global Positioning System	in	inch
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 1000 feet for all areas of the grid	INACTV	inactive
		INC FUEL	increase fuel
		IND	indicated
		Indicated	Information provided by properly calibrated and set instrumentation on the aircraft panel.
Groundspeed	The velocity that the aircraft is travelling relative to a ground position.		
		INFO	information
Ground Track	*see Track*	in HG	inches of mercury
GRS	Garmin Reference System	INT	intersection(s)
GS	Ground speed	INTEG	integrity (RAIM unavailable)
GTX	Garmin Transponder	IrDA, IRDA	Infrared Data Association
HA	Hold Terminating at Altitude	KEYSTK	key stuck
HDG	heading	kg	kilogram
Heading	The direction an aircraft is pointed, based upon indications from a magnetic compass or a properly set directional gyro.	kHz	kilohertz
		km	kilometer
		kt	knot
HF	Hold Terminating at Fix	L	left, left runway
HFOM	Horizontal Figure of Merit	LAT	latitude
Hg	mercury	LBL	label
HI	high	lb	pound
HI SENS	High Sensitivity	LCD	Liquid Crystal Display
HM	Hold with Manual Termination	LCL	local
Horizontal Figure of Merit	A measure of the uncertainty in the aircraft's horizontal position.	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.
hPa	hectopascal		
HPL	Horizontal Protection Level		
HPM	Heading Preset Mode	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.
hr	hour		
HSDB	High-Speed Data Bus		
HSI	Horizontal Situation Indicator		
HT	heat		

Leg	The portion of a flight plan between two waypoints.	N	north
LIFR	Low Instrument Flight Rules	NAV	navigation
LNAV	Lateral Navigation	NAVAID	NAVigation AID
LO	low	NDB	Non-directional Beacon
LOC	localizer	NEXRAD	Next Generation Radar
LOI	loss of integrity (GPS)	nm	nautical mile(s)
LON	longitude	NoPT	No Procedure Turn Required (procedure shall not be executed without ATC clearance)
LPV	Localizer Performance with Vertical guidance		
LRU	Line Replaceable Unit	NRST	nearest
LT	left		
LTNG	lightning	O	Outer Marker
LVL	level	OAT	Outside Air Temperature
		OBS	Omni Bearing Selector
M	Middle Marker	OFST	offset
m	meter	OXY	oxygen
MAG	Magnetic		
MAG VAR	Magnetic Variation	P ALT	pressure altitude
MAHP	Missed Approach Hold Point	PA	Passenger Address
MAN IN	manifold pressure (inches Hg)	PA	Proximity Advisory
MAN SQ	Manual Squelch	PASS	passenger(s)
MAP	Missed Approach Point	PC	personal computer
MASQ	Master Avionics Squelch	PFD	Primary Flight Display
MAX	maximum	PI	Procedure Turn to Course Intercept
MAXSPD	maximum speed (overspeed)	PIT, PTCH	pitch
MDA	barometric minimum descent altitude	POSN	position
MET	manual electric trim	PPM	parts per million
METAR	Meteorological Aviation Routine	P. POS	Present Position
MEPT	manual electric pitch trim	PRES, PRESS	pressure
MFD	Multi Function Display	PROC	procedure(s), procedure turn
MGRS	Military Grid Reference System	psi	pounds per square inch
MHz	megahertz	PT	Procedure Turn
MIC	microphone	PTK	parallel track
MIN	minimum	PTT	Push-to-Talk
Minimum Safe Altitude	Uses Grid MORAs to determine a safe altitude within ten miles of the aircraft present position.	PWR	power
		QTY	quantity
MKR	marker beacon		
MOA	Military Operations Area	R	right, right runway
MOV	movement	RAD	radial
mpm	meters per minute	RAIM	Receiver Autonomous Integrity Monitoring
MSA	Minimum Safe Altitude		
MSAS	Multi-functional Satellite Augmentation System	RAM	random access memory
		REF	reference
MSG	message	REM	remaining (fuel remaining above Reserve)
MSL	Mean Sea Level		
MT	meter	REQ	required
mV	millivolt(s)	RES	reserve (fuel reserve entered by pilot)
MV DB	Magnetic Field Variation Database	REV	reverse, revision, revise
MVFR	Marginal Visual Flight Rules	RF	Constant Radius Turn to Fix

RFM	Rotorcraft Flight Manual		TAF	Terminal Aerodrome Forecast
RFMS	Rotorcraft Flight Manual Supplement		TAS	True Airspeed
RMI	Radio Magnetic Indicator		TAS	Traffic Advisory System, true airspeed
RMT	remote		TAT	Total Air Temperature
RNG	range		TCA	Terminal Control Area
RNWY	runway		TCAS	Traffic Collision Avoidance System
ROL	roll		TEL	telephone
ROM	read only memory		TEMP	temperature
rpm	revolutions per minute		TERM	terminal
RST FUEL	reset fuel		TF	Track Between Two Fixes
RSV	reserve (fuel reserve entered by pilot)		TFR	Temporary Flight Restriction
RT	right		T HDG	True Heading
RVRSNRY	reversionary		TIS	Traffic Information System
RX	receive		TIT	Turbine Inlet Temperature
			TKE	Track Angle Error
S	south		TMA	Terminal Maneuvering Area
SA	Selective Availability		TMR/REF	Timer/Reference
SAT	Static Air Temperature		Topo	topographic
SBAS	Satellite-Based Augmentation System		Track	Direction of aircraft movement relative to a ground position; also 'Ground Track'
SCIT	Storm Cell Identification and Tracking			
SD	Secure Digital			
sec	second(s)		Track Angle Error	The angle difference between the desired track and the current track.
SEL, SLCT	select			
SFC	surface		TRG	target
SIAP	Standard Instrument Approach Procedures		TRK	track
			TRSA	Terminal Radar Service Area
SID	Standard Instrument Departure		TRUNC	truncated
SIGMET	Significant Meteorological Information		TTL	total
Sim	simulator		TURN	procedure turn
SLP/SKD	slip/skid		TX	transmit
SMBL	symbol			
SPD	speed		UNAVAIL	unavailable
SPI	Special Position Identification		USR	user
SPKR	speaker		UTC	Coordinated Universal Time
SQ	squelch		UTM/UPS	Universal Transverse Mercator / Universal Polar Stereographic Grid
SRVC, SVC	service			
STAL	stall			
STAR	Standard Terminal Arrival Route		V, Vspeed	velocity (airspeed)
STATS	statistics		VA	Heading Vector to Altitude
STBY	standby		VAPP	VOR approach
STD	standard		VAR	variation
SUA	Special Use Airspace		VD	Heading Vector to DME Distance
SUSP	suspend		Vdc	volts, direct current
SVT	Synthetic Vision Technology		VERT	vertical
SW	software		Vertical Figure of Merit	A measure of the uncertainty in the aircraft's vertical position.
SYS	system			
T	true			
TA	Traffic Advisory			
TACAN	Tactical Air Navigation System			

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
VLOC	VOR/Localizer Receiver
VM	Heading Vector to Manual Termination
VMC	Visual Meteorological Conditions
VNAV, VNV	vertical navigation
VOL	volume
VOR	VHF Omni-directional Range
VORTAC	very high frequency omnidirectional range station and tactical air navigation
VPL	Vertical Protection Level
VPROF	VNV profile, vertical profile
VPTH	VNV path, vertical path
VR	Heading Vector to Radial
VS	vertical speed
VSI	Vertical Speed Indicator
VSR	Vertical Speed Required
VTF	vector to final
W	watt(s), west
WAAS	Wide Area Augmentation System
WARN	warning (GPS position error)
WGS-84	World Geodetic System - 1984
WPT	waypoint(s)
WW	world wide
WX	weather
XFER, XFR	transfer
XPDR	transponder
XTALK	cross-talk
XTK	cross-track

FREQUENTLY ASKED QUESTIONS

If a particular aspect of G1000H 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 and parts of northern Australia.

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 G1000H 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.

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 G1000H 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 G1000H uses the waypoint information from the current database to define the waypoints. If the database is changed or updated, the G1000H 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 G1000H?

"/G" may be filed for a flight plan. The G1000H 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 Rotorcraft Flight Manual Supplement (RFMS) 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 G1000H 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 G1000H 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 G1000H suspends automatic waypoint sequencing (indicated by a 'SUSP' annunciation placed on the HSI) when the missed approach point (MAP) is crossed. This prevents the G1000H from automatically sequencing to the missed approach holding point (MAHP). During this time, the **OBS** Softkey designation changes to **SUSP**. Selecting the **SUSP** Softkey reactivates automatic waypoint sequencing. The **OBS** Softkey then resumes its normal functionality.

WHY DOES THE G1000H NOT AUTOMATICALLY SEQUENCE TO THE NEXT WAYPOINT?

The G1000H only sequences flight plan waypoints when automatic sequencing is enabled (i.e., no "OBS" or 'SUSP' annunciation). 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 G1000H 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 selecting 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 G1000H 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 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 G1000H 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 G1000H 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 G1000H 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

INTRODUCTION

> ✓ **NOTE:** *Aircraft without an operating transponder are invisible to TIS.*

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 G1000H 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. Surveillance data includes all transponder-equipped aircraft within the coverage volume. The G1000H 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.

TIS VS. TAS/TCAS

The Traffic Information System (TIS) is a ground-based service that requires contact with a ground station through a datalink radio in order to receive traffic information. Traffic Advisory (TAS) and Traffic Collision Avoidance Systems (TCAS) are self-contained. 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 LIMITATIONS

> ✓ **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 shall not be used for avoidance maneuvers during instrument meteorological conditions (IMC) or when there is no visual contact with the intruder aircraft.*

> ✓ **NOTE:** *Refer to the TIS Limitations section of the Aeronautical Information Manual (AIM) for a more comprehensive explanation.*

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.

- Other limitations and anomalies associated with TIS are described in the AIM.

⚠️ **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.*

✓ **NOTE:** *TIS is unavailable at low altitudes in many areas of the United States. This is often the case in mountainous regions.*

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. Errors affect relative bearing information and target track vector. This can cause a delay in the displayed 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)

DISPLAY SYMBOLS

AIRPORT

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	
TACAN	

BASEMAP
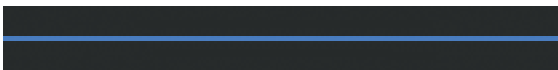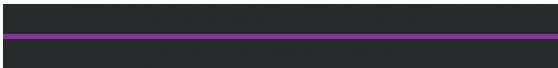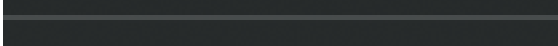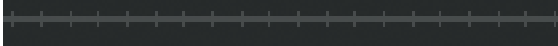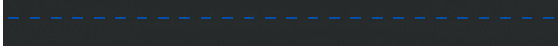
Item	Symbol
Interstate Highway	
State Highway	
US Highway	
National Highway	
Small City or Town	
Medium City	
Large City	

TRAFFIC

Traffic Symbol	Description
	Non-Threat Traffic
	Proximity Advisory (PA) (Not available with TIS
	Traffic Advisory (TA)
	Traffic Advisory Off Scale
	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).

LINE SYMBOLS

Item	Symbol
ICAO Control Area Class B Airspace	
Mode C Tower Area	
Warning Area Alert Area Caution Area Danger Area Prohibited Area Restricted Area Training Area Unknown Area	
Class C Terminal Radar Service Area Mode C Area	
Military Operations Area (MOA)	
State or Province Border	ST/PRV BORDER
International Border	INTL BORDER
Road	
Railroad	
Latitude/Longitude	

OBSTACLE DATABASE

Unlighted Obstacle		Lighted Obstacle		Obstacle Location
< 1000' AGL	> 1000' AGL	< 1000' AGL	> 1000' AGL	
				Red obstacle is at or above current aircraft altitude
				Yellow obstacle is between 0' and 250' below current aircraft altitude
				Gray obstacle is 250' or more below current aircraft altitude

HTAWS Obstacle Colors and Symbology

Potential Impact Point Symbol	Alert Type	Example Annunciation
✕	Warning	TERRAIN
✕	Caution	TERRAIN

HTAWS Potential Impact Point Symbols with Alert Types

TERRAIN COLOR CHART
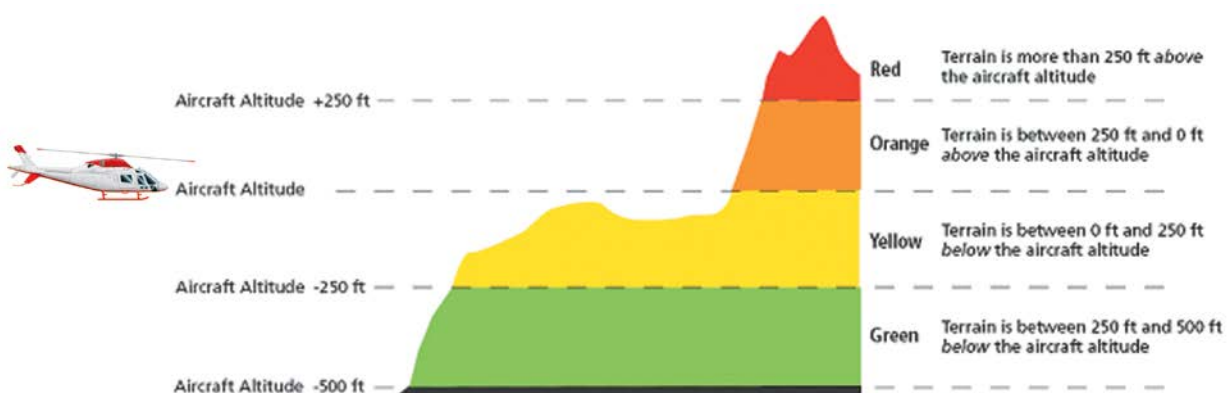
Terrain Altitude/Color Correlation for HTAWS

MISCELLANEOUS

Item	Symbol
ARTCC Frequency or FSS Frequency	
Default Map Pointer	
Elevation Pointer	
Wind Vector	
Measuring Pointer	
Overzoom Indicator	
HTerrain Proximity or HTAWS Enabled	
Traffic Enabled	
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	

HAZARD AVOIDANCE FEATURES

Item	Symbol
HTAWS display enabled	
Traffic display enabled	
NEXRAD display enabled	
Cloud Top display enabled	
Echo Top display enabled	
XM Lightning display enabled	
Cell Movement display enabled	
SIGMETs/AIRMETs display enabled	
METARs display enabled	
Surface Analysis with City Forecast 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)	

X

Z

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